SCHOOL OF SCIENCES AND ENGINEERING

DEPARTMENT OF BIOLOGY

Organization of the Department

Establishment of the Department

The Department of Biology of the School of Sciences and Engineering at the University of Crete, has launched a Postgraduate Program of Studies since 1983 and an Undergraduate Program of Studies since 1987. The Department is recognized internationally as a center of up-to-date university education and active research in various fields of current Biology.

Administration of the Department

Chairperson:

Kriton Kalantidis, Professor 2810-394084, kalantidis@uoc.gr

Vice Chairperson:

Emmanouil Ladoukakis, Associate Professor 2810-394435, ladoukakis@uoc.gr

Department's Secretariat: Fax: 2810-394404

Staff:	Maria Smyrnaki	2810-394401, smyrnaki@uoc.gr
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General Description of the Department

Teaching staff and laboratory units of the Department are organized in distinct Research Sections. Each Section coordinates teaching and research of particular subject areas, corresponding to specific scientific fields. In accordance with the Decree 103/83, FEK (Government Gazette Issue) 48 of the relevant Article, currently there are three (3) Divisions at the Department of Biology:

SECTION OF BIOCHEMISTRY, MOLECULAR BIOLOGY, CELLULAR AND DEVELOPMENTAL BIOLOGY

This Division covers topics of Biochemistry, Molecular Biology, Cellular and Developmental Biology, Genetics and Immunology, with main focus on the study of cells as a functional unit and on cellular functions in relation to their environment.

SECTION OF BIOLOGY OF ORGANISMS, POPULATIONS, ENVIRONMENT AND MARINE BIOLOGY

This Division covers topics of Zoology, Botany, Ecology, Physiology, Marine Biology and it mainly studies the biology of organisms, populations and environment.

SECTION OF BIOTECHNOLOGY AND APPLIED BIOLOGY

This Division covers various applications of biology and biological processes in mechanics, technology, environment and medicine.

Faculty staff– Fields of teaching and research activities

SECTION OF BIOCHEMISTRY, MOLECULAR BIOLOGY, CELLULAR AND DEVELOPMENTAL BIOLOGY

Irene Athanasakis, Professor, PhD 1988, University of Alberta.
Immunology.
George Garinis, Professor, PhD 2001, National and Kapodistrian University of Athens
Molecular genetics of mice – Senescence, Cancer and Longevity.
Christos Delidakis, Professor, PhD 1988, Harvard University.
Molecular Biology of Drosophila -Neurogenetics.
George Zachos, Associate Professor, PhD1997, University of Crete.
Cellular Biology, Cell cycle and Division, Mechanisms of Carcinogenesis, Checkpoints.
Ioanna Keklikoglou, Assistant Professor, PhD2012 University of Heidelberg.
Molecular Mechanisms of Animal Differentiation and Development.
Dimitrios Papadopoulos, Associate Professor, PhD 2010, University of Basel.
Molecular Biology
Charalampos Spilianakis, Associate Professor, PhD 2003, University of Crete.
Biochemistry, Molecular Immunology, Transcriptional regulation in the Immune System, Nuclear Organization of Chromosomes.
Dimitris Tzamarias, Professor, PhD 1990, University of Crete.
Biochemistry, Molecular Biology, Chromatin Structure, Transcriptional regulation, Epigenetic Inheritance
Efthymia Tsagri, Assistant Professor, PhD 1987, University of Giessen.
Molecular Plant Biology, Plant Virology.
George Chalepakis, Professor, PhD 1988, University of Marburg.
Cellular Biology.

SECTION OF BIOLOGY OF ORGANISMS, POPULATIONS, ENVIRONMENT AND MARINE BIOLOGY

Kriton Kalantidis, Professor, PhD 1995, University of Nottingham.
Evolutionary Developmental biology of higher plants.
Kyriakos Kotzambasis, Professor, PhD 1987, University of Marburg.
Plant Biochemistry and Physiology, Photosynthesis, Photobiology and Bioenergetics
George Koumoundouros, Professor, PhD 1998, University of Crete.
Marine Biology –Fish Biology
Emmanouil Ladoukakis, Associate Professor, PhD 2001, University of Crete.
Evolutionary Zoology
Konstantina Lyka, Associate Professor, PhD 1996, University of Tennessee.
Biomathematics
Panagiotis Moschou, Associate Professor, PhD 2009, University of Crete.
Molecular Physiology and Plant Biotechnology
Michael Pavlidis, Professor, PhD 1990, National & Kapodistrian University of Athens.
Biology – Marine Ecology, Fish Physiology – Endocrinology
Nikolaos Poulakakis, Professor, PhD 2005, University of Crete.
Systematic Zoology, Molecular Phylogenesis, Phylogeography and genetic management of animal populations, Ancient DNA (aDNA)
Stergios Pirintsos, Professor, PhD 1993, Aristotle University of Thessaloniki.
Plant Ecology, Ecology and Management of Terrestrial Ecosystems, Ecology of Rare and Endemic Plant Species, Biomonitoring of Environmental Changes, Environmental Risk Assessment.
Kyriaki Sidiropoulou, Associate Professor, PhD 2003, Rosalind Franklin University.
The role of intrinsic excitability on learning and memory. The role of inhibition in cortical information processing, Computational Neuroscience.

SECTION OF BIOTECHNOLOGY AND APPLIED BIOLOGY

Electra Gizeli, Professor, PhD 1993, University of Cambridge.
Bio-Nano Technology – Biosensors
Ioannis Karakassis, Professor, PhD 1991, University of Crete.
Marine Ecology.
Maroudio Kentouri, Professor, PhD 1978, Universite des Sciences et Techniques du Languedoc, Montpellier.
Fish Cultures, Behaviour of Fishes under Controlled conditions.

Panagiotis Sarris, Assistant Professor, PhD 2009, University of Crete.

Microbiology

Maria Dafni Mpazopoulou, Assistant Professor, PhD 2009, University of Crete.

Oxidative stress; Redox signaling during aging and host-microbe interactions. Aging of the nervous system and amyloid-induced pathologies in C. elegans. Microfluidics for nervous system and behavioral studies in small model organisms.

Retired Faculty Staff and Emeritus Professors

Despina Alexandraki, Vassilis Bouriotis, Michael Damanakis, Aristidis Economopoulos, Anastasios Eleftheriou, Eleftherios Zouros, Fotis Kafatos, Michael Kokkinidis, Christos (Kitsos) Louis, Moysis Mylonas, Vassilis Nafpaktitis, Nikolaos Panopoulos, Josef Papamattheakis, Kalliopi Roubelakis-Aggelakis, Emmanuel Stratakis, Nikolaos Tsimenidis.

Procedures of Admission

Students are admitted to the Department of Biology, University of Crete, is consistent following all legal ways defined by the Ministry of Education and Religious Affairs for all Universities (Panhellenic Exams, special categories of large families of three or more children, immigrants, Greek emigrants, people suffering from serious diseases, ranking following exams. Recognition of courses complies with 4115/30-1-2013 Law, Article 35.

Participation in the ERASMUS Program

The Department participates in European Union (EU) Programs designed to promote free student mobility, while recognizing successfully completed courses from other European Universities within the framework of the above mentioned Programs.

Education and research objectives of Biology Department

The students of the Biology Department have the opportunity to obtain an adequate theoretical background and practical experience in advanced technologies in various biological fields such as Molecular Biology and Genetics, Cellular and Developmental Biology, Evolutionary Biology, Ecology, Marine Biology, Applied Biology, as well as Bio- and nano-technology.

The Department collaborates with the internationally recognized Research Institutes, located in Crete under the supervision of the General Secretary of Research and Technology (ΓΓΕΤ), the Institute of Molecular Biology and Biotechnology (active participation of Faculty professors) (IMBB/ITE, http://www.imbb.forth.gr) and the Hellenic Centre of Marine Research (HCMR, http://www.hcmr.gr/indexel.php). Additionally, it collaborates with the Natural History Museum of the University of Crete (http://www.nhmc.uoc.gr) which provides valuable scientific and educational services on Eastern Mediterranean environmental matters, as well as with the Botanical Garden of the University of Crete (http://www.bg.uoc.gr) and the National Agricultural Research Foundation (http://www.nagref.gr).

Occupational profile of graduates

Graduates of the Biology Department at the University of Crete have been pursuing a professional career towards various directions in the public and private sector in organizations concerned with biomedicine and health in general, with biotechnology, environment, aquacultures, as well as with education and research in the above mentioned fields.

Access to further studies

The Post-graduate Studies Programs which are carried out by the Department lead to the acquisition of a specialization Master's Degree, followed by a Doctoral Degree (Ph. D.) in the following fields: 1) Molecular Biology and Biomedicine, 2) Molecular Biology and Plant Biotechnology 3) Environmental Biology -Management of Terrestrial and Marine Resources 4) Protein Biotechnology 5) Bioethics and 6) Erasmus Mundus Joint Master Degree in Aquaculture, Environment and Society.

Regulations and Curriculum

Summary of the curriculum. Central axes / directions of the curriculum

The curriculum comprises a number of courses whose subject matter covers a wide range of biological fields, while offering students high standard of knowledge in contemporary Molecular Biology, Cell Biology, Biology of Populations and Organisms (mandatory courses). At the beginning of the 4th semester of studies, students choose one of the two directions of the curriculum and attend all mandatory courses of their selected direction, while also choose a series of optional courses. The **directions** (according to decree No 66442A/B1, Government Gazette Issue (FEK) 1658 / 12-11-2003) constitute two cutting edge areas of research in Biological sciences and are as follows:

A. **Biomolecular Sciences and Biotechnology** (*Molecular Direction*)
B. **Environmental Biology and Management of Biological Resources** (*Environmental Direction*)

Brief Description of Course Units – Type of Courses:

A. MANDATORY COURSES	NUMBER OF COURSES	Total ECTS
Common Mandatory Courses of Molecular and Environmental Direction	**32**	**135**
Molecular Direction	**7**	**39**
Environmental Direction	**4**	**16**
B. COMPULSORY ELECTIVE COURSES	**NUMBER OF COURSES**	**Total ECTS**
Common Compulsory Elective Courses of Molecular and Environmental Division	**13**	**52**
Diploma Thesis		**20**
Trimester Laboratory Course		**4**
Reading Course		**4**
Internship (3 month duration)		**3**
Erasmus Internship (3 month duration)		**3 (20 will be indicated in the Diploma Supplement)**
Molecular Direction	**10**	**40**
Environmental Direction	**9**	**36**
Γ.FREE CHOICE COURSES	**NUMBER OF COURSES**	**Total ECTS**
Free Choice Courses	**All mandatory and obligatory elective courses of the other division**	**32 (they are taken into account upon graduation)**
COURSES OFFERED FROM OTHER DEPARTMENTS	**NUMBER OF COURSES**	**Total ECTS**
Courses from other Departments	**Courses offered from other Departments**	**18 (included in 32 ECTS allocated to Free Choice Courses and are taken into account for graduation)**

Courses offered each semester (winter and spring) are clearly outlined at the beginning of each academic year. Throughout the first three (3) semesters of study, students are registered in **18** mandatory common courses for both directions, coupled with **3** English language courses. At the 4th semester students are registered in one more English language course. At the end of the 4th semester, students are asked to choose the direction corresponding to the areas of their scientific interest. At the 4th, 5th and 6th semesters of study, they are registered in both the common mandatory courses of the two directions and the compulsory ones of their direction.

At each academic semester students are registered for the first time in courses (compulsory, elective, free choice) that should not exceed 35 ECTS. On top of the 35 ECTS, students are allowed to register to courses that they were previously registered but not successfully examined. Also on top of the 35 ECTS can be considered the Practical Training as long as it takes place during the summer period.

Foreign Language courses

Compulsory Elective Courses may be taught in English in case of Erasmus students' attendance.

Transfer of ECTS through the Erasmus Program

Students who participate in the Erasmus Program, after selecting one of the network Universities, can attend courses of their choice and achieve the corresponding credit transfer for their division, after approval of the Undergraduate Studies Committee and the Department's Assemby. It should be clarified that if a course title-content of the receiving University selected by the students coincides with our Department's curriculum courses, it can be recognized as such, only after consulting the instructor in charge. Foreign languages cannot be recognized.
Since the academic year 2007-2008 the students of our Department are eligible to be offered an internship within the framework of Erasmus Lifelong Learning Programme at a University or other organization abroad. Three months of Erasmus internship correspond to 3 ECTS, as well as 17 additional ECTS for the Degree Supplement.

Examination periods and exams

The end of teaching at each academic semester is followed by a written examination period whose duration is decided by the Dean of the School. In case students fail at a subject in the proper exam period of the academic semester, they can be re-examined during the second examination period. If they fail again they are allowed to be re-examined according to the instructions of the current Law.

Grade re-evaluation

Students are allowed to apply for re-evaluation of grades obtained at either past or current academic semester courses. For the former they should apply to the Secretary during the period of each semester course declaration. Students who wish to improve their grades -although they could be graduates - are eligible to request re-grading and postponement of their graduation for one examination period. They should hold an identity card and sign when applying, while their application should be assigned with a protocol number upon submission.

Grading system and requirements for students' graduation

There is a continuous process of students' evaluation throughout the whole semester, which is indispensable to the educational process. Grading is determined on the basis of a 0 to 10 scale. Examination is considered successful if students get at least five (5). The instructor in charge of each course is fully responsible for deciding how to test students' progress, as well as grading and announcing the results. The exact format of the examination process (number of tests-frequency-way of testing and evaluation of student progress) is determined and described at the beginning of each semester by the instructor who is responsible for each course. Exams take place following the Exam Rules of the Department, whose complete text can be accessed in the Department's website (https://www.biology.uoc.gr/el/studies/undergraduate/various).

The requirements for graduation are the attendance of 8 teaching academic semesters, the successful completion of **35** mandatory courses for the Direction of Biomolecular Sciences and Biotechnology (concerning students who entered the Department in the academic year 2011-12) or **32** mandatory courses for the Direction of Environmental Biology and Management of Biological Resources, **4** mandatory semester courses of English Language and the completion of at least **240 ECTS credits** for both direction.

Course structure diagram with credits (60 per academic year)

(https://www.biology.uoc.gr/el/studies/undergraduate/complete-courses-list)

A' Semester **Course/ Instructor**	**hours**	**C.C.**	**ECTS**
BIOL-101 Introduction to Zoology (N. Poulakakis)	**4** X13	**4**	**6**
BIOΛ-102 Laboratory Course "Introduction to Zoology" (N. Poulakakis)	**3** X11	**2**	**3**
BIOL-103 Physics (S. Maragkaki, Pdoc)	**2** X13	**3**	**4**
BIOL-105 General Chemistry (G. Chatzidakis)	**4** X13	**4**	**6**
BIOL-107 Organic Chemistry	**4** X13	**4**	**6**

(E. Gizeli)			
BIOL-109 Uses of Computers and Biological Data Bases (A. Kanterakis, Pdoc)	2 X13	2	2
BIOL-111 English I (M. Koutraki)	3 X13	3	2

B' Semester **Course/ Instructor**	**hours**	**C.C.**	**ECTS**
BIOL-150 Cell Biology (G. Chalepakis)	5 X13	4	6
BIOL-152 Structure and Function of Plants (K. Kotzabasis)	3 X13	3	4
BIOL-153 Laboratory Course in Structure and Functional Organization of Plants (K. Kotzabasis)	3 X11	2	3
BIOL-154 Biochemistry I (D. Tzamarias)	4 X13	4	6
BIOL-156 Biomathematics (K. Lyka)	5 X13	4	6
BIOL-158 English II (M. Koutraki)	3 X13	3	2
BIOL-155 General Methods for the Identification and Analysis of Biological Macromolecules (D. Tzamarias, Ch. Spilianakis, K. Kotzabasis)	4 X11	2	3

C' Semester **Course/ Instructor**	**hours**	**C.C.**	**ECTS**
BIOL-201 Microbiology (P. Sarris)	4 X13	4	6
BIOL-203 Ecology (S. Pirintsos)	4 X13	4	6
BIOL-204 Methods in Ecology (S. Pirintsos)	3 X11	2	3
BIOL-205 Genetics I (Ch. Delidakis)	5 X13	4	6
BIOL-207 Molecular Biology (Ch. Spilianakis)	4 X13	4	6
BIOL-208 General Methods in Genetics and Microbiology (Ch. Delidakis)	3 X11	2	3
BIOL-211 English III (M. Koutraki)	3 X13	3	3

D' Semester **Course/ Instructor**	**hours**	**C.C.**	**ECTS**
BIOL-251 Methods for the Functional Analysis of Biological Macromolecules (G. Garinis, E. Athanasakis, K. Kotzabasis)	3 X12	2	3
BIOL-252 Biochemistry II (D. Tzamarias)	4 X13	4	6
BIOL-254 Genetics II (M.D. Mpazopoulou)	3 X13	3	4
BIOL-256 Physical Chemistry (G. Tserevelakis, Pdoc)	4X13	4	6
BIOL-263 Laboratory Course in Animal Biodiversity (G. Koumoundouros, N. Poulakakis)	3 X11	2	3

BIOL-257 Biodiversity and Plant Evolutionary Ecology (S. Pirintsos)	**3** X13	**3**	**4**
BIOL-259 Laboratory Course in Plant Biodiversity (S. Pirintsos)	**3** X11	**2**	**3**
BIOL-265 Marine Biology (I. Karakassis, G. Koumoundouros)	**3** X13	**3**	**4**
BIOL-266 Laboratory Course in Marine Biology (I. Karakassis, M. Pavlidis, G. Koumoundouros)	**3** X11	**2**	**3**
BIOL-258 English IV (M. Koutraki)	**3** X13	**3**	**3**

E' Semester **Course/ Instructor**	**hours**	**C.C.**	**ECTS**
BIOL-300 Advanced Methods for the Analysis of Cellular Processes (D. Alexandraki, E Athanasakis, K. Kotzabasis, G. Zachos)	**3** X11	**2**	**3**
BIOL-303 Evolution (E. Ladoukakis)	**5** X13	**4**	**6**
BIOL-305 Enzyme Biotechnology (D. Mpazopoulou)	**4** X13	**4**	**6**
BIOL-307 Immunobiology (E. Athanasakis)	**4** X13	**4**	**6**
BIOL-309 Biostatistics (K. Lyka)	**4** X13	**4**	**6**
BIOL-313 Biogeography (N. Poulakakis)	**3** X13	**3**	**4**

F' Semester **Course/ Instructor**	**hours**	**C.C.**	**ECTS**
BIOL-350 Developmental Biology (Keklikoglou)	**4** X13	**4**	**6**
BIOL-352 Biotechnology (M. Kokkinidis, K. Kalantidis)	**4** X13	**4**	**6**
BIOL-358 Plant Physiology (P. Moschou)	**3** X13	**3**	**4**
BIOL-355 Methods of Analysis for Physiological Processes (K. Kotzabasis, K. Sidiropoulou, P. Moschou)	**4** X11	**2**	**3**
BIOL-357 Animal Physiology (K. Sidiropoulou)	**3** X13	**3**	**4**
BIOL-315 Computational Biology ()	**4** X13	**4**	**5**

Elective Courses

WINTER SEMESTER

a. Biomolecular Sciences and Biotechnology

Course/ Instructor	**hours**	**C.C.**	**ECTS**
BIOL-406 Crystal Structure Determination of Biological Macromolecules (S. Maragkaki, Pdoc) *(The course will be taught in spring semester at the academic year 2022-23)*	**2** X13	**2**	**4**
BIOL-410 RNA *(The course will not be taught at the academic year 2022-23)*	~~**2** X13~~	~~**2**~~	**4**
BIOL-412 Cell Growth, Proliferation and Cancer (G. Zachos) *(Successful examination at the courses of Cell Biology, Molecular Biology,*	**3** X13	**3**	**4**

Genetics I and Genetics II is recommended) *(The course will be taught in spring semester at the academic year 2022-23)*			
BIOL-418 Human Genetics: from molecular mechanisms to disease (G. Garinis) *(Successful examination at the courses of Genetics I, Genetics II, Biochemistry I, Biochemistry II and Molecular Biology is required)* *(The course will not be taught at the academic year 2022-23)*	**2** x 13	**2**	**4**

b. Environmental Biology and Management of Biological Resources

Course/ Instructor	hours	C.C.	ECTS
BIOL-403 Aquacultures (G. Koumoundouros)	**3** X13	**3**	**4**
BIOL-405 Applied Ecology and terrestrial Ecosystem Management (S. Pirintsos) *(The course will be taught every even academic year)*	**3** X13	**3**	**4**
BIOL-409 Marine Pollution (I.Karakassis) *(The course will be taught every even academic year)*	**2**X13	**2**	**4**
BIOL-411 Benthic Ecology (I. Karakassis)	**3** X13	**3**	**4**

c. Courses Common to both Directions

Course/ Instructor	hours	C.C.	ECTS
BIOL-492 Neurobiology (K. Sidiropoulou)	**3** X13	**3**	**4**
BIOL-416 Special Issues in Cell Biology (G. Chalepakis) *(The course will not be taught at the academic year 2022-23)*	**3** X13	**3**	**4**
BIOL-440 Photosynthesis (K. Kotzabasis)	**3** X13	**3**	**4**
BIOL-443 Reading Course Faculty Member		**2**	**4**
BIOL-444 Quarterly Laboratory Course Faculty Member		**2**	**4**
BIOL-447 Developmental Plant Biology (K. Kalantidis)	**3** X13	**3**	**4**
BIOL-445 Laboratory Course – Green Biotechnology (K. Kotzabasis, K. Kalantidis, S. Pirintsos, I. Vontas, P. Moschu, P. Sarris)	**3** X13	**3**	**4**

SPRING SEMESTER

a. Biomolecular Sciences and Biotechnology

Course/ Instructor	hours	C.C.	ECTS
BIOL-414 When Biochemistry meets Epigenetics (Ch. Spilianakis) (The course will be taught every odd academic year)	**3** X13	**3**	**4**
BIOL-456 Molecular Oncogenesis (obligatory attendance) (I. Papamathaiakis) *(Successful examination at the courses of Genetics I, Cenetics II, Cell Biology, Molecular Biology and Developmental Biology is recommended)*	**2** X13	**3**	**4**
BIOL-460 Molecular Plant Virology *(The course will not be taught at the academic year 2022-23)*	**2** X13	**2**	**4**
BIOL-462 Special Topics in Immunology (E. Athanasakis)	**4** X13	**3**	**4**

Course/ Instructor	hours	C.C.	ECTS
(Successful examination at the course of Immunobiology is recommended)			
BIOL-468 Developmental Biology of Drosophila (obligatory attendance) (Ch. Delidakis) *(Successful examination at the courses of Cell Biology, Molecular Biology, Genetics I and Genetics II is recommended)*	**2** X13	**3**	**4**

b. Environmental Biology and Management of Biological Resources

Course/ Instructor	hours	C.C.	ECTS
BIOL-407 Topics in Physical Geography and Geomorphology (Ch. Fasoulas)	**3** X13	**3**	**4**
BIOL-453 Management of Marine Biological Resources (obligatory attendance) (G. Koumoundouros) *(The course will not be taught at the academic year 2022-23)*	**2** X13	**2**	**4**
BIOL-455 Marine Biotechnology (obligatory attendance) *(The course will not be taught at the academic year 2022-23)*	**2** X13	**2**	**4**
BIOL-461 Laboratory Course in Fauna of Greece (N. Poulakakis) *(Successful examination at the courses of* Laboratory Course in Animal Biodiversity *is recommended)*	**4**X13	**4**	**4**
BIOL-471 Evolutionary Ecology (N. Poulakakis)	**3** X13	**3**	**4**

c. Courses Common to both Directions

Course/ Instructor	hours	C.C.	ECTS
BIOL-463 Photobiology (K. Kotzabasis)	**2** X13	**2**	**4**
BIOL-446 Molecular Evolution (E. Ladoukakis)	**2** X13	**2**	**4**
BIOL-450 Computational Methods in Evolution (N. Poulakakis, E. Ladoukakis)	**3** X13	**3**	**4**
BIOL-491 Special Topics in Biotechnology and Plant Imaging (P. Moschou)	**3 X13**	**3**	**4**
BIOL-493 Applications of Current Microscopy Techniques (obligatory attendance) (G. Zachos)	**2** X13	**2**	**4**
BIOL-443 Reading Course Faculty Member		**2**	**4**
BIOL-444 Quarterly Laboratory Course Faculty Member		**2**	**4**
BIOL-473 Genomes Ch. Spilianakis (Successful examination at the course of Molecular Biology is required) (The course will be taught every even academic year)	2 X13	**2**	**4**
BIOL-474 Research and Communication Skills in Biology (obligatory attendance) Ch. Spilianakis	**2** X13	**2**	**4**
BIOL-494 Introduction to Programming (A. Kanterakis, Pdoc) *(Addressed to all students (2nd, 4th, 6th semester, etc) – no prerequisites)*	**2** X13	**3**	**4**
BIOL-495 Micro/nano-technologies in Biology and Molecular Diagnostics (obligatory attendance) (E. Gizeli) *(Successful examination at the courses of Organic Chemistry and Biochemistry I is recommended)*	**2** X13	**2**	**4**

Information

Department of Biology Secretariat

B. Description of individual course units

1ST YEAR FALL SEMESTER

Course Title: *Introduction to Zoology*		
Name of Lecturer:	*Michael Pavlidis, Nikolaos Poulakakis*	
Course Code: *BIOL-101*	**Type of course:** *Core*	**Level of course:**
Year of study: *1*	**Semester/trimester:** *A*	**ECTS:** *6*
Objectives of the course (preferably expressed in terms of learning outcomes and competences		
Prerequisites: *None*		
Course contents: *The conceptual basis of Zoology. The origin of life. Principles of Evolution and Ecology. Organisms, populations and species. Principles of taxonomy and phylogeny of animals. Animal nomenclature. Principles of developmental Biology. Animal form and function. Animal diversity: from Protozoa to mammals.* *Labs: 1st. The lab of Zoology and its facilities, 2nd. Biodiversity panorama, 3rd. Histology 1, 4th. Histology 2, 5th. Anatomy of terrestrial mollusc, 6th. Anatomy of mouse, 7th Anatomy of chicken, 8th. Protection, support and movement, 9th. The digestive system, 10th. The reproductive system, 11th. The nervous system.*		
Recommended reading: *Hickman, Roberts and Larson: Integrated Principles of Zoology. 11th edition*		
Teaching methods: *3h/week lectures, 3h/week lab.*		
Assessment methods: *Written examinations*		
Language of instruction: *Greek*		

Course Title: Laboratory Course in Zoology		
Name of Lecturer:	*Michael Pavlidis, Nikolaos Poulakakis*	
Course Code: *BIOL-102*	**Type of course:** *Core*	**Level of course:**
Year of study: *1*	**Semester/trimester:** *A*	**ECTS:** *3*
Objectives of the course (preferably expressed in terms of learning outcomes and competences		
Prerequisites: *None*		
Course contents: *Labs: 1st. The lab of Zoology and its facilities, 2nd. Biodiversity panorama, 3rd. Histology 1, 4th. Histology 2, 5th. Anatomy of terrestrial mollusc, 6th. Anatomy of mouse, 7th Anatomy of chicken, 8th. Protection, support and movement, 9th. The digestive system, 10th. The reproductive system, 11th. The nervous system.*		
Recommended reading:		

Course Title: *Physics*		
Name of Lecturer: *postdoc*		
Course Code: *BIOL-103*	**Type of course:** *Core*	**Level of course:**
Year of study: *1*	**Semester/trimester:** *A*	**ECTS:** *4*
Objectives of the course (preferably expressed in terms of learning outcomes and competences): *The main goal of the course is to offer a global understanding of physics through studying the basic principles.*		

Important part of global understanding is the presentation of the inevitable connection of Physics to Biology and other scientific fields.
Prerequisites: *There are no prerequisites*
Course contents: *In order to have a global understanding of the fundamental concepts and queries of physics, all following are studied.* ***INTRODUCTION:*** *Measurement units. Vectors. Differentials, derivatives, integrals, partial derivatives. Connection to mathematics.* ***MECHANICS:*** *Newton's laws for motion and mass inertia. The concepts of momentum and energy. Circular motion, gravity and the motion of projectiles and satellites.* ***ELECTRICITY AND MAGNETISM:*** *The concepts of charge, electric field and electric current. Magnetism, magnetic field and electromagnetic induction. The general concept of force, force field and energy. Electromagnetic waves.* ***THERMODYNAMICS:*** *The concepts of temperature, heat and heat convection. The laws of thermodynamics, Carnot engine and the connection to physical chemistry. Phase diagrams, the atomic nature of matter, gases, liquids, solids, plasma. Properties of matter, natural and artificial materials. Connection to geology and material science.* ***VIBRATIONS AND WAVES:*** *The concepts of vibrations and waves. Wave propagation and properties. The sound and light. Light emission and absorption. Colors. Light reflection, refraction and diffraction. The particle and wave nature of light.* ***MODERN PHYSICS:*** *Special and general theory of relativity. The particle and wave nature of matter. Schrödinger's wave function. The atom, the atomic orbital and the nucleus. The connection to chemistry, quantum chemistry and biology. Radioactivity, nuclear fission and fusion. Particles and principles of astrophysics.* *Of primary importance is, the understanding of the concepts and queries of physics by the implementation of the absolutely necessary mathematical formalism. The connection to biological queries, concepts and methodologies is constant.*
Recommended reading: ***Οι έννοιες της φυσικής (Conceptual physics)****, P.G. Hewitt, 2004,* ***Φυσική για επιστήμονες και μηχανικούς (Physics for scientists & engineers) (1-4)****, R.A. Serway and J.W. Jewett, 2008,* ***Fundamentals of physics extended****, D. Halliday, R. Resnick and J. Walker, 2007,* ***University physics with modern physics****, H.D. Young and R.A. Freedman, 2007*
Teaching methods: *Lectures 4h/week and 3h/week tutorials and multimedia presentations*
Assessment methods: *Written examination*
Language of instruction: *Greek*

Course Title: *General Chemistry*		
Name of Lecturer: *Chatzidakis Georgios*		
Course Code: *BIOL-105*	***Type of course:*** *Core*	***Level of course:***
Year of study: *1*	***Semester/trimester:*** *A*	***ECTS:*** *6*
Objectives of the course (preferably expressed in terms of learning outcomes and competences): *Understanding of fundamental concepts in chemistry and development of the ability to apply these concepts in solving chemistry problems.*		
Prerequisites: *None*		
Course contents: *,* *1. Introduction. Chemistry and Measurements* *2. Atoms, molecules and ions* *Structure of atom. Chemical Formulas. Molecular and ionic compounds. Mass and mole of a substance. Stoichiometry.*		

3. Chemical reactions *Types of chemical reactions. Ions in aqueous solution* *4. The gaseous state* *Laws of gases. Kinetic-molecular theory* *5. Quantum Theory of the atom* *Model of Bohr. Quantum mechanics and quantum numbers* *6. Electronic structures and periodicity* *Electron configurations of atoms. Periodic relationships between elements.* *7. Ionic and covalent bond. Classical description - Lewis configuration.* *8. Molecular geometry and chemical bond theory* *The VSEPR model. Valence-bond theory. Compex ions and coordination Compounds.* *9. States of Matter: Liquids and Solids* *Changes of matters. Intermolecular forces. Physical properties.* *10. Solutions I. Types of concentration. Solution dilution. Additive properties. Colloids.* *11. Solutions II. Acids and bases. Acid-base theories. Acid-base strengh and molecular structure. pH and buffer solutions. Solubility and balance of complex ions.*
Recommended reading: *Ebbing and Gammon, "General Chemistry", 10th edition*
Teaching methods: *3 hours of lectures plus 1 hour problem solving per week*
Assessment methods: *Written examination*
Language of instruction: *Greek*

Course Title: *Organic Chemistry*		
Name of Lecturer: *Electra Gizeli*		
Course Code: *BIOL-107*	***Type of course:*** *Core*	***Level of course:***
Year of study: *1*	***Semester/trimester:*** *A*	***ECTS:*** *6*
Objectives of the course (preferably expressed in terms of learning outcomes and competences): *To become familiar with organic structures and chemical reactions*		
Prerequisites: *None*		
Course contents: *Introduction to the basic principles of general and organic chemistry (atomic structure, types of chemical bonds, acids and bases, stereochemistry). Nomenclature, structure, properties and reaction mechanisms of organic molecules (alkanes, cycloalkanes, alkenes, alkyl halides, benzene, alcohols, ethers, epoxides, aldehydes, ketones, carboxylic acids, carbohydrates, amino acids, peptides, proteins, lipids and nucleic acids). Brief introduction to spectrometry (mass spectrometry, infra red, nuclear magnetic resonance).*		
Recommended reading: *Organic Chemistry Vol. I & II, John McMurry*		
Teaching methods: *Lectures*		
Assessment methods: *Written exam*		
Language of instruction: *Greek*		

Course Title: *Uses of Computers and Biological Databases*		
Name of Lecturer: *(PostDoc)*		
Course Code*: BIOL-109*	***Type of course:*** *Core*	***Level of course:***

Year of study: *1*	**Semester/trimester:** *A*	**ECTS:** *2*
Objectives of the course (preferably expressed in terms of learning outcomes and competences *Familiarization with Computers in a MS Windows environment and basic applications such as MS Office*		
Prerequisites: *None*		
Course contents: *Introduction to Computers. Familiarization with PCs and peripherals. Introduction to Operating Systems, emphasizing MS Windows and its Graphical User Interface. Presentation of the Internet and its applications. Use and management of electronic correspondence.* *Specifically: Structure of computers, Peripherals, Network equipment, Operating systems, Network communication, Graphical User Interfaces, Security and Authentication, File management, File distribution, Search engines and use of the Internet, Search of academic sources over the Internet, Web, Mail.* *Windows applications. Introduction to MS Office and OpenOffice. In-depth view of MS Word as a word processor, MS Excel as a spreadsheet application and MS PowerPoint for presentation management.* *Specifically: Basic operations in MS Word, Text input, Formatting, Tables, Importing pictures and graphics. Basic operations in MS Excel, Functions, Auto-complete, Cell Formatting, Basic operations in MS PowerPoint, Presentation advice and best practices, Effect additions and multimedia.*		
Recommended reading: -		
Teaching methods: *Lectures, Practical Training on Computers*		
Assessment methods: *Written Examination*		
Language of instruction: *Greek*		

Course Title: *English I*		
Name of Lecturer: *Maria Koutraki*		
Course Code: *BIOL-111*	**Type of course:** *Core*	**Level of course:**
Year of study: *1*	**Semester/trimester:** *A*	**ECTS:** *2*
Objectives of the course (preferably expressed in terms of learning outcomes and competences *A good grasp of English whereby the students can familiarize themselves with English as it is used in a scientific context. Emphasis is given on grammar, reading and speaking skills*		
Prerequisites: *None*		
Course contents: *Reading comprehension of technical texts, focus on terminology and appropriate language in use, speaking, grammar revision, introducing academic writing, listening*		
Recommended reading: *English 1 File notes in the Library, English 1 links & extras in our blog: http://www.englishbiology.wordpress.com*		
Teaching methods: *Reading and comprehending texts in class, performing interactive group activities, writing in class, vocabulary build-up and grammar practice through Internet in class, commenting on issues related to biology in order to practice oral skills.*		
Assessment methods: *3hr exam at the end of term, vocabulary tests, brief oral presentation of a biology-oriented topic, class interactive participation and homework submission throughout the semester.* *Note: Students have the choice to submit a certificate of C1 level and sit a diagnostic test at the beginning of the semester; they can get exempted from English I if their grade is at least 7/10.*		

Language of instruction: *English*

1ST YEAR SPRING SEMESTER

Course Title: *Cell Biology*		
Name of Lecturer: *George Chalepakis*		
Course Code: *BIOL-150*	***Type of course:*** *Core*	***Level of course:***
Year of study: *1*	***Semester/trimester:*** *B*	***ECTS:*** *6*
Objectives of the course (preferably expressed in terms of learning outcomes and competences): *Cell biology of animal cells*		
Prerequisites: *None*		
Course contents: Eukaryotic Cells*: evolution.* ***Biological Membranes****: lipid bilayer, fluidity and asymmetry of the bilayer, membrane proteins, membrane transport, carrier proteins, ion channels.* ***Mitochondrion****: membranes, functional specialization of internal compartments, oxidation, chemiosmotic process, the respiratory chain and ATP-synthase, the genome of mitochondria.* ***Endoplasmic Reticulum (ER)****: Rough ER, Smooth ER, direction of signal peptides to the Rough ER, topology of multipass transmembrane proteins, soluble proteins in the ER, N-linked glycosylation in ER.* ***Golgi Apparatus****: ER - Golgi - communication, O-linked glycosylation in Golgi, oligosaccharide chains processing in Golgi, secretory vesicles, synaptic vesicles.* ***Lysosomes****: Transport from trans Golgi to lysosomes, transport of lysosomal enzymes.* ***Peroxisomes****: Oxidative reactions, import of proteins into peroxisomes.* ***Endocytosis / Vesicular Transport****: Endosomes, pinocytic vesicles, Clathrin-coated pits, receptor mediated endocytosis, coatomer-coated vesicles, GTP-binding proteins in vesicular transport.* ***Cell Nucleus****: Membranes of the nuclear envelope, nuclear pore, transport of macromolecules, chromosomal DNA and its packaging, the global structure of chromosomes, nucleolus.* ***Cytoskeleton****: The nature and function of cytoskeleton, intermediate filaments, microtubules (microtubule-associated proteins, motor proteins and movements, centrioles and basal bodies), actin filaments (actin binding proteins, motor proteins, microvilli, migration of animal cells, muscle contraction).* ***Extracellular Space****: Cell junctions, cell-cell adhesion, the extracellular matrix.* ***Cell-Division Cycle****: The general strategy and phases of the cell cycle, the cell-cycle control system, cell-division controls in multicellular animals, growth factors, mitosis, cytokinesis.* ***Meiosis****.* ***Laboratory Practicals****: Light and Electron Microscopy.*		
Recommended reading: *Cell Biology, L. Margaritis et al., 4th edition* *Cell Biology, B. Marmaras and M. Lampropoulou, 4th edition* *Molecular Biology of the Cell, B. Alberts et al., 4th edition, Garland Science, N. York.*		
Teaching methods: *Power Point Presentation*		
Assessment methods: *Written Examination*		
Language of instruction: *Greek*		

Course Title: *Structure and Function of Plants*		
Name of Lecturer: *Kyriakos Kotzabasis*		
Course Code*: BIOL-152*	***Type of course:*** *Core*	***Level of course:***

Year of study: *1*	***Semester/trimester:*** *B*	***ECTS:*** *4*
Objectives of the course (preferably expressed in terms of learning outcomes and competences *Knowledge focused on the macromolecular structure, plant cell biology and plant structure.*		
Prerequisites: *None*		
Course contents: *Atoms and molecules. Chemical bonds. Organic molecules and polymeric construction. Macromolecular structure. Biomembranes. Plasma membrane and tonoplast. Cytoplasm. Cell vacuole. Plasmolysis. Endoplasmic reticulum and dictyosomes. Mitochondria. Plastids. Chloroplast photodevelopment. Structure of the photosynthetic apparatus. Chemiosmosis. Endosymbiont theory. Chromoplasts. Leucoplasts. Amyloplasts and starch grains. Nucleus and mitosis. Cell division. Synthesis of primary and secondary cell wall. Pit-fields and plasmodesmata. Plant cell types. Plant tissue types. Meristematic tissue. Parenchematic tissue. Epidermic tissue – trichomes, glands and stomata. Ground tissue (collenchyma and schlerenchyma). Periderm. Vascular tissue (xylem and phloem). Internal structure of primary and secondary stems and roots. Internal structure of leaves and flowers.*		
Recommended reading: *I. B Tsekos (2000) BOTANY-Structure, function and biology of plants (in greek). ISBN 960-343-576-7.*		
Teaching methods: *3 hours lecture per week plus lab session 3 hours per week*		
Assessment methods: *Written examination*		
Language of instruction: *Greek*		

Course Title: Laboratory Course in Structure and Functional Organization of Plants		
Name of Lecturer: Kyriakos Kotzabasis		
Course Code*: BIOL-153*	***Type of course:*** *Core*	***Level of course:***
Year of study: *1*	***Semester/trimester:*** *B*	***ECTS:*** *3*
Objectives of the course (preferably expressed in terms of learning outcomes and competences *Knowledge focused on the macromolecular structure, plant cell biology and plant structure.*		
Prerequisites: *None*		
Course contents: ***Lab session:*** ***[1]*** *Microscope techniques.* ***[2]*** *Plant cell structure and function: Plant cell types – primary and secondary plant cell wall – pit-fields and plasmodesmata – cytoplasm – nucleus and mitosis.* ***[3]*** *Plastids (chloroplasts, chromoplasts, amyloplasts, leucoplasts) – photodevelopment of etioplasts to chloroplasts.* ***[4]*** *Cell vacuole – plasmolysis – crystals – protein grains – starch grains.* ***[5]*** *Plant tissue types1): Meristematic tissue - parenchematic tissue - epidermic tissue (trichomes, glands and stomata).* ***[6]*** *Plant tissue types2): Ground tissue (collenchyma and schlerenchyma) – periderm - vascular tissue (xylem and phloem).* ***[7]*** *Internal structure of primary and secondary plant stem.* ***[8]*** *Internal structure of primary and secondary root.* ***[9]*** *Internal structure of leaves.* ***[10]*** *Internal structure of flowers.*		
Recommended reading: *I. B Tsekos (2000) BOTANY-Structure, function and biology of plants (in greek). ISBN 960-343-576-7.*		
Teaching methods: *3 hours lecture per week plus lab session 3 hours per week*		
Assessment methods: *Written examination*		
Language of instruction: *Greek*		

Course Title: *Biochemistry I*		
Name of Lecturer: *Dimitrios Tzamarias*		
Course Code: *BIOL-154*	***Type of course:*** *Core*	***Level of course:***
Year of study: *1*	***Semester/trimester:*** *B*	***ECTS:*** *6*
Objectives of the course (preferably expressed in terms of learning outcomes and competences): *Introduction to the basic principles of Biochemistry. Structure and function of biomolecules, Metabolism and Energy, Regulation and Bioenergetics.*		
Prerequisites: *None*		
Course contents: *4 hours/week (42 hours/semester)* ***The molecular design of life:*** *Biochemistry, an evolving science. Protein composition and structure. Exploring proteins and proteomes. DNA, RNA and the flow of genetic information. Exploring genes and genomes. Exploring evolution. Enzymes, basic concepts and kinetics. Catalytic strategies. Carbohydrates.* ***Transducing and storing energy:*** *Metabolism, basic concepts and design. Glycolysis and gluconeogenesis. The Citric acid cycle. Oxidative phosphorylation. The Calvin cycle and the pentose phosphate pathway. Glycogen metabolism.* ***<u>Lab course Content</u>*** *1) acid-base titrations, acids-bases, pH, hydrolysis and buffers. 2) Detecting lipids, proteins and carbohydrates in food. 3) Characterizing carbohydrates. 4) Enzymatic catalysis. 5) Chromatographic analysis of proteins and amino-acids*		
Recommended reading: ***1.*** *Biochemistry (J.Berg, J.L.Tymocsko, L.Stryer), 6th edition, W.H.Freeman.* ***2.*** *Lehninger-Principles of Biochemistry (D.Nelson, M.Cox), 5th edition, W.H.Freeman.*		
Teaching methods: *Lectures (PowerPoint Presentations)*		
Assessment methods: *Written Examination, written Midterm exam*		
Language of instruction: *Greek*		

Course Title: General methods for the identification and analysis of biological macromolecules		
Name of Lecturer: *Technical and Laboratory staff*		
Course Code*: BIOL-155*	***Type of course:*** *Compulsory*	***Level of course:***
Year of study: *1*	***Semester/trimester:*** *2*	***ECTS:*** *3*
Objectives of the course: *The primary objective of this course is for students to (1) learn fundamental approaches for experimentally investigating biological macromolecules, (2) learn the theoretical foundations for the methods used, and (3) understand the applicability of the biochemical methods to realistic situations.*		
Prerequisites: *none*		
Course contents *1. Preparation of solutions (3 hours)* *2. Acid-Base Titrations and Neutralization reactions (3 hours)* *3. Redox (reduction-oxidation) reactions-Spectroscopic methods (3 hours)* *4. Synthesis of Aspirin (4 hours)* *5. Quantification of Protein concentration (4 hours)* *6. The detection of Fats, Proteins and Carbohydrates in Foods (4 hours)* *7. Digestion (fats, proteins, carbohydrates), general methods for characterizing the products (4 hours)* *8. Extraction, chromatographic identification and absorption spectra of photosynthetic pigments (3 hours)* *9. Extraction of plasmid DNA (3 hours)*		

10. Quantification, electrophoresis and digestion of plasmid DNA (3 hours) *11. Extraction of eukaryotic RNA (3 hours)*
Recommended reading: • *A Laboratory Manual for General, Organic & Biochemistry, 6e, C.H.Henrickson, L.C.Byrd, N.W.Hunter, McGraw-Hill, c2008.* • *Biochemistry 5e, J.M.Berg, J.L.Tymoczko, L. Stryer, W.H.Freeman/Palgrave Macmillan, c2012.* • *Lehninger-Basic Principles of Biochemistry, D.L.Nelson, M.M. Cox, W.H.Freeman and company, c2008.* • *Textbook of BIOCHEMISTRY with clinical correlations 7e, T.M.Devlin, John Wiley & Sons Inc., c2011.* • *Principles of Biochemistry 4e, H.R.Horton, L.A. Moran, K.G. Scrimgeour, M.D. Perry, J.D. Rawn, Pearson Education International, c2006.*
Teaching methods: *Introduction to the lab and practical training*
Assessment methods: *Delivery of each lab report and written examinations*
Language of instruction: *Greek*

Course Title: *Biomathematics*			
Name of Lecturer: *Konstadia Lika*			
Course Code: *BIOL-156*	***Type of course:*** *Core*	***Level of course:***	
Year of study: *1*	***Semester:*** *B*	***ECTS:*** *6*	
Objectives of the course (preferably expressed in terms of learning outcomes and competences): *This course provides an introduction to a variety of mathematical topics of use in analyzing problems arising in the biological sciences.*			
Prerequisites: *None*			
Course contents: *Limits of functions and continuity. Calculus of exponential, logarithmic, trigonometric and allometric functions and applications. Derivatives and applications. Antiderivatives and integrals, integration techniques and applications of integration. Difference and differential equations. Introduction to mathematical modeling. Discrete and continuous in time dynamical systems - linear and nonlinear examples, equilibrium, and stability. Introduction to discrete probability- sample space, counting techniques, conditional probability, independence, Bayes theorem, Markov chains. Discrete and continuous random variables and distributions.*			
Recommended reading: • *F. R. Adler. "Modeling the dynamics of life: calculus and probability for life scientists". Brooks/Cole, 1998.* • *M. R. Cullen "Mathematics for the biosciences". Techbooks, 1983* • *C. Neuhauser "Calculus for biology and medicine" Pearson/Prentice Hall, 2004*			
Teaching methods*: Four 45-minute lectures per week*			
Assessment methods: *Written examination*			
Language of instruction: *Greek*			

Course Title: *English II*		
Name of Lecturer: *Maria Koutraki*		
Course Code*: BIOL-158*	***Type of course:*** *Core*	***Level of course:***
Year of study: *1*	***Semester/trimester:*** *B*	***ECTS:*** *2*
Objectives of the course (preferably expressed in terms of learning outcomes and competences		

• *To familiarize students with scientific terminology and in particular that of Biology, Molecular biology and Genetics* • *To introduce the skills and language of the laboratory, graphs and charts, biology English related note-taking, summarizing, report writing, classifying, comparing, describing processes and giving instructions.* • *To enable students to communicate their English effectively in a scientific context, to write in a manner adequate to the ACS style for scientists.* • *To enable students master the language of science and achieve academic and professional development.*
Prerequisites: *None*
Course contents: *Reading, speaking, listening, grammar, sentence structure, introducing academic writing (analysis & synthesis skills, paraphrasing and quoting) & translation of scientific and technical sources, familiarising students with terminology and technical vocabulary.*
Recommended reading: *English 2 File notes in the Library, English 2 links & extras in our blog:* *http://www.englishbiology.wordpress.com*
Teaching methods: *Reading and comprehending texts in class, performing interactive group activities, writing in class, vocabulary build-up and grammar practice through Internet in class, commenting on issues related to biology in order to practice oral skills*
Assessment methods: *3hr exam at the end of term, class participation, progress test, brief (5') oral presentation of biology-oriented topics, participation through class work & homework submitted throughout the semester*
Language of instruction: *English*

2ND YEAR FALL SEMESTER

Course Title: *Microbiology*		
Name of Lecturer: *Panagiotis F. Sarris*		
Course Code: *BIOL-201*	***Type of course:*** *Core*	***Level of course:***
Year of study: *2*	***Semester/trimester:*** *C*	***ECTS:*** *6*
Objectives of the course (preferably expressed in terms of learning outcomes and competences): *Basic principles of microbial cell chemistry; Cell structure of microorganisms; Molecular Microbiology; Energy and metabolism of microorganisms; Cellular regulation in Bacteria and Archaea; Cell division in Bacteria and Archaea; Genomic recombination; Principles of molecular phylogeny in microbiology; Principles of microbial systematic; Basic principles of genetic engineering and Biotechnology; Human-Microbe Interactions; Basic principles of Virology; Basic principles of Mycology.*		
Prerequisites: *NO*		
Course contents: ***Principles of microbial Cell Chemistry:*** *• Chemical base of living organisms, groups of biological macro-elements, from the simple structural units to the macro-complexes, the chemical bonds in biomolecules.* ***Cell Structures of Microorganisms:*** *• Cell membrane and function (Archaea, Bacteria).* *• Cell wall of prokaryotes: Gram negative, Gram positive bacteria and Archaea, Outer membrane of Gram negative bacteria.* *• Movement of microorganisms.*		

• Membrane transport systems in Gram-negative and Gram-positive bacteria.

Molecular Microbiology:
• Steps in genetic information flow, structure of the prokaryotic genomes, the central dogma of Molecular Biology.
• Basic principles of Molecular Biology: Genome Replication, Transcription and Translation in prokaryotic organisms.
• Gene expression regulation in Bacteria and Archaea - RNA polymerase, transcription factors, operon structure (arg, lac, mal, trp).

Energy and Metabolism of microorganisms:
• Basic principles of energy.
• Cell energy principles.
• Absorbance of chemicals from the environment.
• Membrane transporters.
• Oxidation-reduction (redox) reaction - Fermentation and Respiration.

Cellular Regulation in Bacteria and Archaea:
• The basic pathways to gene expression regulation in Bacteria and Archaea: Transcriptional regulation, Post-Transcriptional regulation, Translational regulation, Post- Translational regulation.
• Operons and Regulons.
• Transcriptional regulation in Archaea.
• Attenuation.
• Reactive inhibition.
• Global regulation: Catabolic inhibition, Two-element regulatory systems, Heat shock, Movement - chemotactic.
• Quorum Sensing.

Cell Division in Bacteria and Archaea:
• Cell division.
• Dividosome.
• Genome Replication in rapidly growing cells.
• Replisome, double-stranded Replication.
• "Θ" Cairnes structures.
• Mutation, the molecular basis of mutagenesis.
• Genotype and Phenotype.

Genetic recombination:
• Absorption of foreign DNA
• Molecular mechanisms of genomic material transfer: Transformation, Conjugation.
• Transposons.
• Gene transfer in Archaea.
• CRISPR.

Basic Principles of Molecular Phylogeny in Microbiology:
• The evolutionary origin of microorganisms.
• Phylogenetic trees.
• Phylogeny and DNA-DNA hybridization.

Basic Principles of Microbial Systematic:
• The species concept in Microbiology.
• Phenotypic analysis.
• Genotypic analysis.
• Taxonomic methods in microbial systematics.
• Nomenclature of Microorganisms.

Basic Principles of Genetic Engineering and Biotechnology:
• Restriction enzymes and nucleic acids.
• Protection against restriction enzymes.
• Hybridization of nucleic acids.
• Polymerase chain reaction (PCR), applications
• Cloning vectors, plasmids, binary vectors, BACs, YACs

• *Molecular cloning.* • *Products from genetically modified microorganisms: genetically modified vaccines (recombinant vaccines).* • *Identification and Isolation of "environmental genes".* • *Metabolic engineering.* ***Human-microbe interactions:*** • *Colonization.* • *Normal microflora: Skin microflora, oral cavity microflora, Gastrointestinal tract microflora.* • *Changing the normal microflora - probiotics.* • *Pathogenesis (Pathogenicity) and Infection.* • *Microbial toxins, endotoxins, exotoxins, effectors.* • *Basic principles of immunology: antigen-antibody recognition, adhesion, fluorescent antibodies, ELISA.* • *Basic principles of epidemiology.* ***Basic principles of Virology:*** • *Viruses - Classification, Structure (virion, viral envelope), viral load, viral replication.* • *Examples of viruses: Hepatitis C virus, Hepatitis B virus, Human immunodeficiency virus.* • *Molecular Virology.* ***Basic Principles of Mythology:*** • *Fungal and Oomycetes morphology.* • *Classification of fungi and Oomycetes.* • *Fungal & Oomycetes Genetics.* • *Host Infection.*
Recommended Reading: - Brock Biology of microorganisms*, Madigan M, Martinko J. and Parker J. Prentice Hall.*
Teaching methods: *Live teaching and/or on line teaching*
Assessment methods: *The final exams are written and may include all or some of the following:* *- "Short Answer (1-2 sentences)" Questions,* *- "One or two paragraph(s) answering" Questions,* *- "Multiple Choice" questions* *Ability to prepare/write an essay with a presentation (on specific occasions).*
Language of instruction: *Greek*

Course Title: *Ecology*		
Name of Lecturer: *Stergios Pirintsos*		
Course Code: *BIOL-203*	***Type of course:*** *Core*	***Level of course:***
Year of study: *2*	***Semester/trimester:*** *C*	***ECTS:*** *6*
Objectives of the course (preferably expressed in terms of learning outcomes and competences): *Adequate knowledge about mechanisms and processes in nature that take place in the ecological scale of time*		
Prerequisites: *None*		
Course contents: Organisms: *Organisms and the abiotic environment. Water. Light. Temperature. Climate. Nutrients. Soil. Geomorphology. Geological substrate. Law of the minimum. Theory of tolerance limits. Niche. Acclimation. Homeostasis. Interactions between abiotic factors. Interactions between organisms and abiotic factors.* ***Populations:*** *Population size. Population characteristics. Demography. Intraspecific relationships.*		

Interspecific relationships. Life strategies. Population dynamics patterns. ***Metapopulations:*** *Metapopulation approach. Metapopulation patterns and processes. Levins and Hanski models. Core-satellite hypothesis. Metapopulation genetics and evolution.* ***Biocommunities:*** *Biocommunity approach. Biocommunity structure and organization. The views of Clements and Gleason and the school of Zurich-Montpellier. The Gaia hypothesis. The modern synthesis. The concepts of biocommunity biodiversity and stability. Disturbances. Succession. Allelopathy. Growth forms. Resource allocation. RCS-strategies. Functional groups. Spatial and temporal patterns. Ordination and Classification techniques.* ***Ecosystems:*** *The ecosystem concept. Ecosystem structure, dynamics and management. Energy flow. Recycling. Biogeochemical cycles. Productivity. Systems theory. The role of biotic interactions and disturbance. Biomes. Terrestrial ecosystems of Greece. Mediterranean ecosystems. Desertification in Mediterranean countries.* ***Global environmental problems:*** *Biodiversity. Climate change. Pollution.*
Recommended reading: *1. Veresoglou D. 2004. Ecology. Εκδόσεις Έλλα.* *2. Begon, M., Townsend, C.R., Harper, J.L. 2006. Ecology: From Individuals to Ecosystems. Blackwell Publishing* *3. Krebs, C. J. 2001. Ecology: The experimental analysis of distribution and abundance. Benjamin/Cummings* *4. Krebs, C. J. 1999. Ecological methodology. Benjamin/Cummings* *5. Ricklefs, R.E., Miller, G. 2000. Ecology. W.H. Freeman, New York*
Teaching methods: *Lectures: 4 hours/week*
Assessment methods: *Written examination: theory (100%)*
Language of instruction: *Greek*

Course Title: *Methods in Ecology*		
Name of Lecturer: *Stergios Pirintsos*		
Course Code: *BIOL-204*	***Type of course:*** *Core*	***Level of course:***
Year of study: *2*	***Semester/trimester:*** *C*	***ECTS:*** *3*
Objectives of the course (preferably expressed in terms of learning outcomes and competences): *Adequate knowledge about mechanisms and processes in nature that take place in the ecological scale of time*		
Prerequisites: *None*		
Course contents: Organisms: *Organisms and the abiotic environment. Water. Light. Temperature. Climate. Nutrients. Soil. Geomorphology. Geological substrate. Law of the minimum. Theory of tolerance limits. Niche. Acclimation. Homeostasis. Interactions between abiotic factors. Interactions between organisms and abiotic factors.* ***Populations:*** *Population size. Population characteristics. Demography. Intraspecific relationships. Interspecific relationships. Life strategies. Population dynamics patterns.* ***Metapopulations:*** *Metapopulation approach. Metapopulation patterns and processes. Levins and Hanski models. Core-satellite hypothesis. Metapopulation genetics and evolution.* ***Biocommunities:*** *Biocommunity approach. Biocommunity structure and organization. The views of Clements and Gleason and the school of Zurich-Montpellier. The Gaia hypothesis. The modern synthesis. The concepts of biocommunity biodiversity and stability. Disturbances. Succession. Allelopathy. Growth forms. Resource allocation. RCS-strategies. Functional groups. Spatial and temporal patterns. Ordination and Classification techniques.* ***Ecosystems:*** *The ecosystem concept. Ecosystem structure, dynamics*		

and management. Energy flow. Recycling. Biogeochemical cycles. Productivity. Systems theory. The role of biotic interactions and disturbance. Biomes. Terrestrial ecosystems of Greece. Mediterranean ecosystems. Desertification in Mediterranean countries. ***Global environmental problems:*** *Biodiversity. Climate change. Pollution.*
Recommended reading: *1. Veresoglou D. 2004. Ecology. Εκδόσεις Έλλα.* *2. Begon, M., Townsend, C.R., Harper, J.L. 2006. Ecology: From Individuals to Ecosystems. Blackwell Publishing* *3. Krebs, C. J. 2001. Ecology: The experimental analysis of distribution and abundance. Benjamin/Cummings* *4. Krebs, C. J. 1999. Ecological methodology. Benjamin/Cummings* *5. Ricklefs, R.E., Miller, G. 2000. Ecology. W.H. Freeman, New York*
Teaching methods: *Lectures: 4 hours/week, Lab: 3 hours/week, Excursion: fieldwork in terrestrial ecosystems*
Assessment methods: *Written examination: theory (100%) and lab (pass / non pass)*
Language of instruction: *Greek*

Course Title: *Genetics I*			
Name of Lecturer: *Christos Delidakis*			
Course Code: *BIOL-205*	***Type of course:***	*Core*	***Level of course:***
Year of study: *2*	***Semester/trimester:*** *C*		***ECTS:*** *6*
Objectives of the course (preferably expressed in terms of learning outcomes and competences):			
Prerequisites: *None*			
Course contents: *General genetics: introduction; Mendelian analysis; chromosomal theory of inheritance; extension of Mendelian analysis; linkage; genomics; chromosomal aberrations: structural differences; chromosomal aberrations: differences in chromosome number; DNA structure; the nature of the gene; DNA function; gene mutations; extranuclear genomes (mitochondria/chloroplasts); bacterial and phage genetics: conjugation; transduction; transformation; recombinant DNA technology (vectors, restriction enzymes – DNA mapping, cloning, selection, library construction, DNA sequencing), control of gene expression I (prokaryotes, lac operon, positive and negative control).*			
Recommended reading: *Classical and Molecular Genetics, Konstantinos Triantafyllidis*			
Teaching methods: *4 hours lecture*			
Assessment methods: *Written examination*			
Language of instruction: *Greek*			

Course Title: *Molecular Biology*		
Name of Lecturer: *Charalampos Spilianakis*		
Course Code: *BIOL 207*	***Type of course:*** *Core*	***Level of course:*** *4*
Year of study: *2*	***Semester/trimester:*** *C*	***ECTS:*** *6*
Objectives of the course (preferably expressed in terms of learning outcomes and competences): *understanding life processes at the molecular level*		
Prerequisites: *None*		

***Course contents:**. **DNA is the genetic material:** hallmark experiments, Molecular Biology from an evolutionary perspective, mutations and mutant phenotypes. **The content of genomes:** genome mapping, genomes of model organisms and human, chloroplast and mitochondrial DNA. **The interrupted gene**: origin of introns, exons and protein domains, alternative splicing. **Gene families:** structure and evolution, pseudogenes. **Chromosomes:** solving the packaging problem, nuclear matrix, chromosomal territories, euchromatin-heterochromatin, centromeres, telomeres. **Nucleosomes:** structure and assembly, histone tails and modifications, levels of chromatin orgnization. **Messenger RNA:** structure and stability of mRNA, the role of miRNAs. **Transcription of eukaryotic genes by RNA polymerase II:** assembly of the basal transcriptional apparatus, transcription initiation, promoters and enhancers, LCRs, insulators. **Activation-repression of transcription:** types of transcription factors and modes of activation-repression, co-activators, co-repressors, histone acetyltransferases-deacetylases-methyltransferases, DNA methyltransferases. **Regulation of transcription at the chromatin level:** histone code, chromatin remodeling complexes**. Epigenetic phenomena-cell «memory»:** perpetuation of chromatin structures, imprinted genes, X-chromosome inactivation. **RNA splicing and processing:** the spliceosome and the splicing reactions, group I and II introns, catalytic RNA, regulation of (alternative) splicing**. DNA replication in eukaryotes:** enzymes, co-ordination of replication in both strands, control of DNA replication and cell cycle**. DNA damage and repair in eukaryotes :** types and sources of damage, repair systems (direct reversion, base excision, nucleotide excision, mismatch repair, double strand break repair)*
***Recommended reading:** GENES VIII*
***Teaching methods:** Classes*
***Assessment methods:** Mid-term exam and final (multiple choices, descriptive questions, critical thinking)*
***Language of instruction:** Greek*

***Course Title:** General methods in Genetics and Microbiology*		
***Name of Lecturer:** Technical and Laboratory staff*		
***Course Code**: BIOL-208*	***Type of course:** Compulsory*	***Level of course:***
***Year of study:** 2*	***Semester/trimester:** 3*	***ECTS:** 3*
Objectives of the course: *The primary objective of this course is for students to (1) learn fundamental approaches for experimentally investigating biological macromolecules, (2) learn the theoretical foundations for the methods used, and (3) understand the applicability of the biochemical methods to realistic situations.*		
***Prerequisites:** none*		
Course contents ***1.** Aseptic conditions in Microbiology (3 hours)* ***2.** Liquid and solid culture media (3 hours)* ***3.** Microscopic observation of microorganisms/Staining (3 hours)* ***4.** Antibiotics/Resistance mechanisms (3 hours)* ***5.** Quantitation of bacterial cells (3 hours)* ***6.** Bacterial conjugation (3 hours)* ***7.** Drosophila matings A' (3 hours)* ***8.** Microbial Biotechnology (2 hours)* ***9.** Tissue-specific gene expression in Drosophila embryos (3 hours)* ***10.** Drosophila matings B' (3 hours)* ***11.** Drosophila tutorial (2 hours)*		
Recommended reading:		

• *A Laboratory Manual for General, Organic & Biochemistry, 6e, C.H.Henrickson, L.C.Byrd, N.W.Hunter, McGraw-Hill, c2008.* • *Brock Biology of Microorganisms, 12/E, Michael T. Madigan, John M. Martinko,, Paul V. Dunlap, David P. Clark, Publisher: Benjamin Cummings, c2009*
Teaching methods: *Introduction to the lab and practical training*
Assessment methods: *Delivery of each lab report and written examinations*
Language of instruction: *Greek*

Course Title: *English III*		
Name of Lecturer: *Maria Koutraki*		
Course Code*: BIOL-211*	***Type of course:*** *Core*	***Level of course:***
Year of study: *2*	***Semester/trimester:*** *C*	***ECTS:*** *3*
Objectives of the course (preferably expressed in terms of learning outcomes and competences *With the completion of the course, students are expected to have a proficient knowledge of written English so as to give them the confidence to write articles, essays, summaries and CVs*		
Prerequisites: *None*		
Course contents: *Revision of advanced grammar and syntax, introduction to different mediums of writing for professional as well as educational use, giving definitions, writing summaries, translating scientific texts – focusing on Genetics, Genetic Engineering, Molecular biology and evolution- using sources, handling terminology, working on a series of authentic articles.*		
Recommended reading: *English 3 File notes in the Library, English 3 links & extras in our blog: http://www.englishbiology.wordpress.com, scientific journals, newspaper and magazine articles*		
Teaching methods: *Reading and comprehending texts in class, performing interactive group activities, writing in class, vocabulary build-up and grammar practice through Internet in class, commenting on issues related to biology in order to practice oral skills, powerPoint presentations, practical writing exercises*		
Assessment methods: *3hr exam at the end of term, class participation, oral presentation of a report on biology-oriented topics, participation through class work & homework submitted throughout the semester*		
Language of instruction: *English*		

2ND YEAR SPRING SEMESTER

Course Title: *Methods for the functional analysis of biological macromolecules*		
Name of Lecturer: *Technical and Laboratory staff*		
Course Code*: BIOL-251*	***Type of course:*** *Core*	***Level of course:*** *4*
Year of study: *2*	***Semester/trimester:*** *D*	***ECTS:*** *3*
Objectives of the course: *The primary objective of this course is for students to (1) learn fundamental approaches for experimentally investigating biological macromolecules, (2) learn the theoretical foundations for the methods used, and (3) understand the applicability of the biochemical methods to realistic situations.*		
Prerequisites: *none*		
Course contents ***1.*** *DNA ligation and cloning (3 hours)* ***2.*** *Transformation of bacteria (3 hours)*		

3. *Lysis of bacterial cells expressing alkaline phosphatase (3 hours)* ***4.*** *Enzyme purification with ion-exchange chromatography (4 hours)* ***5.*** *Enzyme identification using polyacrylamide gel electrophoresis (3 hours)* ***6.*** *Enzyme action (3 hours)* ***7.*** *Polymerase Chain Reaction (3 hours)* ***8.*** *Genotyping (3 hours)* ***9.*** *DNA Hybridization using Southern I (3 hours)* ***10.*** *DNA Hybridization using Southern I (3 hours)* ***11.*** *Immunological methodologies (4 hours)*
Recommended reading: • *A Laboratory Manual for General, Organic & Biochemistry, 6e, C.H.Henrickson, L.C.Byrd, N.W.Hunter, McGraw-Hill, c2008.*
Teaching methods: *Introduction to the lab and practical training*
Assessment methods: *Delivery of each lab report and written examinations*
Language of instruction: *Greek*

Course Title: *Biochemistry II*		
Name of Lecturer: *Dimitris Tzamarias*		
Course Code: *BIOL-252*	***Type of course:*** *Core*	***Level of course:***
Year of study: *2*	***Semester/trimester:*** *D*	***ECTS:*** *6*
Objectives of the course (preferably expressed in terms of learning outcomes and competences): *To understand principles of the structure and function of nucleic acids, the flow and regulation of genetic information, and the structure, function of cellular membranes and receptors and the mechanisms of molecular signaling and sensing.*		
Prerequisites: *None*		
Course contents: *1. DNA, RNA and the flow of genetic information (structure of DNA and RNA, principles of gene expression and regulation)* *2. Biosynthesis of Nucleotides (de novo biosynthesis of pyrimidines and purines, salvage pathways, reduction of ribonucleotides, regulation of biosynthetic pathways, mutations)* *3. DNA replication and repair (DNA polymerases, separation of DNA strands, telomeres, topological properties of DNA, DNA damage and repair mechanisms)* *4. RNA synthesis and maturation (prokaryotic and eukaryotic transcription, RNA polymerases, post-transcriptional modification of RNA, RNA splicing, transcriptional regulation)* *5. Protein synthesis (tRNA aminoacylation, the ribosome, mRNA translation, fidelity of translation, translation factors, translational control)* *6. Structure and function of lipids and cellular membanes (biosynthesis of membrane lipids and cholesterol, lipid mobilization and cholesterol metabolism, structure and function of transporters, channels and transmembrane receptors)* *7. Membrane pumps and channels (ion transport across membranes, P-type ATPases, ligand- and voltage-gated channels, sugar transporters)* *8. Molecular signalling (steroid hormone receptors, 7TM receptors, channel receptors, G proteins, adenylate cyclase and phosphoinositide cascades, calcium signalling, protein phosphorylation)* *9. Integration of metabolism (key regulatory steps in energy production, organ- specific metabolic function and*		

regulation, principles of hormonal regulation, diabetes mellitus and alcoholism). *10. Sensory systems (odorants and olfaction, taste, photoreceptor molecules and vision, mechanical stimuli and hearing, sense of touch)*
Recommended reading: *Biochemistry 5th Edition, Berg, Tymoczko and Stryer*
Teaching methods: *PowerPoint lectures*
Assessment methods: *Written examination*
Language of instruction: *Greek*

Course Title: *Genetics II*		
Name of Lecturer: *Georgios Garinis*		
Course Code*: BIOL-254*	***Type of course:*** *Core*	***Level of course:***
Year of study: *2*	***Semester/trimester:*** *D*	***ECTS:*** *4*
Objectives of the course (preferably expressed in terms of learning outcomes and competences *Advanced genetics course for students specializing in Molecular Biology. Open for all other Biology students as an elective*		
Prerequisites: *None*		
Course contents: *Recombinant DNA technology applications: transgenic organisms, hybrid genes, reporter genes, PCR, recombinant protein production, genomic Southern blots, genetic mapping via RFLPs, diagnosis of hereditary diseases. Procaryotic gene regulation. Eukaryotic genomes and chromatin. Eukaryotic gene regulation. Molecular mechanisms of recombination. Transposable elements.*		
Recommended reading: *Mart Ptashne, A genetical switch, 1999. Hartwell, L.G., Hood, L., et.al., Genetics, From Genes to Genomes.*		
Teaching methods: *Lectures 3hours/week, Supervised problem solving 0,5h/week.*		
Assessment methods: *Written Examination*		
Language of instruction: *Greek*		

Course Title: *Physical Chemistry*		
Name of Lecturer: *postdoc*		
Course Code*: BIOL-256*	***Type of course:*** *Core*	***Level of course:***
Year of study: *2*	***Semester/trimester:*** *D*	***Number of ECTS:*** *6*
Objectives of the course (preferably expressed in terms of learning outcomes and competences		
Prerequisites:		
Course contents: *A. Thermodynamics* *Gas laws. Molecular interactions / Van der Waals equation. Work, Heat, Energy. Expansion work. Heat transfer. Enthalpy. Adiabatic changes. Entropy changes in specific processes. Third thermodynamic law. Helmholtz and Gibbs equations. Phase diagrams. Thermodynamic description of phase transitions. Thermodynamic properties of mixtures. Properties of solutions. Chemical activity. Chemical equilibrium. Equilibrium electrochemistry.* *B. Quantum Mechanics and Spectroscopy* *Quantization of energy. Wave-particle duality. The Schrödinger equation. Wavefunctions and the Born interpretation. The uncertainty principle. Particle in a box. Quantum Tunnelling. Quantum harmonic oscillator. Structure and spectra of hydrogen-like atoms. Orbitals in multi-electron atoms. Spectra of complex atoms.* *Moment of inertia. Rotational energy levels and transitions. Molecular vibrations. Selection rules. Molecular*		

rotational-vibrational spectra. Beer's law, fluorescence and phosphorescence. Electric dipole moment, polarizability, relative permittivity. Dipole-dipole interactions. *C. Chemical kinetics* *Reaction rate. The dependence of reaction rate on temperature. Cascade reactions. Examples of reaction mechanisms.*
Recommended reading: 1) P.W. Atkins, J. de Paula 'Φυσικοχημεία' (Πανεπ. Εκδόσεις Κρήτης, Ηράκλειο 2014). 2) Σ. Τραχανάς, «Κβαντομηχανική Ι» (Πανεπ. Εκδόσεις Κρήτης, Ηράκλειο 2005).
Teaching methods: *4h/week Lectures*
Assessment methods: *Written examinations*
Language of instruction: *Greek*

Course Title: *Biodiversity and Plant Evolutionary Ecology*		
Name of Lecturer: *Stergios Pirintsos*		
Course Code: *BIOL-257*	***Type of course:*** *Core*	***Level of course:***
Year of study: *2*	***Semester/trimester:*** *D*	***ECTS:*** *4*
Objectives of the course (preferably expressed in terms of learning outcomes and competences): *Adequate knowledge about a) evolutionary events in the history of plant life b) flora and vegetation of terrestrial ecosystems c) plant taxonomy and plant identification d) plant uses and e) bioinformatics in plant biodiversity issues*		
Prerequisites: *None*		
Course contents: Introduction: *Temporal scales and biodiversity.* ***Part A.*** *Historical evolution of floras from the Precambrian up to the Tertiary, Plant Kingdoms, Phytogeographical areas of Europe, Historical evolution of Greek Flora, Flora and Vegetation of Greek terrestrial ecosystems, Vegetation of Cretan terrestrial ecosystems.* ***Part B.*** *Phylogeny and the construction of phylogenetic trees, Evolutionary events in the history of plant life, Overview of green plant phylogeny, Algae, Fungi, Lichens, Bryophytes, Pteridothytes, General characteristics and taxonomy: Aceraceae, Amaryllidaceae, Anacardiaceae, Apiaceae, Araceae, Araucariaceae, Berberidaceae, Betulaceae, Boraginaceae, Brassicaceae, Cactaceae, Campanulaceae, Cannabaceae, Caryophyllaceae, Cistaceae, Compositae, Convolvulaceae, Corylaceae, Cupressaceae, Cyperaceae, Ericaceae, Euphorbiaceae, Fabaceae, Fagaceae, Geraniaceae, Gingoaceae, Iridaceae, Juglandaceae, Labiatae, Liliaceae, Malvaceae, Myrtaceae, Oleaceae, Orchidaceae, Palmaceae, Papaveraceae, Pinaceae, Platanaceae, Plumbaginaceae, Poaceae, Primulaceae, Ranunculaceae, Rosaceae, Rubiaceae, Salicaceae, Ulmaceae.* ***Part C.*** *Plants in history and culture, Introduction in secondary metabolism, Aromatic plants, Pharmaceutical plants, Bee plants, Foraging plants, Weeds, Poisonous plants, Industrial plants, Plants in biomonitoring and bioremediation, Genetically modified plants, Invasive plants.* ***Part D.*** *Bioinformatics and Plant Biodiversity.*		
Recommended reading: *1. Sarlis C. 1999.Sistimatiki Votaniki, Publ. Stamoulis Athens* *2. STefanaki Nikiforaki M. Sistimatiki Votaniki: Agiosperma. , Publ. Stamoulis Athens 3. Judd, W.S., Campbell, C.S., Kellogg, E.A., Stevens, P.F., Donoghue, M.J. 2002.* *3. Plant Systematics: A phylogenetic Approach. Sinauer Associates. Sunderland, Massachusetts* ***Teaching methods:*** *Lectures: 3 hours/week Lab: 3 hours/week Excursion: Mediterranean ecosystems of Greece*		
Assessment methods: *Written Examinations: theory (50%) and lab (50%)*		

Language of instruction: *Greek*

Course Title: *English IV*		
Name of Lecturer: *Maria Koutraki*		
Course Code*: BIOL-258*	***Type of course:*** *Core*	***Level of course:***
Year of study: *2*	***Semester/trimester:*** *D*	***ECTS:****3*
Objectives of the course (preferably expressed in terms of learning outcomes and competences *The objectives of this course are to enable Biology students to construct and use summaries and abstracts in scientific papers, to write and read a scientific paper for publication, to structure and phrase a laboratory report, to effectively write letters and discernible explanations of graphs and charts, to successfully follow and give instructions and explain procedures. Other objectives of this course include our students' being able to compile, filter and edit information, write a cohesive and coherent first draft and choose appropriate language. Our students eventually will be using the principles of technical writing to present their message effectively in high impact language and they will improve accuracy, brevity, and readability of their writing.*		
Prerequisites: *None*		
Course contents: *Reading, listening, paragraph structuring, introduction to different mediums of writing for professional and educational use (articles, abstracts, CVs, application forms, covering letters, reviews, essays, commentaries), practising various skills related to academic writing (coherence & cohesion, hedging, formality, complexity in sentence structure, argumentative and informative language), citing resources – CBE Manual Style and preparing oral presentations.*		
Recommended reading: *English 4 File notes in the Library, English 4 links & extras in our blog: http://www.englishbiology.wordpress.com, scientific journals, newspaper and magazine articles.*		
Teaching methods: *Lectures, PowerPoint presentations, practical writing exercises*		
Assessment methods: *3hr end of term exam, written submission and oral presentation of a review paper, class participation and homework submitted throughout the semester*		
Language of instruction: *English*		

Course Title: *Laboratory Course in Plant Biodiversity*		
Name of Lecturer: *Stergios Pirintsos*		
Course Code: *BIOL-259*	***Type of course:*** *Core*	***Level of course:***
Year of study: *2*	***Semester/trimester:*** *D*	***ECTS:*** *3*
Objectives of the course (preferably expressed in terms of learning outcomes and competences): *Adequate knowledge about a) evolutionary events in the history of plant life b) flora and vegetation of terrestrial ecosystems c) plant taxonomy and plant identification d) plant uses and e) bioinformatics in plant biodiversity issues*		
Prerequisites: *None*		
Course contents: Introduction: *Temporal scales and biodiversity.* ***Part A.*** *Historical evolution of floras from the Precambrian up to the Tertiary, Plant Kingdoms, Phytogeographical areas of Europe, Historical evolution of Greek Flora, Flora and Vegetation of Greek terrestrial ecosystems, Vegetation of Cretan terrestrial ecosystems.* ***Part B.*** *Phylogeny and the construction of phylogenetic trees, Evolutionary events in the history of plant life, Overview of*		

green plant phylogeny, Algae, Fungi, Lichens, Bryophytes, Pteridothytes, General characteristics and taxonomy: Aceraceae, Amaryllidaceae, Anacardiaceae, Apiaceae, Araceae, Araucariaceae, Berberidaceae, Betulaceae, Boraginaceae, Brassicaceae, Cactaceae, Campanulaceae, Cannabaceae, Caryophyllaceae, Cistaceae, Compositae, Convolvulaceae, Corylaceae, Cupressaceae, Cyperaceae, Ericaceae, Euphorbiaceae, Fabaceae, Fagaceae, Geraniaceae, Gingoaceae, Iridaceae, Juglandaceae, Labiatae, Liliaceae, Malvaceae, Myrtaceae, Oleaceae, Orchidaceae, Palmaceae, Papaveraceae, Pinaceae, Platanaceae, Plumbaginaceae, Poaceae, Primulaceae, Ranunculaceae, Rosaceae, Rubiaceae, Salicaceae, Ulmaceae. ***Part C.*** *Plants in history and culture, Introduction in secondary metabolism, Aromatic plants, Pharmaceutical plants, Bee plants, Foraging plants, Weeds, Poisonous plants, Industrial plants, Plants in biomonitoring and bioremediation, Genetically modified plants, Invasive plants.* ***Part D.*** *Bioinformatics and Plant Biodiversity.*
Recommended reading: *1. Sarlis C. 1999.Sistimatiki Votaniki, Publ. Stamoulis Athens* *2. STefanaki Nikiforaki M. Sistimatiki Votaniki: Agiosperma. , Publ. Stamoulis Athens 3. Judd, W.S., Campbell, C.S., Kellogg, E.A., Stevens, P.F., Donoghue, M.J. 2002.* *3. Plant Systematics: A phylogenetic Approach. Sinauer Associates. Sunderland, Massachusetts* ***Teaching methods:*** *Lectures: 3 hours/week Lab: 3 hours/week Excursion: Mediterranean ecosystems of Greece*
Assessment methods: *Written Examinations: theory (50%) and lab (50%)*
Language of instruction: *Greek*

Course Title: *Laboratory Course in Animal Biodiversity*		
Name of Lecturer: *Georgios Koumoundouros*		
Course Code*: BIOL-263*	***Type of course:*** *Core*	***Level of course:***
Year of study: *2*	***Semester/trimester:*** *D*	***ECTS:*** *3*
Objectives of the course (preferably expressed in terms of learning outcomes and competences *The characteristics, taxonomy and phylogeny of the most important animal phyla.*		
Prerequisites: *None*		
Course contents: *Characteristics, taxonomy and phylogeny of the phyla: Porifera, Cnidaria and Ctenophora, Platyhelminthes****,*** *the Aschelminth phyla, Mollusca, Annelida, Arthropoda, Echinodermata, Hemichordata and Chaetognatha, Chordata.* *Labs: 1st. Porifera, Cnidaria and Ctenophora, 2nd. Platyhelminthes, the Aschelminth phyla and Annelida, 3rd. Mollusca, 4th. Chelicerata, 5th. Crustacea, 6th. Uniramia 1, 7th. Uniramia 2, 8th. From Echinodermata to Urochordates and fishes, 9th. Amphibia and reptiles, 10th. Birds, 11th. Mammals.*		
Recommended reading: *Hickman, Roberts and Larson. Integrated Principles of Zoology. 11th Edition.*		
Teaching methods: *3 h/week lectures, 3h/week lab. 2 days field trip*		
Assessment methods: *Written examinations*		
Language of instruction: *Greek*		

Course Title: *Marine Biology*		
Name of Lecturer: *Maroudio Kentouri* **–** *Georgios Koumoundouros – Ioannis Karakassis*		
Course Code*: BIOL-265*	***Type of course:*** *Core*	***Level of course:***

Year of study: *2*	***Semester/trimester:*** *D*	***ECTS:*** *4*
Objectives of the course (preferably expressed in terms of learning outcomes and competences: *Introductory university-level course dealing with the biology/ecology of marine organism*		
Prerequisites: *None*		
Course contents: *The ocean as a habitat, some ecological and biological concepts. Classification of the marine environment. Physical and chemical properties of sea water. The ocean in motion. Marine primary producers. Benthic communities. The pelagic realm: zooplankton and nekton. Human intervention in the sea.*		
Recommended reading: *P. Castro & M.E. Huber, "Marine Biology", Greek Edition (T. Koukouras & E. Voultsiadou Eds.), 1999.* *James W. Nybakken, "Marine Biology. An Ecological Approach", Greek Edition (M. Apostolopoulou, G. Verroiopoulos, M. Thessalou-Legaki & A. Nikolaidou Eds.), 2005*		
Teaching methods: *3 hours lecture plus 3 hours laboratory training*		
Assessment methods: *Written Examination*		
Language of instruction: *Greek*		

Course Title: Laboratory Course in Marine Biology		
Name of Lecturer: Maroudio Kentouri - Michael Pavlidis – Ioannis Karakassis		
Course Code*: BIOL-266*	***Type of course:*** *Core*	***Level of course:***
Year of study: *2*	***Semester/trimester:*** *D*	***ECTS:*** *3*
Objectives of the course (preferably expressed in terms of learning outcomes and competences: *Introductory university-level course dealing with the biology/ecology of marine organism*		
Prerequisites: *None*		
Course contents: *The ocean as a habitat, some ecological and biological concepts. Classification of the marine environment. Physical and chemical properties of sea water. The ocean in motion. Marine primary producers. Benthic communities. The pelagic realm: zooplankton and nekton. Human intervention in the sea.*		
Recommended reading: *P. Castro & M.E. Huber, "Marine Biology", Greek Edition (T. Koukouras & E. Voultsiadou Eds.), 1999.* *James W. Nybakken, "Marine Biology. An Ecological Approach", Greek Edition (M. Apostolopoulou, G. Verroiopoulos, M. Thessalou-Legaki & A. Nikolaidou Eds.), 2005*		
Teaching methods: *3 hours lecture plus 3 hours laboratory training*		
Assessment methods: *Written Examination*		
Language of instruction: *Greek*		

3RD YEAR FALL SEMESTER

Course Title: Advanced methods for the analysis of cellular processes		
Name of Lecturer: *Technical and Laboratory staff*		
Course Code*: BIOL-300*	***Type of course:*** *Compulsory*	***Level of course:***

Year of study: *3*	***Semester/trimester:*** *5*	***ECTS:*** *3*

Objectives of the course:
The primary objective of this course is for students to (1) learn fundamental approaches for experimentally investigating cellular processes, (2) learn the theoretical foundations for the methods used, and (3) understand the applicability of the biochemical methods to realistic situations.

Prerequisites: *none*

Course contents

1. *Function of cell membranes-ATPase activity (3 hours)*
2. *Measuring the water potential of plant cells (3 hours)*
3. *Molecular Genetics assays in yeast I (3 hours)*
4. *Molecular Genetics assays in yeast II (3 hours)*
5. *Isolation of lymphocytes from mouse spleen (3 hours)*
6. *Lymphoid and myeloid cell morphology (3 hours)*
7. *Immunization of experimental mice (4 hours)*
8. *Blood groups (3 hours)*
9. *Phagocytosis/lymphocyte response in mitogens (3.5 hours)*
10. *Cytotoxicity (4 hours)*
11. *Observing cell division with fluorescence microscopy (3 hours)*

Recommended reading:

- *A Laboratory Manual for General, Organic & Biochemistry, 6e, C.H.Henrickson, L.C.Byrd, N.W.Hunter, McGraw-Hill, c2008.*
- *Brock Biology of Microorganisms, 12/E,* **Michael T. Madigan, John M. Martinko,, Paul V. Dunlap, David P. Clark,** *Publisher: Benjamin Cummings, c2009*

Teaching methods: *Introduction to the lab and practical training*

Assessment methods: *Delivery of each lab report and written examinations*

Language of instruction: *Greek*

Course Title: *Evolution*

Name of Lecturer: *Manolis Ladoukakis*

Course Code: *BIOL-303*	***Type of course:*** *Core*	***Level of course:***
Year of study: *3*	***Semester/trimester:*** *E*	***ECTS:*** *6*

Objectives of the course (preferably expressed in terms of learning outcomes and competences): *To understand the basic mechanisms of the evolution of life*

Prerequisites: *Basic Genetics, Basic concepts of Statistics*

Course contents: *Evolution as a unifying principle in biology. The adaptive significance of genetic variation. Theory of natural selection. Population structure. Molecular evolution, macroevolution and coevolution. Sociobiology.*

Recommended reading: *D. J. Futuyma Ëvolutionary Biology*

Teaching methods: *Two lectures weekly, one problem-solving session weekly*

Assessment methods: *An optional interim written exam and a final compulsory written exam*

Language of instruction: *Greek*

Course Title: Enzyme Biotechnology

Name of Lecturer: Daphne Bazopoulou

Course Code: BIOL-305	**Type of course:** Core	**Level of course:**

Year of study: 3	**Semester/trimester:** E	**ECTS:** 6
Objectives of the course (preferably expressed in terms of learning outcomes and competences): To introduce students to the field of enzymes, mechanisms of catalysis, related methods, and applications. To enhance critical thinking in science, organization, and presentation skills.		
Prerequisites: Enzyme Biotechnology		
Course contents: Topics: ▪ Course logistics/How to give a talk ▪ Introduction on Enzymes/Mechanisms of Catalysis ▪ Enzyme Kinetics, Regulation and Modifications ▪ Methods in protein purification/Protein interactions ▪ Enzymes in activity assays ▪ *de novo* Design and Directed Evolution ▪ Enzymes in history/Meet the enzyme (proteases, methyltransferases, redox enzymes, folding catalysts - chaperones) ▪ The RNA World ▪ Extremophilic Enzymes ▪ Enzymes in Health and Diseases		
Recommended reading: Lecture notes and selected research/review publications		
Teaching methods: Lectures and discussion sessions.		
Assessment methods: Final examination (written), group presentations (oral)		
Language of instruction: Greek		

Course Title: *Immunobiology*		
Name of Lecturer: *Irene Athanassakis*		
Course Code: *BIOL-307*	***Type of course:*** *Core*	***Level of course:***
Year of study: *3*	***Semester/trimester:*** *E*	***ECTS:*** *6*
Objectives of the course (preferably expressed in terms of learning outcomes and competences): *Acquisition of a general knowledge in the field of Immunology, including cellular, molecular, medical Immunology and Immunogenetics*		
Prerequisites: *None*		
Course contents: ***Cells of the immune system****: Description of the differentiation pathways of myeloid cells and B lymphocytes.* ***Organs of the immune system****: Structural and functional analysis of primary and secondary immune organs.* ***Differentiation of T lymphocytes****: Maturation and differentiation of T cells in thymic microenvironments. Positive and negative selection of T cells.* ***Biochemical and genetic analysis of immunoglobulins****: Definition of isotypes, allotypes and idiotypes. Description of structural characteristics and function of the different*		

immunoglobulin isotypes. Description of the immunoglobulin genes and mechanisms for polymorphism generation. Transplantation Immunology/ Major Histocompatibility Complex (MHC): Historical background on the discovery of MHC. Description of MHC in mouse and human. Analysis of class I and class II MHC molecules. Protein and gene structure. ***Humoral Immunity****: Cells involved in humoral immunity, antigen presentation, primary and secondary immune response.* ***Cell mediated immunity****: Cells involved in humoral immunity, antigen presentation, primary and secondary immune response.* ***Allergies****: Gell-Coombs classification of allergies, mechanisms and examples of the different types of allergies.* ***T cell receptor (TCR)****: Description of TCRαβ and TCRγδ, mechanisms of polymorphism generation. Description of immune synapse.* ***Immune suppression****: Tsuppressors/Tegulatory. The cellular and biochemical nature of suppression.* ***Idiotypes****: Description of the idiotypic network and the idiotypic regulatory mechanisms.* ***Immune tolerance****: Mechanisms regulating the development and breakage of immune tolerance.* ***Autoimmunity- Immunodeficiency****: Diseases caused by mal-functionning of the immune system.* ***Cancer Immunology****: immune surveillance, mechanisms evoked by malignant cells to immune escape.* ***Laboratory training:*** *1) Immune cell isolation from mouse spleen: counting of white cells, counting of alive/dead cells, elimination of dead cells using density gradient.* *2) Morphology of lymphocytes and myeloid cells: observation of spleen cells after Giemsa staining, observation and identification of prepared samples from human peripheral blood.* *3) Phagocytosis and lymphocyte responsiveness to mitogens: isolation of phagocytes by adherence to plastic, estimation of metal chip phagocytosis. Estimation of the proliferative activity of mouse spleen cells in response to concanavalin A and lipopolysaccharide.* *4) Cytotoxicity: Estimation of T, B and macrophage cell content in mouse spleen using specific antibodies and complement.* *5) Immunisation: Mouse immunization with sheep red blood cells, determination of antigen specific B cells and titration of the immune serum.* *Virtual ELISA lab (http://www.hhmi.org/biointeractive/immunology/vlab.html)*
Recommended reading: *Introduction to Immunology (J. Decker), Immunology (J. Klein, V. Horejsi), Fundamental Immunology (W.E. Paul), Immunology (I.M. Roitt et al.), Immunobiology (C. Janeway et al.), Cellular and Molecular Immunology (A.K. Abbas et aL*
Teaching methods: *Lectures and 6 laboratory sessions*
Assessment methods: *Written examination for the theoretical part and individual reports for each laboratory session.*
Language of instruction: *Greek*

Course Title: *Biostatistics*		
Name of Lecturer: *Konstadia Lika*		
Course Code: *BIOL-309*	***Type of course:*** *Core*	***Level of course:***
Year of study: *3*	***Semester:*** *E*	***ECTS:*** *6*
Objectives of the course (preferably expressed in terms of learning outcomes and competences): *This course provides an introduction to a variety of statistical methods of use in describing and analyzing biological*		

data. It includes a laboratory component in which biological data are analyzed using statistical software. No prior knowledge of the software will be assumed.
Prerequisites: *There are no prerequisites.*
Course contents: *Types of biological data. Descriptive statistics. Theoretical and sampling distributions. Estimation – point estimation, confidence intervals. One- and two-sample hypothesis testing. Chi-square goodness of fit. Contingency tables. Analysis of variance (one- and two-factor) and multiple comparisons. Simple linear regression and correlation. Multiple regression and correlation. Some nonparametric statistical methods.*
Recommended reading: *J. Zar , "Biostatistical Analysis"*
Teaching methods: *Three 45-minute lectures and three 45-minute computer labs per week*
Assessment methods: *Written examination (70%) and homework assignments (30%)*
Language of instruction: *Greek*

Course Title: Biogeography		
Name of Lecturer: Poulakakis Nikos		
***Course Code**: BIOL-313*	***Type of course:*** *Obligatory for the direction of “Environmental Biology and Management of Biological Recourses“*	***Level of course:*** *Advanced*
Year of study: *3*	***Semester/trimester:*** *E*	***Number of ECTS:*** *4*
Objectives of the course (preferably expressed in terms of learning outcomes and competences		
Prerequisites: *Typically none, but good knowledge of the following is highly recommended:* • *Evolutionary Biology (less important – student should be familiar with the concepts of speciation/subspeciation/diversification, selection, adaptive radiation)* • *Ecology (less important – student should be familiar with the concepts of ecosystems, habitats and basic ecological processes)* • *Zoology/Biodiversity (less important)*		
Course contents: *This course aims to provide you a theoretical background on the science of Biogeography. Biogeography studies the distribution of the biological diversity in space, seeking patterns and rules by emphasizing on the assessment of processes that shape biological diversity in a variety of time and space scales. It is a dynamic field where progress is rapid, fuelling both theoretical quests at the cutting edge of ecology and evolutionary biology, as well as practical applications in the fields of biological diversity and conservation on our planet. Some of the questions raised in biogeography are: Why a species or any given taxon (genus, family, order, etc.) follows the observed distribution in space? What allows a species to live there and what prevents it from settling different areas? What is the determining role of climate, topography, and the interactions with other species, in any given species distribution? How do different organisms replace each other along a gradient (habitat, climate, etc.)? How does a species end up being limited to its current distribution? Where did his ancestors live? How did historical events, such as Continental Drift, the glaciers of Pleistocene and the recent*		

climate change, have shaped the distribution of species? Why are the animals and plants of large, isolated regions such as Australia, New Caledonia and Madagascar so different than those of other nearby areas? Why are some groups of closely related species confined to the same area, while others are in opposite parts of the Earth? Why there are many more species in the tropics than in the temperate zones and the poles? How the isolated oceanic islands are colonized, and why are there fewer species on the islands than continental regions, although organisms are facing with the same types of habitats? *At the end of the course, the student should be able to: (1) understand the contents and the study purpose of the biogeography, (2) develop a critical view on the distribution patterns of the organisms, (3) make valid scientific questions and hypotheses on biogeography of species, (4) discuss the main theories and approaches in the context of biogeography, (5) understand the comparative method in the biogeography and generally in biology and (6) understand the processes of morpho-ecological adaptations of organisms and the spatial and temporal patterns of biodiversity.* ***Topics covered*** • *Introductory definitions, history of Biogeography, divisions* • *The geographical, geological and climatic contexts* • *The ecological framework (biomes)* • *Distributions, biogeographical regions, barriers* • *Dispersal, Vicariance and Migrations.* • *Island Biogeography. Island life patterns. Characteristics of life on islands.* • *Theoretical Biogeography* • *Phylogeography* • *Biogeography of Greece* • *Biogeography of the Mediterranean Basin*
Recommended reading: • *Whittaker, R.J. & Fernández-Palacios, J.M. (2007):* ***Island biogeography: ecology, evolution and conservation****, 2nd edition. Oxford University Press, Oxford, UK.* • *Brown, J. H. & Lomolino, M. V. (1998):* ***Biogeography****. 2nd Ed. Sunderland, Massachusetts*
Teaching methods: *Three 45-minute lectures per week*
Assessment methods: *Written examination (75%) and homework assignments (25%)*
Language of instruction: *Greek*

3RD YEAR SPRING SEMESTER

Course Title: *Developmental Biology*		
Name of Lecturer: *Despina Alexandraki*		
Course Code: *BIOL-350*	***Type of course:*** *Core*	***Level of course:***
Year of study: *3*	***Semester/trimester:*** *F*	***ECTS:*** *6*
Objectives of the course (preferably expressed in terms of learning outcomes and competences): *Learning the basic principles and questions of current Developmental Biology based on several model systems*		
Prerequisites: *There are no prerequisites*		
Course contents: *Introduction to fundamental principles and questions of development and to model*		

experimental systems, invertebrates and vertebrates (sea urchin, nematode, fruit fly, frog, fish, chicken, mouse). Germline formation and gametogenesis (spermatogenesis, oogenesis). Cytoplasmic localisation of morphogenetic factors-cellular polarity, cellular interactions, hormonal regulation, meiosis controlling factors. Mechanisms of fertilisation. Mosaic and regulative embryos, cellular determination and differentiation, morphogens. Types of cleavage, blastula formation, gastrulation, morphogenesis (invertebrates and vertebrates). Neurulation of vertebrates, primary and secondary induction. Molecular patterning of the Drosophila body plan: developmental mutants, morphogenetic fields, axis formation, segmentation, homeotic genes. Molecular patterning of the vertebrate body plan: mesodermal induction and patterning, organising signalling centers, induction and patterning of the neural tube and neural crest cells. Hox code and morphogens in vertebrate somitogenesis, rhombomere formation and limb development. Left-right asymmetry of vertebrate internal organs. Evolution of patterning molecules. Cell lineages, heterochronic mutations, mechanisms of cellular communication in Caenorhabditis elegans.
Recommended reading: *Developmental Biology, Scott. F. Gilbert , 2006, Principles of Development, L. Wolpert, 2001, Essential Developmental Biology, J. Slack 2006,* *Provided: Lectures in Powerpoint and texts from the internet. CDs, Videos.*
Teaching methods: *Lectures 4h/week*
Assessment methods: *Written examination*
Language of instruction: *Greek*

Course Title: *Biotechnology*		
Name of Lecturer: *Michael Kokkinidis, Kriton Kalantidis*		
Course Code*: BIOL-352*	***Type of course:*** *Core*	***Level of course:***
Year of study: *3*	***Semester/trimester:*** *F*	***ECTS:*** *6*
Objectives of the course (preferably expressed in terms of learning outcomes and competences *Survey of basic principles of molecular biotechnology, DNA manipulations, protein engineering and protein design and their applications in areas of medical, agricultural, environmental and industrial importance. Familiarization with biotechnology information resources on the internet*		
Prerequisites: *None*		
Course contents: *Introduction to Biotechnology. Basic concepts of gene cloning, transfer and establishment of genetic molecules in cells/organisms (methods, target genes, methodology, strategies): Transgenic Plants. Transgenic insects, Transgenic animals. Applications of microbial/environmental biotechnology. Social, commercial and regulatory issues.* *Biotechnological applications of structural biology. Introduction to protein engineering and protein design. Characteristics of protein structures. Methods or protein structure determination. Protein folding and structural stability. Principles of stable protein design. Computer applications in protein design.*		
Recommended reading: Molecular Biotechnology: *Principles and Applications of Recombinant DNA, 3rd edition, by Bernard R. Glick, Jack J. Pasternak, Amazon.com*		
Teaching methods: *Regular lectures*		
Assessment methods: *Written exams, report on a self-selected topic related to Biotech*		

Language of instruction: *Lectures in Greek, Instructional materials in both Greek and English*

Course Title: *Methods of analysis for physiological processes*		
Name of Lecturer:		
Course Code*: BIOL-355*	***Course Code****: BIOL-355*	***Course Code****: BIOL-355*
Year of study: *3*	***Year of study:*** *3*	***Year of study:*** *3*
Objectives of the course: *The primary objective of this course is for students to (1) learn fundamental approaches for experimentally investigating physiological processes, (2) learn the theoretical foundations for the methods used, and (3) understand the applicability of the biochemical methods to realistic situations.*		
Prerequisites: *none*		

Course contents

PART A': Physiology and Biochemistry of plants

1. ***Plant Growth [A. Papadaki, K. Kotzabasis]***
   - A. *Plant Nutrition: A study of growth and development of seedlings characteristics of various plant species in nutrient solutions without essential minerals.*
   - B. *Photobiological control of germination through PhyA and PhyB: Seeds undergo different illumination treatments (qualitative and quantitative) and the rate of germination is monitored.*
2. ***Plant morphogenesis in vitro [A. Papadaki, P. Moschou]***
   - A. *Directed plant morphogenesis in vitro in the presence of different concentrations of auxin and cytokinin.*
   - B. *Quantitative determination of total phenolic substances in plants.*
3. ***Chloroplast biogenesis [A. Papadaki, K. Kotzabasis]***
   - A. *Photoconversion of etioplast to chloroplast: Study of the light dependent conversion of etioplasts to chloroplasts and the photoreduction of protochlorophyllide to chlorophyllide.*
   - B. *Recording the structure and function of the photosynthetic apparatus in the context of chloroplast biogenesis using fluorescence induction techniques.*
4. ***Photosynthetic Activity - Hill Reactions [A. Papadaki, K. Kotzabasis]***
   - A. *Isolation of intact chloroplasts.*
   - B. *Determination of chlorophyll amount.*
   - C. *Determination of photosynthetic activity by Hill reactions in isolated chloroplasts.*
5. ***Abiotic stress [A. Papadaki, P. Moschou]***
   Determination of enzymatic activity of catalase and in situ localization of the superoxide anion in plants exposed to high salinity conditions.

PART B': Animal Physiology

6. ***Membrane Potentials [D. Dokianaki, K. Sidiropoulou]***
   Diffusion, Facilitated diffusion, osmosis, active transport. Resting membrane potential, ion equilibrium potentials, action potential.
7. ***Electrical signal transfer in the nervous system [D. Dokianaki, K. Sidiropoulou]***
   Electrical signal transfer in the passive axon, unmyelinated and myelinated axon. Postsynaptic potential in the neuromuscular junction and its properties.
8. ***Anatomy of the Central Nervous System [D. Dokianaki, K. Sidiropoulou]***
   Observation of human brain model, demonstration of the perfusion technique, handling of a fixed mouse brain, preparation and observation of coronal brain slices
9. ***Neurobiological basis of behavior [D. Dokianaki, K. Sidiropoulou]***
   Introduction to the basic principles for handling laboratory animals for investigating the nervous system. Behavioral tasks to study anxiety and learning and memory in animals. Observation of brain slices that have been prepared using the Nissl staining and Golgi-Cox staining techniques.
10. ***Cardiac function physiology – Electrocardiogram [D. Dokianaki, K. Sidiropoulou]***
    Recording of blood pressure, heart sounds, sensory stimulation and blood pressure, regulation of cardiac function. Using the electrocardiogram (EKG), Einthoven triangle, Cardiac axis.
11. ***Pulmonary system – Metabolism regulation [D. Dokianaki]***
    Spirometry, comparative spirometry, glucose curve.

Recommended reading: Notes
Teaching methods: *Introduction to the lab and practical training*
Assessment methods: *Delivery of each lab report and written examinations*
Language of instruction: *Greek*

Course Title: *Plant Physiology*		
Name of Lecturer: *Panagiotis N. Moschou*		
Course Code*: 358*	***Type of course:*** *Core*	***Level of course:*** *Advanced*
Year of study: *3*	***Semester/trimester:*** *F*	***Number of ECTS:*** *4*
Objectives of the course (preferably expressed in terms of learning outcomes and competences *The study of plant physiology is of great importance both in purely scientific terms and in possible applications. For example, the study of plant organisms may indicate new molecular paths that can be preserved throughout the tree of life. This has happened in the past with the discovery, for example, of inheritance mechanisms, gene silencing and transposable elements. Also, the study of plant physiology can indicate ways to improve plants to produce more or even produce novel products. Modern horticultural and agricultural systems require higher yield and quality combined with low production costs and reduced pesticide use to meet growing demand. These goals can only be achieved with sufficient knowledge of plant physiology. The aim of the course is to introduce students to the use of plants as experimental models, molecular biology of plants and metabolism, plant structure, and regulation of growth under various environmental conditions.*		
Prerequisites: *The course introduces students to the world of plants, analyzing their main physiological processes. At the same time, attempts are made to correlate the physiological processes of plants with those of other organisms, so that students acquire an overall knowledge of the physiology of the organisms and the evolutionary course. Each chapter presents the history of science and, as time permits, a presentation of modern work so that students can understand how new scientific knowledge is produced and built.* *The general competencies that will be acquired by the students are:* *1. Knowledge of basic concepts-terminology related to plant physiology.* *2. Data analysis and synthesis, production of new research ideas, development of critical thinking.* *3. Understand concepts related to various processes within the plant cell. Explaining the principles and practices of plant physiology, the lesson gives an insight into the detailed plant processes, how plants work, how they grow and react to environmental factors such as light, water and nutrition.* *4. Synthesis and evaluation of experimental approaches to answer basic questions of physiology. Understanding concepts related to the comparative study of organisms (plant and animal for example).*		
Course contents: *1. Introduction (acquaintance, way of teaching, learning outcomes, why we study plants, plant cell)* *2. Plant genomes (structure, organization, regulation, genetic engineering)* *3. Water uptake (modes of transport, water balance, transfer of solutes)* *4. Photosynthesis (light and dark reactions, physiology and ecology)* *5. Structure (embryogenesis, meristems, organogenesis, phloem and xylem, modes of transport, systemic transport, aging)* *6. Metabolism of lipids and secondary metabolites (respiration, glycolysis, oxidative pathways, lipid metabolism, main secondary metabolites and activity)* *7. Inorganic nutrients and nutrition (main inorganic ions and role)* *8. Signal transduction (responses to light and hormones)* *9. Growth and development 1 (auxin, gibberellins, cytokines)* *10. Growth and development 2 (ethylene, abscisic acid)* *11. Growth and development 3 (brassinosteroids and other hormones)* *12. Responses to stresses (developmental plasticity, main stresses, molecular mechanisms of responses)* *13. Circadian rhythms (bloom, inner clock, photoperiod)*		
Recommended reading:		

-Additional cources: *Buchanan, B.B., Gruissem, W., and Jones, R.L. (2015). Biochemistry & Molecular Biology of Plants, 2nd ed. (West Sussex, UK: Wiley).* *Evert, R.F., and Eichhorn, S.E. (2012). Raven Biology of Plants, 8th ed. (New York: W.H. Freeman).* *Hodson, M.J., and Bryant, J.A. (2012). Functional Biology of Plants. (Oxford, UK: Wiley-Blackwell).* *Hopkins, W.G., and Hüner, N.P.A. (2009). Introduction to Plant Physiology, 4th ed. (Hoboken, NJ: John Wiley and Sons).* *Jones, R., Ougham, H., Thomas, H., and Waaland, S. (2013). The Molecular Life of Plants. (Oxford, UK: Wiley-Blackwell).* *Mauseth, J.D. (2016). Botany: An Introduction to Plant Biology, 6th ed. (Burlington, MA: Jones & Bartlett Learning).* *Nobel, P.S. (2009). Physicochemical and Environmental Plant Physiology, 4th ed. (Oxford, UK: Academic Press).* *Smith, A., Coupland, G., Dolan, L., Harberd, N., Jones, J., Martin, C., Sablowski, R., and Amey, A. (2009). Plant Biology. (New York: Garland Science).* ***-Relevant journals:*** *Science, Nature, Nature Genetics, Nature Plants, PNAS, Developmental Cell, Plant Cell, New Phytologist, Plant Journal, Plant Physiology, Journal of Experimental Botany, Physiol Plant, κ.ά.* ***-Websites:*** *https://www.facebook.com/Teaching-Tools-in-Plant-Biology-175851565771129/* *http://www.plantcell.org/content/teaching-tools-plant-biology*
Teaching methods: *Lectures*
Assessment methods: *One final exam*
Language of instruction: *Greek, English*

Course Title: *Animal Physiology*		
Name of Lecturer: *Kyriaki Sidiropouloy*		
Course Code: *BIOL-357*	***Type of course:*** *Core*	***Level of course:***
Year of study: *3*	***Semester/trimester:*** *F*	***ECTS:***4
Objectives of the course (preferably expressed in terms of learning outcomes and competences): *To learn the fundamentals of animal cell physiology and some of the most important physiological systems of vertebrates*		
Prerequisites: *None*		
Course contents: ***Basic principles of cellular physiology:*** *membrane potential, action potential, ion channels, synaptic transmission, intracellular signalling pathways.* ***Nervous system:*** *Cell types, brain anatomy, blood-brain barrier, sensory systems, neuromuscular junction, spinal reflexes, autonomic nervous system.* ***Muscle:*** *Structure, contraction and mechanics of striated and smooth muscle.* ***Cariovascular system:*** *Cardiac muscle, electrical activity of the heart, cardiac cycle, blood circulation, vascular system.* ***Respiratory system:*** *Anatomy, lung volumes, gas flow, gas exchange.* ***Endocrine systems:*** *Hormones,*		

hypothalamus, pituitary, pancreas, thyroid gland, adrenal gland, regulation of the metabolism, reproduction. ***Kidney:*** *anatomy, function, hormonal regulation.*
Recommended reading: *R.M. Berne and M.N. Levy, Principles of Physiology 2nd Ed.*
Teaching methods: *Lectures and Practicals*
Assessment methods: *Written Examination*
Language of instruction: *Greek*

Course Title: *Computational Biology*		
Name of Lecturer:		
Course Code: *BIOL-315*	***Type of course:*** *Core*	***Level of course:***
Year of study: *3*	***Semester/trimester:*** *F*	***ECTS:*** *5*
Objectives of the course (preferably expressed in terms of learning outcomes and competences): *Introduction to the concepts of probability and statistics in the analysis of primary biological sequences.* *Brief description of available resources (databases and web-services) on the world wide web* *Introductory Analysis of nucleotide and protein sequences, performance of homology searches and basic phylogenetic analysis.* *Use of computational methods for genome analysis, comparative genomics and text mining.*		
Prerequisites: *Basic Knowledge of Molecular Biology, Biochemistry, Evolutionary Biology.*		
Course contents: *Introduction to Probability. "Words" in Biological Sequences. Motif Search. Gene-finding strategies and Genome Annotation. Proteomics, analysis of protein sequence and structure. Alignment methods, homology and similarity search. Phylogenetic Analysis. Analysis of sequence variation. Clustering and Classification methods. Introduction to Comparative Genomics. Intorduction to biological networks and Systems Biology.*		
Recommended reading: *1. Deonier, Tavare & Waterman. Computational Genome Analysis.* *2. Baxevanis & Ouellette. Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins* *3. Allman & Rhodes. Mathematical Models in Biology. An introduction.* *4. David Mount. Bioinformatics: Sequence and Genome Analysis.* *5. Course presentations.*		
Teaching methods*: Weekly Lectures. Practical exercises*		
Assessment methods: *Practical Exercises, Semester Projects. Final written examination.*		
Language of instruction: *Greek (English if necessary)*		

4TH YEAR FALL SEMESTER

ELECTIVE COURSES

- ***BIOMOLECULAR SCIENCES AND BIOTECHNOLOGY***

Course Title: *Crystal Structure Determination of Biological Macromolecules*		
***Name of Lecturer:* S. Maragkaki** *(postdoc)*		
Course Code: *BIOL-406*	***Type of course:*** *Elective*	***Level of course:***
Year of study: *4*	***Semester/trimester:*** *G*	***ECTS:*** *4*
Objectives of the course (preferably expressed in terms of learning outcomes and competences): *To introduce students to the basic steps of macromolecular crystallography*		
Prerequisites: *Basic physics, biology*		
Course contents: *Crystallization techniques. Symmetry & Space Groups. Principles of X-ray Diffraction and the Phase Problem. Structure Determination and Refinement.*		
Recommended reading: *J. Drenth, Principles of X-ray Crystallography*		
Teaching methods: *Lectures & Internet based teaching*		
Assessment methods: *Written exam*		
Language of instruction: *Greek, English*		

Course Title: *RNA*		
Name of Lecturer: *Efthimia Tsagri*		
Course Code: *BIO-410*	***Type of course:*** *Elective*	***Level of course:***
Year of study: *4*	***Semester/trimester:*** *G*	***ECTS:*** *4*
Objectives of the course (preferably expressed in terms of learning outcomes and competences): *To understand mechanisms of plant gene structure, regulation, expression, and development and learn some applications of plant biotechnology*		
Prerequisites: *Molecular Biology, Structure and Organization of the Plant Cell*		
Course contents: *DNA and genomes of plants. Transcription, examples of induction and repression mechanisms. RNA structure, protein coding and non coding genes. RNA processing and stability. Transcriptional and posttranscriptional silencing. Translation, rules and exceptions. Plasticity of plant development in a changing environment. Applications in Plant Biotechnology*		
Recommended reading: *Chapters from: Biochemistry and Molecular Biology of Plants (ASPB), Mechanisms of Plant Development (O. Leyser), selected publications*		
Teaching methods: *Lectures and reading course*		
Assessment methods: *Written examination and/or presentation of specific subjects*		
Language of instruction: *Greek*		

Course Title: *Cell Growth, Proliferation and Cancer*		
Name of Lecturer: George Zachos		
Course Code: *BIOL-412*	***Type of course:*** *Elective*	***Level of course:***
Year of study: *4*	***Semester/trimester:*** *G*	***ECTS:*** *4*
Objectives of the course (preferably expressed in terms of learning outcomes and competences): *To*		

understand the cell biology of carcinogenesis and learn about recent advances in cancer therapy.
Prerequisites: *Successful attendance of courses Cell Biology, Molecular Biology, Genetics I and Genetics II is recommended.*
Course contents: *Introduction in tumourigenesis: proto-oncogenes, oncogenes and oncosupressors; mutagenesis, immortalisation and carcinogenesis; cell cycle control in vertebrate cells; The mitotic spindle checkpoint; Membrane receptors and signal transduction pathways: the ERK, JNK p38MAPK and PI3 kinase pathways; Chromatin remodelling in carcinogenesis; DNA damage and responses; DNA repair pathways: mismatch repair, nucleotide excision repair, base excision repair, homologous recombination and non-homologous end-joining; Programmed cell death; Replicative senescence; Recent advances in cancer therapy.*
Recommended reading*: Molecular Biology of the cell, Alberts et al.*
Teaching methods: *Lectures*
Assessment methods: *Written examination*
Language of instruction: *Greek*

Course Title: *Human Genetics: from molecular mechanisms to disease*		
Name of Lecturer: *Georgios Garinis*		
Course Code*: 416*	***Type of course:*** *Elective*	***Level of course:*** *Advanced*
Year of study: *4*	***Semester/trimester:*** *G*	***Number of ECTS:*** *4*
Objectives of the course (preferably expressed in terms of learning outcomes and competences		
Prerequisites: *The students should have successfully completed (passed the exams) for the following courses: Genetics I, Genetics II, Molecular Biology, Biochemistry I and Biochemistry II.*		
Course contents: *Basic principles of human heredity, Autosomal and sex-linked disorders, molecular mechanisms underlying distinct human pathologies, ageing and age-related disorders, experimental strategies to identify genes and pathways in human diseases, the use of mouse models in human disorders.*		
Recommended reading: *Medical Genetics, M.W. Thompson, R.R. McInnes, H.F. Willard, 5th Edition*		
Teaching methods: *Lectures 2 hours/week, Supervised problem solving 0,5h/week.*		
Assessment methods: *Written Examination*		
Language of instruction: *Greek*		

- ***ENVIRONMENTAL BIOLOGY AND MANAGEMENT OF BIOLOGICAL RESOURCES***

Course Title: *Aquaculture*		
Name of Lecturer: *Georgios Koumoundouros*		
Course Code: *BIOL-403*	***Type of course:*** *Elective*	***Level of course:***
Year of study: *4*	***Semester/trimester:*** *G*	***ECTS:*** *4*
Objectives of the course (preferably expressed in terms of learning outcomes and competences): *Fish*		

Cultures, Aquaculture of Mediterranean finfish species
Prerequisites: *None*
Course contents: *State-of the-art and production of world aquaculture with emphasis on Mediterranean finfish species.*
Recommended reading: *Relative scientific publications and lecture notes*
Teaching methods: *Lectures*
Assessment methods: *Written examination or project (written report and oral presentation)*
Language of instruction: *Greek*

Course Title: *Applied Ecology and Terrestrial Ecosystem Management*		
Name of Lecturer: *Stergios Pirintsos*		
Course Code: *BIOL-405*	***Type of course:*** *Elective*	***Level of course:***
Year of study: *4*	***Semester/trimester:*** *G*	***ECTS:*** *4*
Objectives of the course (preferably expressed in terms of learning outcomes and competences): *Adequate knowledge and understanding of the Terrestrial Ecosystem Management seen in the social context*		
Prerequisites: *Adequate knowledge of Ecology*		
Course contents: *Concepts and terminology. Environmental Ethics. Ecosystem management in the social context. Scientific basis of ecosystem management. Development and Environment. Environmental policy. International Conventions. Environmental Law, Ecological Risk Assessment. The concept of sustainability. Indicators of sustainability. In situ and ex situ conservation. Population management. Habitat management. Atmospheric pollution and climate change. Soil pollution. Ecological restoration. Monitoring of environmental changes. Mapping of natural environment, ecosystems and vegetation. Geographical Information Systems (GIS). Protected areas. NATURA 2000. Local communities. International experience on the management of protected areas.*		
Recommended reading: *1. Meffe, G.K., Carroll C.R. and contributors 1997. Principles of Conservation Biology. Sinauer Associates Inc. Sunderland, Massachusetts* *2. Pickett, S.T.A., Ostfeld, R.S., Shachak, M., Likens, G.E. 1997. The Ecological Basis of Conservation. Chapman & Hall, New York, London* *3. Fiedler, P.L., Kareiva, P.M. 1998. Conservation Biology: for the coming decade. Chapman & Hall, New York, London* *4. Soulé, M.E., Orians, G.H. 2001. Conservation Biology: Research Priorities for the Next Decade. Island Press, Washington, Covelo, London* *5. Spellerberg, I.F. 1996. Conservation Biology. Addison Wesley Longman, Essex, England* *6. Κουτούπα – Ρεγκάκου Ε. 2005. Δίκαιο του Περιβάλλοντος. Εκδόσεις Σάκκουλα, Αθήνα* *7. Παναγόπουλος Θεόδωρος 2004. Δίκαιο Περιβάλλοντος. Εκδόσεις Σταμούλης, Αθήνα*		
Teaching methods: *Lectures: 3 hours/week, Excursion: National Parks and Protected Areas of Europe*		
Assessment methods: *Evaluation of projects (written report and oral presentation)*		
Language of instruction: *Greek*		

Course Title: *Marine Pollution*		
Name of Lecturer: *Ioannis Karakassis*		
Course Code*: BIOL-409*	***Type of course:*** *Elective*	***Level of course:***
Year of study: *4*	***Semester/trimester:*** *G*	***ECTS:*** *4*
Objectives of the course (preferably expressed in terms of learning outcomes and competences *Understanding the main concepts related to pollution and environmental degradation* *Knowledge of the main sources of marine pollution and their effects on marine organisms* *Ability to retrieve scientific information and to evaluate its relevance to marine pollution issues.* *Understanding the global issues related to anthropogenic pressures on the marine environment.*		
Prerequisites: *None*		
Course contents: *Definitions, types of pollutants, pollution sources, impacts on biological populations, communities and ecosystems. Eutrophication: impacts of nutrient discharge on pelagic food webs. Oil, metals, plastic and radioactive wastes. Pollution state of the worlds' oceans. Pollution problems in the Mediterranean. EU water framework directive. Prediction models, design of environmental monitoring programs. Mitigation of marine pollution. Critique and analysis of marine pollution issues found in recent bibliography and the press.*		
Recommended reading: *RB Clark: Marine Pollution , plus a list of recent research papers and reviews*		
Teaching methods: *Lectures (2 h/week)*		
Assessment methods: *Written examination (80%); paper presentation and analysis (20%)*		
Language of instruction: *Greek*		

Course Title: *Benthic Ecology*		
Name of Lecturer: *Ioannis Karakassis*		
Course Code*: BIOL-411*	***Type of course:*** *Elective*	***Level of course:***
Year of study: *4*	***Semester/trimester:*** *G*	***ECTS:*** *4*
Objectives of the course (preferably expressed in terms of learning outcomes and competences *Knowledge of the diversity of functional groups of organisms inhabiting marine sediments* *Knowledge and understanding of the key geochemical variables affecting the distribution of benthic organisms* *Understanding of the interactions of benthic organisms with environmental variables* *Understanding the potential for using benthic sampling in environmental monitoring* *Ability to analyse benthic ecological data and detecting patterns, clusters and disturbance*		
Prerequisites: *None*		
Course contents: *Marine Biology*		
Recommended reading: *JS Gray: The ecology of marine sediments, plus a list of recent research papers and reviews*		
Teaching methods: *Lectures (3 h/week), Practical exercises in data analysis (3h)*		
Assessment methods: *written examination (80%); paper presentation and analysis (20%)*		
Language of instruction: *Greek*		

- ***COMMON COURSES***

Course Title: *Photosynthesis*		
Name of Lecturer: *Kiriakos Kotzabasis*		
Course Code: *BIOΛ-440*	***Type of course:*** *Elective*	***Level of course:***
Year of study: *4*	***Semester/trimester:*** *G*	***ECTS:*** *4*
Objectives of the course (preferably expressed in terms of learning outcomes and competences): *Specific knowledge focused on the molecular structure, function and bioenergetics of the photosynthetic apparatus. Impact of environmental changes on photosynthesis.*		
Prerequisites: *There are no prerequisites*		
Course contents: *Photosynthesis and bioenergetics. Molecular structure and function of the photosynthetic apparatus. Light absorption and fluorescence. Energy transfer mechanisms. Linear and cyclic electron transfer. Light harvesting complex (LHCII). Photosystem II (PSII). Cytochrom* b_6f. *Photosystem I (PSI). State transitions (state 1→ state 2). Photophosphorylation and chemiosmosis. Calvin cycle. Fluorescence induction measurements and photosynthetic efficiency. Molecular biology of the photosynthetic system. Organization of the chloroplast genome. Regulation of chloroplast protein synthesis. Protein transport into chloroplasts. Functional assembly of photosynthetic chlorophyll/protein complexes. Chloroplast photodevelopment. Photoreceptors and signal transduction chains for the photosynthetic apparatus synthesis. Chlorophyll biosynthesis. Carotenoid biosynthesis. Photoadaptation. Photorespiration. Photosynthesis in C3, C4 and CAM plants. Photoinhibition. Mehler reaction. Photosynthesis in bacteria. Impact of global environmental changes on the structure and function of the photosynthetic apparatus. Biotechnological applications.*		
Recommended reading: *Plant Physiology – From the Molecule to the Environment (in greek), K.A. Roubelakis-Angelakis (Ed.), Crete University Press, Heraklion. 1st Edition October 2003. Chapter #5-PHOTOSYNTHESIS I (D. Ghanotakis and K. Kotzabasis) and Chapter #6-PHOTOSYNTHESIS II (N.A.Gavalas and I. Manetas).*		
Teaching methods: *3 hours lecture per week plus 10 hours lab session per semester*		
Assessment methods: *written examination (70%), project report and presentation (30%)*		
Language of instruction: *Greek*		

Course Title: *Introduction to biomedical imaging techniques*		
Name of Lecturer: *George J. Tserevelakis*		
Course Code*: BIOL-403DEM*	***Type of course:*** *Elective*	***Level of course:***
Year of study: *3*	***Semester/trimester:*** *E*	***Number of ECTS:*** *4*
Objectives of the course (preferably expressed in terms of learning outcomes and competences		
Prerequisites:		
Course contents: 1. *Introduction: The general model for imaging methods. Multimodal imaging. Optical imaging limitations.* 2. *X-Ray Computed Tomography (X-Ray CT): X-Ray generation. The X-Ray spectrum. Main interactions of X-ray radiation with matter. Evolution of X-Ray CT scanners. The filtered Back-Projection reconstruction algorithm. Pre-clinical and clinical applications of X-Ray CT.* 3. *Positron Emission Tomography (PET): Radioactive decay and decay modes. Fundamental principles of PET. Scintillators / Photomultipliers. Radioisotopes for clinical applications. Spatial resolution limiting*		

factors.

4. *Ultrasound imaging: Advantages and limitations of diagnostic ultrasound imaging. Acoustic propagation. Reflection, refraction and attenuation of ultrasonic waves. Direct and reverse piezoelectric effect. A-Scan and B-Scan. Doppler effect flow measurements.*
5. *Photoacoustic tomography (PAT): The photoacoustic effect. Stress and thermal confinement conditions. Factors determining photoacoustic waveform generation. PAT imaging systems and applications. Filtered back-projection algorithm in PAT.*
6. *Introduction to optical microscopy: Historical overview. Ray-tracing applied to compound microscopes. Back focal plane, real and virtual images. Huygens principle. The diffraction limit in spatial resolution. The Abbe's formula proof. Köhler illumination. Optical aberrations (spherical, chromatic, curvature of field).*
7. *Fluorescence microscopy I: Jablonski diagram for fluorescence process. Stokes shift. Widefield fluorescence microscopy. Optical filters technologies. Dichroic mirrors and filter cubes. Principles of confocal microscopy. Rayleigh criterion and spatial resolution.*
8. *Fluorescence microscopy II: Cylindrical lenses. Gaussian beam parameters. Selective Plane Illumination Microscopy (SPIM). Types of SPIM. Applications, advantages and limitations of SPIM.*
9. *Non-linear microscopy: Rayleigh and Mie scattering. Main intrinsic absorbers of tissue. The optical window in near infrared region. Two photon excitation fluorescence. Virtual states and time-energy uncertainty principle. Second and Third Harmonic Generation microscopy (SHG, THG). Advantages and applications.*
10. *Photoacoustic microscopy: Optical and acoustic resolution approaches. Trans and epi-illumination geometries. Imaging depth and spatial resolution. Linear spectral unmixing. Photoacoustic Doppler effect.*
11. *CARS microscopy: Spontaneous Raman scattering. Raman spectrum. Beat frequency. Jablonski diagram for CARS process. CARS microscopy configuration. Capabilities and applications.*
12. *Nanoscopy: The diffraction limit in confocal fluorescence microscopy. Absorption, spontaneous emission, stimulated emission. Helical beams. Principles of STED nanoscopy. Principles of PALM/STORM nanoscopy.*

Recommended reading: *1. Simon R. Cherry, Ramsey D. Badawi, Jinyi Qi, "Essentials of In Vivo Biomedical Imaging", CRC Press, 2015. 2. Guy Cox, "Optical Imaging Techniques in Cell Biology" 2nd Edition, CRC Press, 2012.*

Teaching methods: *2h/week Lectures*

Assessment methods: *Written examinations*

Language of instruction: *Greek*

Course Title: *Reading Course*		
Name of Lecturer: *Faculty Member*		
Course Code: *BIOL-443*	***Type of course:*** *Elective*	***Level of course:***
Year of study: *4*	***Semester/trimester:*** *G*	***ECTS:*** *4*
Objectives of the course (preferably expressed in terms of learning outcomes and competences): *The student concentrates in a scientific topic assigned by the instructor and is performing a literature research.*		
Prerequisites: *None*		
Course contents: *A specific scientific topic assigned by the instructor.*		
Recommended reading: *Scientific papers assigned by the instructor.*		
Teaching methods: *Frequent meetings with the instructor discussing the chosen topic of interest.*		
Assessment methods: *Writing of a review paper on the scientific topic assigned.*		

Language of instruction: *Greek*

Course Title: *Special Issues in Cell Biology*		
Name of Lecturer: *G. Chalepakis*		
Course Code*: BIOL-416*	***Type of course:*** *Elective*	***Level of course:***
Year of study: *4*	***Semester/trimester:*** *G*	***ECTS:*** *4*
Objectives of the course (preferably expressed in terms of learning outcomes and competences		
Prerequisites:		
Course contents: Biological membranes. *Plasma membrane microdomains. Lipid Shells, Caveolae and Lipid Caveolae as plasma membrane sensors and organizers. Membrane curvature and homesostasis.* ***Cytoske*** *Ciliogenesis: building the cell's antenna. Cilia defects and ciliopathies.Molecular architecture of centriole asse Septins: the fourth component of the cytoskeleton. Architecture and dynamic remodelling of the septin cytosk during the cell cycle.* ***The secretory pathway.*** *Inheritance and biogenesis of organelles in the secretory pathway. Dynamics and diver autophagy mechanisms. Implication of endosomes and lysosomes in gene transfer. Erythroblast enucleation. Th biology of lysosomal storage disorders. Cellular cholesterol trafficking and transport. Mechanisms of pathogen through the endosomal compartments. Entry of viruses through the epithelial barrier. Exosomes, extracellular ve and their potential roles in regenerative medicine.* ***Mitochondria****: structure, functions and dysfunctions. Endopl reticulum–mitochondria contacts. Mechanisms of mitophagy.* ***Cell nucleus.*** *Breaching the nuclear envelo development and disease. Laminopathies. The nucleoskeleton as a genomeassociated dynamic 'network of netw Biogenesis and transport of nuclear membrane proteins.* ***Mechanobiology.*** *Mechanotransduction at a dis mechanically coupling the extracellular matrix with the nucleus. Architectural control of mechanotransdu* ***Extracellular matrix****, components and functions. Extracellular matrix assembly and remodeling in developme disease. The function of fibroblasts in cancer.* ***Cell junctions.*** *Endothelial cell-cell junctions.* ***Membrane nanotubes – cytonemes:*** *dynamic long-distance connections between animal cells. Cyton membrane tubulovesicular extensions as secretory and adhesive cellular organelles. The example of Hedg* ***Properties of polarized epithelial cells.*** *Organelle positioning and cell polarity. Organization of vesicular traffick epithelia. From cells to organs: building polarized tissue.* ***Cell division.*** *Asymmetric cell division: recent develop and their implications for tumour biology. Divisions of the stem cells of the skin. Modes of programmed cell deat the signals emanating from dying cells.* ***Cell differentiation.*** *Dedifferentiation, transdifferentiation and reprogram three routes to regeneration. How cells change their phenotype.*		
Recommended reading:		
Teaching methods: *2h/week lectures*		
Assessment methods: *Written examinations*		
Language of instruction: *Greek*		

Course Title: *Quarterly Laboratorial Course*		
Name of Lecturer: *Faculty Member*		
Course Code: *BIOL-444*	***Type of course:*** *Elective*	***Level of course:***
Year of study: *4*	***Semester/trimester:*** *G*	***ECTS:*** *4*
Objectives of the course (preferably expressed in terms of learning outcomes and competences): *The student is coming in contact with laboratory research of his/her interest. This is considered as a initial step in research which gives the student the opportunity to choose a laboratory for the undergraduate thesis dissertation.*		
Prerequisites: *None*		
Course contents: *Laboratory techniques.*		
Recommended reading: *Scientific papers provided by the instructor*		

Teaching methods: *Frequent meetings with the instructor and following up the research progress.*
Assessment methods: *Final report on the laboratory techniques and/or mini-project followed by the student.*
Language of instruction: *Greek*

Course Title: *Developmental Plant Biology*		
Name of Lecturer: Kriton Kalantidis		
Course Code: *BIOL-447*	***Type of course:*** *Elective*	***Level of course:*** *Advanced*
Year of study: *4*	***Semester/trimester:*** *G*	***ECTS:*** *4*
Objectives of the course (preferably expressed in terms of learning outcomes and competences): *Plant Model systems, Plant Molecular Biology Methodology, Principles of Plant Development*		
Prerequisites: Botany or General Plant Biology and Molecular Biology		
Course contents: *Plant Model systems, Methodology in Plant Developmental Biology, Embryo development, Shoot apical meristem, Root Development, Shoot Development, Leaf Development, Flower development, miRNAs in Plant developmental Biology*		
Recommended reading: ***Mechanisms in Plant Development*** *Ottoline Leyser, Stephen Day* *ISBN: 978-0-86542-742-6* *Paperback* *256 pages* *May 2002, Wiley-Blackwe*		
Teaching methods: *Lectures and Handouts*		
Assessment methods: *Written Exam*		
Language of instruction: *Greek*		

Course Title: Laboratorial Course - Green Biotechnology		
Name of Lecturer: *K. Kotzabasis, K. Kalantidis, P. Moschou, A. Papadaki, S. Pirintsos, P. Sarris, E. Tsagris, I. Vontas*		
Course Code: *BIOL-445*	***Type of course:*** *Elective*	***Level of course:***
Year of study: *4*	***Semester/trimester:***	***ECTS:*** *4*
Objectives of the course (preferably expressed in terms of learning outcomes and competences		
Prerequisites: *None*		
Course contents:		
1. In vitro cultivation of plant cells and explants I - Micropropagation. [A. Papadaki] *2. In vitro cultivation of plant cells and explants II - Isolation and cultivation of protoplasts. [P. Moschou, A. Papadaki]* *3. Methods of genetic modification of plants. [K. Kalantidis]* *4. Induction methods of RNA silencing in plants. [K. Kalantidis]* *5. Techniques of molecular virology. [E. Tsagri]* *6. Modern approaches for determining pest sensitivity/resistance to pesticides in plant protection. [J. Vontas]* *7. Introduction to the immune system of plants [P. Sarris]*		

8. Microalgal Biotechnology — Bioenergetic mechanisms of microalgae to produce high yield of hydrogen (H_2). [K. Kotzabasis] 9. Environmental Biotechnology — Combination of biodegradation of toxic OMW (Olive oil Mill Wastewater) phenolic compounds and high yield production of bio-hydrogen. [K. Kotzabasis] 10. Astrobiology — Extremophilic behavior of lichens with astrobiotechnological applications. [K. Kotzabasis, S. Pirintsos] 11. Pharmacognosy - Isolation and identification of pharmaceutically active substances from plants. [S. Pirintsos] 12. Pharmacognosy — Modern methods of solving research questions. [S. Pirintsos]
Teaching methods: *3h/week lab*
Assessment methods:
Language of instruction: *Greek*

Course Title: *Neurobiology*		
Name of Lecturer: *Kyriaki Sidiropoulou*		
Course Code: *BIOL-492*	***Type of course:*** *Elective*	***Level of course:***
Year of study: *4*	***Semester/trimester:*** *H*	***ECTS:*** *4*
Objectives of the course (preferably expressed in terms of learning outcomes and competences): *To learn the fundamentals of nerve cell and brain function*		
Prerequisites: *Animal Physiology*		
Course contents: *Brain anatomy and organization. Electrical properties of neurons. Ion channels. Firing patters and information coding in neurons. Neurotranmitter systems. Synaptic transmission, synaptic plasticity, learning and memory. Sensory information processing in higher brain areas, perception. Motor system. Neurological disorders, schizophrenia, depression, addiction.*		
Recommended reading: *ER Kandel, JH Schwartz, TM Jessel. Essentials of Neural Science and Behaviour.*		
Teaching methods: *Lectures*		
Assessment methods: *End-of-term paper and oral presentation of selected topic.*		
Language of instruction: *Greek*		

4TH YEAR SPRING SEMESTER

ELECTIVE COURSES

- ***BIOMOLECULAR SCIENCES AND BIOTECHNOLOGY***

Course Title: When Biochemistry meets Epigenetics		
Name of Lecturer: *Charalampos G. Spilianakis*		
Course Code*: BIOL-414*	***Type of course:*** *Elective*	***Level of course:***
Year of study: *4*	***Semester/trimester:***	***ECTS:*** *4*
Objectives of the course (preferably expressed in terms of learning outcomes and competences *The biochemical basis of the epigenetic mode of inheritance. The aim is to familiarize the student with the protein complexes and the biochemical approaches that define epigenetic inheritance in various model systems. The*		

epigenetic basis of disease.
Prerequisites: *None*
Course contents: • ***An introduction to Epigenetics*** • ***Biochemical mechanisms of Epigenetics*** *DNA methylation, recognition of methylated CpG, demethylation in mammals, histone modifications, non-coding RNAs, microRNAs, the effect of chromosome organization, mechanisms of polycomb proteins* • ***Biochemical approaches to study Epigenetics*** *Analysis of tissue-specific DNA methylation, methods for assessing genome-wide DNA methylation, methylation of Lysine-9 of Histone H3: role in heterochromatin modulation and tumorigenesis, chromatin modifications distinguish genomic features and physical organization of the nucleus, assessing epigenetic information* • ***Model Organisms of Epigenetics*** *Eukaryotic microbes, Drosophila, mouse models of epigenetic inheritance, epigenetic regulatory mechanisms in plants* • ***Metabolism and Epigenetics*** • ***Functions of Epigenetics*** *Stem Cells and cellular differentiation, Epigenetic basis of skeletal muscle regeneration, X Chromosome Inactivation, genomic imprinting, Epigenetics of memory processes, transgenerational Epigenetics, aging Epigenetics* • ***Evolutionary Epigenetics*** *Epigenetics in adaptive evolution and development* • ***Epigenetic Epidemiology*** *The Effects of diet on Epigenetic processes, environmental agents and Epigenetics, impact of microbial infections on the human Epigenome and carcinogenesis, population pharmacoepigenomics* • ***Epigenetics and Human Disease*** *Cancer Epigenetics, the role of Epigenetics in Immune disorders, Epigenetics of brain disorders, complex metabolic syndromes and Epigenetics, clinical applications of Histone Deacetylase Inhibitors*
Recommended reading: • *Handbook of Epigenetics, Tollefsbol, Elsevier, 2011* • *Epigenetics, D.Allis-T.Jenuwein-D.Reinberg, CSHL press, 2007* • *Epigenetics in Biology and Medicine, M.Esteller, Garland Science, 2008* • *Transcriptional regulation in Eukaryotes concepts, strategies and techniques, M.Carey-S.Smale, CSHL press, 2000*
Teaching methods: *3h/week lectures*
Assessment methods: *Written examinations*
Language of instruction: *Greek*

Course Title: *Molecular Oncogenesis*		
Name of Lecturer: *Joseph Papamatheakis*		
Course Code: *BIOL-456*	***Type of course:*** *Elective*	***Level of course:***

***Year of study**: 4*	***Semester/trimester:** H*	***ECTS:** 4*
***Objectives of the course (preferably expressed in terms of learning outcomes and competences):** Basic cell and molecular aspects and detailed study of seleted topics*		
***Prerequisites:** Genetics I and II, Cell Biol., Mol. Biol. , Devel. Biol.*		
Course contents: Oncogenic DNA and RNA viruses. Oncogenes and tumor suppressor genes (structure, expression molecular signaling mechanisms and biological effects). Regulation and dysgerulation of the cell cycle, cell differentiation and apoptosis. Immune mechanisms, stem cell origins, mutations, Genome instability, metastasis, angiogenesis, molecular approaches to diagnosis and treatment.		
***Recommended reading:** Genes VIII , articles , reviews*		
***Teaching methods:** Classes*		
***Assessment methods**: multiple choice questions and analysis of papers and oral presentations*		
***Language of instruction:** Greek*		

***Course Title:** Plant Molecular Virology*		
***Name of Lecturer:** Efthimia Tsagri*		
***Course Code:** BIOL-460*	***Type of course:** Elective*	***Level of course:***
***Year of study:** 4*	***Semester/trimester:** H*	***ECTS:** 4*
***Objectives of the course (preferably expressed in terms of learning outcomes and competences):** to understand structure, replication, movement and spread of plant viruses, and methods to reduce their impact in crops*		
***Prerequisites:** Microbiology*		
***Course contents:** Isolation, taxonomy and structure of plant viruses, Families and groups of plant RNA and DNA viruses and viroids (genome structure and expression, replication and movement, pathogenicity and resistance, biotechnological applications)*		
***Recommended reading:** Matthews Plant Virology (Ed. R. Hull), Fundamentals in Plant Virology (R.E.F. Matthews) and selected publications*		
***Teaching methods:** Lectures and reading course*		
***Assessment methods:** Written examination and or/ presentation of specific studies*		
***Language of instruction:** Greek*		

***Course Title:** Special Topics in Immunology*		
***Name of Lecturer:** Irene Athanassakis*		
***Course Code:** BIOL-462*	***Type of course:** Elective*	***Level of course:***
***Year of study:** 4*	***Semester/trimester:** H*	***ECTS:** 4*
***Objectives of the course (preferably expressed in terms of learning outcomes and competences):** The course concentrates in three major Immunology topics through scientific paper presentation by the students themselves. The students come in direct contact with the most recent knowledge in all three topics and are able to express their own thought in regard to specific scientific questions.*		
***Prerequisites:** Immunobiology*		

Course contents: *Topic 1: Major histocompatibility proteins: biosynthesis and role in the immune response, Topic 2: T cell receptor: signalling to T cell activation, Topic 3: Autoimmunity: mechanisms of autoimmunity induction and therapeutic approaches*
Recommended reading: *Twenty to 25 scientific review papers/topic*
Teaching methods: *Each topic starts with a lecture by the instructor defining the content of the session. The students are having 15 min presentations of specific papers giving the latest knowledge of the topic.*
Assessment methods: *Oral and written assessment. Each student gets a mark for the oral presentation in each topic. Upon completion of each topic, the students take a written examination. The final mark is given by the mean of three oral and three written examinations.*
Language of instruction: *Greek*

Course Title: *Developmental Biology of Drosophila*		
Name of Lecturer: *Christos Delidakis*		
Course Code: *BIOL-468*	***Type of course:*** *Elective*	***Level of course:***
Year of study: *4*	***Semester/trimester:*** *H*	***ECTS:*** *4*
Objectives of the course (preferably expressed in terms of learning outcomes and competences *Introduction to the field of Drosophila developmental biology. Emphasis on accessing and utilizing original scientific literature.*		
Prerequisites: *Genetics I, Genetics II, Cell Biology, Molecular Biology*		
Course contents: *Tools for Drosophila developmental biology and genetics. Molecular characterization of pathways that define the two major axes of the embryo (anterior – posterior) and dorsal – rentral). Oogenesis and localization of determinants. Embryogenesis and elaboration of pattern.*		
Recommended reading: *Original literature (reviews, papers), Peter Lawrence: The Making of a Fly*		
Teaching methods: *Lecture 2h/week*		
Assessment methods: *Written Examination and homeworks*		
Language of instruction: *Greek*		

- ***ENVIRONMENTAL BIOLOGY AND MANAGEMENT OF BIOLOGICAL RESOURCES***

Course Title: *Management of Marine Biological Resources*		
Name of Lecturer: *Koumoundouros Giorgos*		
Course Code: *BIOL-453*	***Type of course:*** *Elective*	***Level of course:***
Year of study: *4*	***Semester/trimester:*** *H*	***ECTS:*** *4*
Objectives of the course (preferably expressed in terms of learning outcomes and competences		
Prerequisites: *None*		
Course contents: *Fisheries resources, distribution, productivity, migration. The concept of fish stock. Methods for the study of fecundity, growth, age, survival/mortality. Modern methods for the analysis of biological resources. Legal aspects concerning the exploitation of marine resources.*		

Recommended reading: *Fisheries Biology, Assessment and Management (M. King), list of recent research papers and reviews*
Teaching methods: *Lectures*
Assessment methods: *Written Examination and paper presentation and Analysis*
Language of instruction: *Greek*

Course Title: *Topics in Physical Geography & Geomorphology*		
Name of Lecturer: *Charalampos Fasoulas*		
Course Code: *BIOL-407*	***Type of course:*** *Elective*	***Level of course:***
Year of study: *4*	***Semester/trimester:*** *G*	***ECTS:*** *4*
Objectives of the course (preferably expressed in terms of learning outcomes and competences): *Introduction to earth processes like volcanism, plate tectonics, weathering etc. and their contribution to the development of landscape and certain landforms. Analysis of individual landforms and relief changes through time. Study and practices on geological, geomorphological and paleogeographic maps.*		
Prerequisites: -		
Course contents: *Introduction to earth processes like volcanism, plate tectonics, weathering etc. and their contribution to the development of landscape and certain landforms. Analysis of individual landforms and relief changes through time. Study and practices on geological, geomorphological and paleogeographic maps.*		
Recommended reading: ***Doutsos Th.:*** *Geology: Principles and Implementation. Leader Books. (in Greek)* ***Skinner, Porter, Park:*** *Dynamic Earth: Introduction to Physical Geology., J. Willey and Sons.*		
Teaching methods: *Lectures, multimedia presentations.*		
Assessment methods: *Written tests*		
Language of instruction: *Greek*		

Course Title: *Marine Biotechnology*		
Name of Lecturer: *Maroudio Kentouri*		
Course Code: *BIOL-455*	***Type of course:*** *Elective*	***Level of course:***
Year of study: *4*	***Semester/trimester:*** *H*	***ECTS:*** *4*
Objectives of the course (preferably expressed in terms of learning outcomes and competences *Introductory university-level course dealing with the biotechnological applications of marine organisms*		
Prerequisites: *None*		
Course contents: *Introduction to marine biotechnology. Marine Genomics. Comparative functional Genomics of Marine Organisms. Marine enzyme biotechnology. Microbial Diversity and ecosystems: The case of the Eastern Mediterranean Sea. Transgenic organisms. Probiotics. Phage Biotechnology. Vaccines. Medicine from the seas.*		
Recommended reading: *Relative scientific publications*		
Teaching methods: *Lectures*		
Assessment methods: *Written examination or project (written report and oral presentation)*		
Language of instruction: *Greek*		

Course Title: Laboratory Course Fauna of Greece		
Name of Lecturer: **Poulakakis Nikos**		
Course Code: *BIOL-461*	**Type of course:** *Elective*	**Level of course:** *Advanced*
Year of study: *4*	**Semester/trimester:** *H*	**Number of ECTS:** *4*
Objectives of the course (preferably expressed in terms of learning outcomes and competences		

Prerequisites:

Typically none, but good knowledge of the following is highly recommended:

- *Zoology/Biodiversity (important)*
- *Biogeography (semi important, student should understand the causes of distributions, the concepts of barriers/corridors and the mechanisms of dispersal of animal species, the concepts of endemism, cosmopolitanism and insularity)*
- *Ecology (less important – student should be familiar with the concepts of ecosystems, habitats and basic ecological processes)*
- *Evolutionary Biology (less important – student should be familiar with the concepts of speciation/subspeciation/diversification, selection, adaptive radiation)*

Course contents: *This course aims to provide you with the basic knowledge related to the genuine composition of the fauna of Greece, its extraordinary diversity and peculiarities, as well as the processes and mechanisms that shape and define it today and in the past. A large spectrum of Greek animal species, both Vertebrates and Invertebrates, in continental and insular Greek regions is treated for that reason. We also aim to develop the practical skills to carry out samplings on various animal taxa, to mount (or keep otherwise) animal samples and tissues and to construct and use databases of these specimens. In this course you will listen to topics on the contemporary geomorphology of the Greek landscapes, the causes from the past that led to this specific morphology, the climatic mainframe that interferes with the Greek landscapes, elements on paleogeography, paleoclimatology and paleoecology of Greece, hot spots of endemism and management of rare or threatened Greek animal species, as well as a "group per group" comprehensive analysis of the extant faunal elements of continental and insular Greece. Topics like: the exploitation of the Greek fauna, animals as indicators of environmental quality in Greece, the cultural value of the Greek fauna, etc., are also covered.*

At the end of the course, the student should be able to know the distribution and composition of the main animal groups in Greece and to understand the mechanisms and processes that have shaped the Greek landscape and the faunal composition in the dominant ecosystems. Also, the student should develop a critical view of the observed distribution patterns, to understand the processes of morphological and ecological adaptations of the animals, the spatial and temporal dimensions of the Greek biodiversity, and finally to formulate valid scientific questions and assumes.

Topics covered

- *The geomorphological context of Greece today*
- *The climate and ecological framework today*
- *Paleogeography, paleoclima and paleoecology of Greece*

- *The most important animal groups in Greece*
- *Mollusks*
- *Arthropods (Spiders, Crustaceans, Myriapods)*
- *Arthropods (Insects - Part I)*
- *Arthropods (Insects - Part B)*
- *Other Invertebrates*
- *Amphibia*
- *Reptiles*
- *Birds*
- *Mammals*
- *Animal species hot spots in Greece*
- *Management of Endangered Species*

Recommended reading:

- *Alexiou S. and S. Sfenthourakis, 2013. The terrestrial isopods (Isopoda: Oniscidae) of Greece. Parnassiana Archives 1: 3-50.*
- *Anastasiou I., Papadopoulou A., and Trichas A. 2018. Tenebrionid Beetles of the Aegean Archipelago: Historical Review, Current Knowledge and Future Directions. In: Sfenthourakis et al. (Eds), Biogeography of the Aegean. In honor of Prof. Moysis Mylonas. Broken Hill Publishers Ltd, Nicosia, Cyprus, pp: 151-167.*
- *Fet V., Parmakelis A., Stathi I., Tropea G., Kotsakiozi P., Kardaki L. and Nikolakakis M., 2018. Fauna and Zoogeography of Scorpions in Greece. In: Sfenthourakis et al. (Eds), Biogeography of the Aegean. In honor of Prof. Moysis Mylonas. Broken Hill Publishers Ltd, Nicosia, Cyprus, pp: 123-134.*
- *Lymberakis, P. & N. Poulakakis. 2010. Three Continents claiming an Archipelago: The evolution of Aegean's Herpetological Diversity. Diversity 2:233-255.*
- *Poulakakis N., Kapli, K., Lymberakis P., Trichas A., Vardinoyiannis, K., Sfenthourakis, S., & Mylonas M. 2015. A review of phylogeographic analyses of animal taxa from the Aegean and surrounding regions. J Zoolog Syst Evol Res 53(1), 18—32.*
- *Ruth J., M. Grudinski, S. Klaus, B. Streit, M. Pfenninger, 2011. Evolution of freshwater crab diversity in the Aegean region (Crustacea: Brachyura: Potamidae). Molecular Phylogenetics and Evolution 59 (1): 23–33.*
- *Sfenthourakis, S., Pafilis, P., Parmakelis, A., Poulakakis, N., Triantis, K. A. 2018. Biogeography of the Aegean. In honor of Prof. Moysis Mylonas. Broken Hill Publishers Ltd, Nicosia, Cyprus, 300 p.*
- *Vardinoyannis, K., Parmakelis, A., Triantis, K.A., Giokas, S., 2018. Land Mollusks in Greece: The Rich, Unique, Diverse, and Unprotected Animal Models. In: Sfenthourakis et al. (Eds), Biogeography of the Aegean. In honor of Prof. Moysis Mylonas. Broken Hill Publishers Ltd, Nicosia, Cyprus, pp: 45-66.*

Teaching methods: *Three 45-minute lectures per week*

Assessment methods: *Written examination (85%) and homework assignments (15%)*

Language of instruction: *Greek*

Course Title: *Evolutionary Ecology*

Name of Lecturer: *Nikolaos Poulakakis*		
Course Code: *BIOL-471*	***Type of course:*** *Elective*	***Level of course:***
Year of study: *4*	***Semester/trimester:*** *H*	***ECTS:*** *4*
Objectives of the course (preferably expressed in terms of learning outcomes and competences*): The course is designed as an introduction to Molecular Ecology, a relatively new discipline that studies the relationships between natural history, genetics, and evolution.*		
Prerequisites: *There are no prerequisites*		
Course contents: *The subject area currently encompass a wide range of research topics including population and evolutionary genetics, phylogenetics, phylogoegraphy, comparative phylogeography, conservation biology, the identification and assessment of species diversity, and the release of genetically modified organisms into the environment. Topics will include a survey of methods for studying genetic variation at the protein and DNA levels and the application of molecular genetic markers to research questions related to natural selection, gene flow, genetic drift, and non-random mating.*		
Recommended reading: *Pianka, R.E. (2006) Evolutionary Ecology* *Provided: Lectures in Powerpoint and texts from the internet.*		
Teaching methods: *Three 45-minute lectures per week.*		
Assessment methods: *Written examination (85%) and homework assignments (15%)*		
Language of instruction:Greek		

➢ ***COMMON COURSES***

Course Title: *Molecular Evolution*		
Name of Lecturer: *Manolis Ladoukakis*		
Course Code: *BIOL-446*	***Type of course:*** *Elective*	***Level of course:***
Year of study: *4*	***Semester/trimester:*** *G*	***ECTS:*** *4*
Objectives of the course (preferably expressed in terms of learning outcomes and competences): *To understand the basic mechanisms which shape evolution of molecules*		
Prerequisites: *basic molecular genetics and evolution*		
Course contents: *Dynamics of mutations. Advantageous, deleterious and neutral mutations. Estimating the number of nucleotide substitutions between sequences. Rates and patterns of nucleotide substitutions. Increase of genetic information in genomes. Evolution by gene duplication and domain shuffling. Evolution by transposition and horizontal gene transfer. Concerted evolution of multigene families. Evolution of coding and non-coding genomic sequences. DNA polymorphism in populations. Molecular clocks. Molecular phylogenetics.*		
Recommended reading: *Graur and Li "fundamentals of molecular evolution"*		
Teaching methods: *a two-hour lecture weekly*		
Assessment methods: *final exams*		
Language of instruction: *Greek*		

Course Title: Photobiology		
Name of Lecturer: Kiriakos Kotzabasis		
Course Code: ΒΙΟΛ-463	**Type of course:** Elective	**Level of course:**
Year of study: 4	**Semester/trimester:** H	**ECTS:** 4
Objectives of the course (preferably expressed in terms of learning outcomes and competences): *Specific knowledge focused on the light perception, photoreceptors, light signal transduction chains and photoregulated responses in plants.*		
Prerequisites: *There are no prerequisites*		
Course contents: *Photons and photoregulated responses. Light perception and photoreceptors. Action spectra and characterization of the primary photoreceptors. Types of photoregulated responses (photoinduced- and HIR-responses). Photoreceptors (phytochromes and cryptochromes). Gene expression and regulation of phytochromes. Functional models of PHYA and PHYB. Molecular structure and function of cryptochromes (CRY1, CRY2/PHH1 & NPH1). Light induced signal transduction chains. Photoreceptors interactions. Photoregulated metabolic pathways. Photomorphogenesis (germination, de-etiolation, shade avoidance, "end of day" response, flowering). Phototropism. The physiology and molecular bases of the plant circadian clock. Synthetic photoreceptors. Biotechnological applications.*		
Recommended reading: *Plant Physiology – From the Molecule to the Environment (in greek), K.A. Roubelakis-Angelakis (Ed.), Crete University Press, Heraklion. 1st Edition October 2003. Chapter #13- PHOTOBIOLOGY (K. Kotzabasis).*		
Teaching methods: *2 hours lecture per week*		
Assessment methods: *written examination (70%), project report and presentation (30%)*		
Language of instruction: *Greek*		

Course Title: *Computational methods in Evolution*		
Name of Lecturer:	*Poulakakis Nikos, Ladoukakis Emmanouil, Pavlidis Pavlos (FORTH), Antoniou Aglaia (HCMR)*	
Course Code*: BIOL-450*	***Type of course:*** *Elective*	***Level of course:*** *Advanced*
Year of study: *4*	***Semester/trimester:*** *H*	***Number of ECTS:*** *4*
Objectives of the course (preferably expressed in terms of learning outcomes and competences		
Prerequisites: • *Evolution (important)* • *Basic bioinformatics (semi important - student should understand the concept of a biological sequence, know what an alignment is and how to construct it, and how to search sequence databases)* • *Basic mathematics (less important, but student should not be afraid of math - the course has been designed to be accessible also for biology students)* • *Knowledge of UNIX is not required but will be helpful (exercise manuals will introduce the subject gradually, and we will provide links to self-help resources)*		
Course contents: *With this course we aim to provide you with the theoretical knowledge and practical skills to carry out molecular evolutionary analyses on sequence data. In this course you will learn how and why DNA and protein sequences evolve between and within species. Also, we will focus on analyzing within species sequences (e.g. human genome datasets) and infer the history of the species as well as understand how and where natural selection operates. On one hand, the course is focused on the computational methods for inferring phylogenetic trees from sequence data, giving an introduction to the fundamental theory and algorithms. This course will entail data retrieval and assembly, alignment techniques, phylogeny reconstruction, hypothesis testing, and population genetic approaches. On the other hand, the course is dealing with the properties of a sample of sequences and polymorphisms from a single species, thus introducing the concept of coalescent trees.*		

Although the study of molecular phylogenetics and evolution do require a certain level of mathematical understanding, this course has been designed to be accessible also for students with limited computational background (e.g., students of biology). ***Topics covered*** • *Introduction to evolutionary theory and population genetics.* • *Interpretation of molecular phylogenetic trees* • *Dataset assembly and sequence alignment* • *Models of substitution and advanced models of nucleotide substitution (gamma-distributed mutation rates, codon models and analysis of selective pressure).* • *Reconstruction of phylogenetic trees using parsimony, distance based methods, maximum likelihood, and Bayesian techniques.* • *Statistical analysis of biological hypotheses (likelihood ratio tests, Akaike Information Criterion, Bayesian statistics).* • *Hypothesis testing in phylogenetics* • *Estimating divergence times* • *Coalescent model and inference from population data* • *Inference of demographic history using the coalescent* • *Detecting natural selection from polymorphic data* • *Detecting selection from polymorphic data and divergence*
Recommended reading: • *Inferring Phylogenies by Joseph Felsenstein, Sinauer Associates, Inc* • *Phylogenetic Trees Made Easy. by Hall Barry, Sunderland, MA: Sinauer* • *Gene Genealogies, Variation and Evolution: A primer in coalescent theory, by Jotun Hein, Mikkel Schierup, and Carsten Wiuf; Oxford University Press*
Teaching methods: *Three 45-minute lectures per week*
Assessment methods: *Written examination (85%) and homework assignments (15%)*
Language of instruction: *Greek*

Course Title: *Applications of Current Microscopy Techniques*		
Name of Lecturer: *George Zachos*		
Course Code: *BIOL-493*	***Type of course:*** *Elective*	***Level of course:***
Year of study: *4*	***Semester/trimester:*** *H*	***ECTS:*** *4*
Objectives of the course (preferably expressed in terms of learning outcomes and competences): *To understand the optical principles involved in light microscopy, the basic components of modern microscopes and imaging systems and their applications in answering questions of cell biology.*		
Prerequisites: N/A		
Course contents: *Fundamentals of light microscopy; lenses and optics; resolution and image formation; dark-field, polarisation, phase contrast and Differential Interference Contrast microscopy; fluorescence microscopy; confocal laser scanning, 2-photon and video microscopy; Fluorescence resonance energy transfer, Fluorescence lifetime imaging, Fluorescence recovery after photobleaching, Photoactivation, Total internal reflection fluorescence*		
Recommended reading: Fundamentals of light microscopy and electronic imaging, Douglas Murphy, Wiley-Liss (ed), 2001.		
Teaching methods: lectures		

Assessment methods: written examination
Language of instruction: Greek

Course Title: *Reading Course*		
Name of Lecturer: *Faculty Member*		
Course Code: *BIOL-443*	***Type of course:*** *Elective*	***Level of course:***
Year of study: *4*	***Semester/trimester:*** *G*	***ECTS:*** *4*
Objectives of the course (preferably expressed in terms of learning outcomes and competences): *The student concentrates in a scientific topic assigned by the instructor and is performing a literature research.*		
Prerequisites: *None*		
Course contents: *A specific scientific topic assigned by the instructor.*		
Recommended reading: *Scientific papers assigned by the instructor.*		
Teaching methods: *Frequent meetings with the instructor discussing the chosen topic of interest.*		
Assessment methods: *Writing of a review paper on the scientific topic assigned.*		
Language of instruction: *Greek*		

Course Title: *Quarterly Laboratorial Course*		
Name of Lecturer: *Faculty Member*		
Course Code: *BIOL-444*	***Type of course:*** *Elective*	***Level of course:***
Year of study: *4*	***Semester/trimester:*** *G*	***ECTS:*** *4*
Objectives of the course (preferably expressed in terms of learning outcomes and competences): *The student is coming in contact with laboratory research of his/her interest. This is considered as a initial step in research which gives the student the opportunity to choose a laboratory for the undergraduate thesis dissertation.*		
Prerequisites: *None*		
Course contents: *Laboratory techniques.*		
Recommended reading: *Scientific papers provided by the instructor*		
Teaching methods: *Frequent meetings with the instructor and following up the research progress.*		
Assessment methods: *Final report on the laboratory techniques and/or mini-project followed by the student.*		
Language of instruction: *Greek*		

Course Title: Genomes		
Name of Lecturer: Charalampos Spilianakis		
Course Code: BIOL-473	**Type of course:** Elective	**Level of course:** 8th
Year of study: 4	**Semester/trimester:** Spring (even calendar years)	**Number of credits:** 4 ECTS
Objectives of the course Description Introduces fundamentals concepts in genome architecture and genomics including research approaches to uncover genetic variation and the relationship between genotype and phenotype. Prerequisite: BIOL207 – MOLECULAR BIOLOGY.		

Contents

- Mapping Genomes
- Sequencing Genomes
- Genome annotation
- Identifying gene functions
- Eukaryotic nuclear genomes
- Genomes of prokaryotes and eukaryotic organelles
- Viral genomes and mobile genetic elements
- Accessing the genome
- The role of DNA-binding proteins in genome expression
- Transcriptomes
- Proteomes
- Genome expression in the context of cell and organism
- How genomes evolve

Learning Outcomes

- Knowledge and Understanding: All components of the course provide this to some degree but your lectures, in particular, offer an important framework upon which you can build attributes. This University considers itself to be a research-led institution and you will be exposed to cutting edge information and ideas as you progress through the course. In this course you will develop a comprehensive knowledge of genome structure, function and evolution, of tools to analyze genomic data and of methods for genetic manipulation.
- Research and Enquiry: These skills are enhanced by encouraging further reading of books, research papers and electronic materials, to embellish your lecture and practical material.
- Personal and Intellectual Autonomy: By reading and preparing materials for sessions, you will learn to synthesize your own views, develop reasoned arguments and refine scientific judgement. Such skills enhance your capacity for life-long and independent learning.
- Communication: This is a key attribute of all scientists and it is therefore important that you develop skills to interact constructively with others and convey knowledgeable and balanced scientific views.
- Personal Effectiveness: The ability to organize and summaries your thoughts and material in a flexible and accessible way are core features that are required for personal effectiveness. Planning, time management and reflection are central to this. Of course, these features also interlink with your personal and intellectual autonomy. By providing you with a timetable where key submission dates are highlighted, we are encouraging you to develop your effectiveness throughout the course. These same skills extend to other courses and also to your overall ability to maximize your achievement whilst at the University.

Prerequisites: None

Recommended reading: T.A.Brown, GENOMES 4, Garland Science – Taylor and Francis Group, 2018

Teaching methods: 3h/week lectures

Assessment methods: 6 online quizzes/tests (30% of final evaluation mark) and a final assessment (70% of final evaluation mark).

Language of instruction: Greek/English (offered to ERASMUS students)

Course Title: Research and Communication Skills in Biology		
Name of Lecturer: Charalampos G. Spilianakis		
Course Code: BIOL-474	**Type of course:** Elective	**Level of course:** 8th
Year of study: 4	**Semester/trimester:** Spring	**Number of credits:** 4 ECTS

Objectives of the course (preferably expressed in terms of learning outcomes and competences

Aims

This module aims to provide training in core research and communication skills.

Learning Outcome

By the end of the module, a student will be able to demonstrate: (i) the ability to communicate science effectively, in both writing and orally, to peers and the general public; (ii) a knowledge of the principles that underpin the scientific method; (iii) a knowledge of the environment in which scientists fund and execute their research; (iv) identify and work towards targets for career development; and (v) develop skills necessary for self-managed and lifelong learning.

Student Contact Time: The majority of teaching will be in the form of lectures, each of which will focus on specific aspects of the module, demonstrating the necessary skills and then requiring students to use the new skills. The workshops will be both of a practical and theoretical nature. The tutorials will provide guidance for the tasks allocated during the workshops and expand on certain aspects of the module that are more amenable to smaller-group study. The lectures will provide an introduction to the themes that are developed in the workshops. Workshops will include those on scientific writing, presenting research to the media, and career development.

Prerequisites: None

Course contents:
This module provides training in the skills necessary to pursue a research career in Biology. The skills covered include: communication (both written and oral); advanced science writing (e.g. journal publications and grant applications). The module is divided into three main components, each consisting of workshops and training sessions: Research Funding and Communication, Science and the media, Effective marketing of your research skills.

- Write your CV.
- Communication (oral/written).
- Accomplish your goal in an interview.
- Keeping notes in the lab. Archiving, monitoring, storage of primary research data.
- How to write your Diploma Thesis.
- How to present primary research data to the general public.
- Seeking for fellowships - how to write your application – Ask for recommendation letters.
- Research Ethics – Plagiarism.

Recommended reading:

- Garr Reynolds, Presentation Zen, 2011 New Riders.
- Garr Reynolds, Presentation Zen Design, 2010 New Riders.
- Garr Reynolds, The Naked Presenter, 2011 New Riders.
- JT Drew, SA Meyer, Color Management, 2005 Rotovision.
- Scott Berkun, Confessions of a Public Speaker, 2010 O'Reilly.
- Simon Howard, Creating a successful CV, 2009 Safari Books Online.
- Ken Pendler, Digital Colour in graphic design, 1998 Focal Press.
- Otto Yang, Guide to effective grant writing, 2005 Springer.
- Paul McGee, How to write a CV that works, 2006 HowtoBooks.
- Noah Lukeman, How to write a great query letter, 2007 AmazonShorts.
- Laura Bonetta, "Writing a Letter of Recommendation": Electronic addendum published 2009, Making the Right Moves: A Practical Guide to Scientific Management for Postdocs and New Faculty, second edition, 2006 by the Howard Hughes Medical Institute and Burroughs Wellcome Fund.
- William Russey, Hans Ebel, Claus Bliefert, How to write a syccessful science thesis, 2006 Wiley-VCH.
- Patrick Forsyth, How to write reports and proposals, 2010 The Sunday Times.
- Nicholas Oulton, Killer Presentations, 2009 HowToBooks.
- Nancy Duarte, Slideology, 2008 O'Reilly Media.
- Carmine Gallo, The presentation secrets of Steve Jobs, 2010 McGraw Hill.

Teaching methods: 2h/week lectures

Assessment methods: Students will be required to produce reports and complete exercises to demonstrate that they have mastered the necessary skills to a sufficient extent.

- Essays on the focus of each lecture (1. Writing your CV, 2. Writing a message to a Professor/Committee, 3. Description of a Diploma Thesis structure, 4. Presentation of personal research/project in 3 minutes, 5. Writing a fellowship application, 6. Writing a fellowship application with a research project, 7. Evaluation of the Q&A sessions of primary research publications. (90%)
- Class participation (mandatory) (10%)

Language of instruction: Greek, English (for ERASMUS+ students)

Course Title: *Special Topics in Biotechnology and Planta Imaging*		
Name of Lecturer: Panagiotis Moschou		
Course Code: *BIOL-491*	***Type of course:*** *Elective*	***Level of course:*** *Advanced*
Year of study: *4*	***Semester/trimester:*** *H*	***ECTS:*** *4*

Objectives of the course (preferably expressed in terms of learning outcomes and competences):   *Special Topics in Biotechnology and Planta Imaging aims at delving into cellular mechanisms and their methodological exploration. Hence, we will discuss or suggest biological applications based on molecular biology and physiology. We will also emphasize in more classical biotechnological applications.*   *The course aims also to develop the critical thinking of students and introduce them to a series of experimental setups for being able to experimentally approach in a more coherent and mutlidisciplinary way topics relevant to biotechnology.*   *Upon succesful completion of the course, students will be able to :*   *Acquire state of the art knowledge in advanced technologies for identification of cellular mechanisms that can be used to produce new products*   *Acquire knowledge for the advances that plant cells offer for the developemnt of added value products*   *Acquire knowledge that may allow them to develop or even establish settings in industry*
Prerequisites:
*Prior knowledge in cell biology and plant physiology **is desirable***
Recommended reading: *Agnès Ricroch, Surinder Chopra, Shelby J. Fleischer. 2014. Plant Biotechnology: Experience and Future Prospects. SPRINGER, ISBN 978-331-906-891-6*   ***-relevant journals***   *Science, Nature, Nature Biotechnology, Nature Plants, PNAS, Plant Cell, New Phytologist, Plant Journal, Plant Physiology, Journal of Experimental Botany, Journal of Biotechnology κ.ά.*   ***-relevant websites***   *https://www.facebook.com/Teaching-Tools-in-Plant-Biology-175851565771129/*   *http://www.plantcell.org/content/teaching-tools-plant-biology*
Teaching methods: *Lectures 3h/week*
Assessment methods: *Final written exam and/or presentation on a selected topic.*
Language of instruction: *Greek/English*

Course Title: Introduction to Programming		
Name of Lecturer: Alexandros Kanterakis (Pdoc)		
Course Code: BIOL-494	**Type of course:** Elective	**Level of course:**
Year of study: 4	**Semester/trimester:** H	**ECTS:** 4
Objectives of the course (preferably expressed in terms of learning outcomes and competences): Introducing students to the basic theoretical aspects of programming and the structure of simple Algorithms. Principal elements of Programming in Python with focus on biological applications.		
Prerequisites: Basic knowledge of molecular biology		
Course contents: Introduction to Programming Theory: Structure of Algorithms, Flow diagrams and pseudo-code. Introduction to Python: Types of variables, input-output, conditional structures, loop-processes, subroutines, randomization techniques. Bioinformatics data analysis in large biological data.		
Recommended reading: Biological Data Exploration - Martin Jones. Course presentations.		
Teaching methods: Lectures. Hands-on applications in classroom		
Assessment methods: Simple programming exercises. Semester Projects . Final written examination		
Language of instruction: Greek (English if necessary)		

Course Title: Micro/nano-technologιες in biology and molecular diagnostics

Name of Lecturer: *Electra Gizeli*		
Course Code: *BIOL-495*	***Type of course:*** *Elective*	***Level of course:*** *Advanced*
Year of study: *4*	***Semester/trimester:*** *H*	***ECTS:*** *4*
Objectives of the course (preferably expressed in terms of learning outcomes and competences):		
Prerequisites: *Good knowledge of Organic Chemistry and Biochemistry I is necessary.*		
The course is designed for students interested to become familiar with contemporary technologies and their application to biology and medical diagnostics. Briefly, the course will include in the first part, a description of the principle of operation of biosensors followed by their application to (i) the study of biomolecular interactions and (ii) molecular diagnostics for DNA, protein and bacteria detection. The second part will deal with the description of other platforms such as microarrays and "lab-on- chip" systems for the development of integrated point-of-care diagnostics. Finally, the application of nanoparticles to clinical analysis will be presented. A short introduction into practical considerations will be provided during a visit into Biosensors' Laboratory. For the successful attendance of the course, good knowledge of Biochemistry I and structural biology is required.		
Recommended reading: *Biomolecular Sensors, editors: E. Gizeli & C.R. Lowe, Taylor and Francis, 2002; Binding and Kinetics for Molecular Biologists, editors: J.A. Goodrich & J.E. Kugel, Cold Spring JKarbor Laboratory Press, 2007.*		
Teaching methods: *Lectures 2h/w with simultaneous power-point projections.*		
Assessment methods: *Final written exams.*		
Language of instruction: *Greek with English literature.*		

Financing opportunities for Undergraduate students

Scholarships and awards for undergraduates on a level of Department/School/Institute
To estimate student ranking for the purpose of honorary award or scholarship granting on a Department/School/Institute level, all mandatory courses per academic year are taken into account with the exception of English I, II, III. Calculation is carried out by adding course grades, multiplying their sum to their credit load and dividing the product by the sum of the courses' credit load.

Public financing or other
Students are eligible to financing opportunities for their studies offered by various Institutes, as well as scholarship granting bequests.

Information

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