



**IONIAN  
UNIVERSITY**

**SCHOOL OF ENVIRONMENT**

**DEPARTMENT OF ENVIRONMENT**

# **STUDENT HANDBOOK**

ACADEMIC YEAR

2020– 2021

<b>WELCOME FROM THE HEAD OF DEPARTMENT .....</b>	<b>5</b>
<b>THE IONIAN UNIVERSITY .....</b>	<b>6</b>
<b>THE SCHOOL OF ENVIRONMENT .....</b>	<b>7</b>
<b>Administration &amp; Governance .....</b>	<b>7</b>
<b>THE DEPARTMENT OF ENVIRONMENT .....</b>	<b>8</b>
<b>History of the Department .....</b>	<b>8</b>
<b>Our Identity .....</b>	<b>8</b>
<b>Governance of the Department.....</b>	<b>10</b>
<b>Administration Office.....</b>	<b>11</b>
<b>Infrastructure – buildings &amp; laboratories .....</b>	<b>11</b>
<b>Formally established research laboratories .....</b>	<b>12</b>
Software Technology and Geoinformatics .....	12
Environmental Physics, Energy, and Environmental Biology.....	13
Mathematical Physics and Computational Statistics .....	13
Environmental and Sustainable Development Management.....	13
Chemistry and Environmental Protection .....	14
<b>UNIVERSITY RESEARCH CENTER.....</b>	<b>15</b>
Institute of Biosciences, Biotechnology, Food Science and Environment.....	16
<b>UNDERGRADUATE STUDIES IN THE DEPARTMENT OF ENVIRONMENT.....</b>	<b>17</b>
<b>DETAILS OF THE UNDERGRADUATE DEGREE PER YEAR OF STUDY .....</b>	<b>18</b>
<b>Year One Modules (A' Semester – Autumn).....</b>	<b>18</b>
ΤΠ-1001 Principles of Environmental Science .....	18
ΤΠ-1002 Mathematics I.....	19
ΤΠ-1003 General Chemistry.....	19
ΤΠ-1004 Biology.....	20
ΤΠ-1005 Geology .....	20
ΤΠ-1006 Databases .....	21
<b>Year One Modules (B' Semester – Spring).....</b>	<b>21</b>
ΤΠ-2001 Ecology .....	21
ΤΠ-2002 Mathematics II.....	22
ΤΠ-2003 Biology and management of wildlife .....	22
ΤΠ-2004 Physics I .....	23
ΤΠ-2005 Statistics .....	23
ΤΠ-2006 Scientific Software.....	24
ΤΠ-2007 Economics and the Environment I .....	25
<b>Year Two Modules (Γ' Semester – Autumn) .....</b>	<b>25</b>
ΤΠ-3001 Environmental Fluid Mechanics .....	25
ΤΠ-3002 Physics II .....	26

ΤΠ-3003 Geological Information Systems .....	26
ΤΠ-3004 Introduction to Environmental Chemistry .....	27
ΤΠ-3005 Organic Chemistry .....	27
ΤΠ-3006 Programming I.....	28
<b>Year Two Modules (Δ' Semester – Spring) .....</b>	<b>28</b>
ΤΠ-4001 Meteorology - Climatology.....	28
ΤΠ-4002 Environmental Analysis.....	29
ΤΠ-4003 Thermodynamics.....	30
ΤΠ-4004 Environmental Engineering.....	30
ΤΠ-4005 Terrestrial Ecosystems .....	31
ΤΠ-4006 Programming II.....	31
<b>Year Three Modules (Ε' Semester – Autumn).....</b>	<b>32</b>
ΤΠ-5001 Renewable Energy Sources I (Solar PV and Wind Energy Conversion Systems).....	32
ΤΠ-5002 Aqueous Ecosystems .....	32
ΤΠ-5003 Liquid Waste.....	33
ΤΠ-5004 Environmental Policy and Legislation .....	33
ΤΠ-5005/1 Hydrology.....	34
ΤΠ-5005/2 Physical Oceanography.....	34
ΤΠ-5006/1 Quality, evaluation and environmental management standards.....	35
ΤΠ-5006/2 Environmental Education and Communication.....	35
<b>Year Three Modules (ΣΤ' Semester – Spring).....</b>	<b>36</b>
ΤΠ-6001 Atmospheric Pollution.....	36
ΤΠ-6002 Solid Waste.....	36
ΤΠ-6003 Remote sensing .....	37
ΤΠ-6004 Applications of Informatics in the Environment .....	37
ΤΠ-6005/1 Marine Biology.....	37
ΤΠ-6005/2 Dynamic and Restoration of Ecosystems.....	38
ΤΠ-6006/1 Drinking Water Treatment.....	38
ΤΠ-6006/2 Environment & Materials .....	39
<b>Year Four Modules (Ζ' Semester – Autumn).....</b>	<b>40</b>
ΤΠ-7001 Management of Protected Species and Areas .....	40
ΤΠ-7002 Water and Soil Pollution.....	40
ΤΠ-7003 Renewable Energy Sources II .....	40
ΤΠ-7004/1 Indoor Air Quality .....	41
ΤΠ-7004/2 Geochemistry.....	41
ΤΠ-7005/1 Agroforestry Ecosystems .....	42
ΤΠ-7005/2 Spatial analysis and modelling of ecological data .....	42
ΤΠ-7005/3 Population Ecology-biodiversity .....	42
ΤΠ-7006-7/1 Economics and the Environment II.....	43
ΤΠ-7006-7/2 Environment and Cultural Monuments.....	43
ΤΠ-7006-7/3 Scientific Report Writing .....	44
ΤΠ-7006-7/4 Health and Safety in the Workplace.....	44
ΤΠ-7006-7/5 Teaching Methodologies .....	45
<b>Year Four Modules (Η' Semester – Spring).....</b>	<b>45</b>
ΤΠ-8001 Assessment of Environmental Impact.....	45

ΤΠ-8002 Sustainable Development .....	46
ΤΠ-8004/1 Advanced Treatment Processes of Hazardous Waste .....	46
ΤΠ-8004/2 Restoration of polluted soils and groundwater.....	47
ΤΠ-8004/3 Environmental Microbiology .....	47
ΤΠ-8005/1 Management and safeguarding of natural & cultural heritage.....	48
ΤΠ-8005/2 Ecological Sampling Methods - Field Techniques.....	48
ΤΠ-8005/3 Acoustic Ecology .....	48
ΤΠ-8006/1 Environmental Impact on cultural heritage.....	49
ΤΠ-8006/2 History of Technology.....	49
ΤΠ-8006/3 Green Entrepreneurship .....	49
ΤΠ-8006/4 English Language .....	50
ΤΠ-8006/5 Teaching Methods for the Physical Sciences.....	50
<b>POSTGRADUATE STUDIES.....</b>	<b>51</b>
<b>New Technologies in Environmental Education and Sustainable Development .....</b>	<b>51</b>
<b>Preservation &amp; Management of Cultural Heritage .....</b>	<b>51</b>
<b>DOCTORALSTUDIES (PHD) .....</b>	<b>52</b>
<b>LIFELONG LEARNING TRAINING PROGRAMMES.....</b>	<b>53</b>
<b>STUDENT MATTERS.....</b>	<b>54</b>
<b>Year – one students .....</b>	<b>54</b>
<b>Library .....</b>	<b>54</b>
<b>Subsistence – Student Restaurant .....</b>	<b>55</b>
<b>Erasmus+ .....</b>	<b>55</b>
Study abroad – undergraduate student mobility .....	55
Student mobility for vocational training.....	55
<b>Ionio Open e-class [web-based learning platform] .....</b>	<b>55</b>
<b>Educational and administrative Operation during the SARS-Cov-2 virus pandemic.....</b>	<b>56</b>
<b>APPENDIX .....</b>	<b>58</b>

## WELCOME FROM THE HEAD OF DEPARTMENT

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Dear students,

Welcome to the 2020-2021 academic year.

We are thrilled to welcome you to the Department of Environment. This year, the conditions have changed due to the COVID-19 pandemic. Our aim for this academic year is to facilitate your learning both by distance and at campus depending on the circumstances. To this end, we prepared a brief guide describing how the Department has adapted to the new circumstances. We hope that this guide will be useful to you in order to participate in the academic life. The coming semester may be more challenging compared to other (COVID-free) years, but we are confident that this will not compromise your studies, because we have built on experience from previous semesters taught by distance.

Distance teaching and learning at the Ionian University is supported by the asynchronous online learning platform <https://opencourses.ionio.gr>, as well as the online video conferencing platforms Zoom® and Webex®. These are used for synchronous online teaching, including for live lectures, seminars, workshops, etc. whereas we use the asynchronous platform open courses for each module of the programme to upload educational material, announcements, exercises, etc. The use of both the asynchronous and synchronous platforms, require certification with the institutional e-mail account.

The activation of the institutional e-mail account must be carried out by the individual students. Instructions will be sent to each student from the Departmental Administrators, to the e-mail account registered during your enrolment to your course, which you have already completed via the webpage of the Ministry of Education.

In the case of year one students in particular access to these platforms may not require certification for the first few days until all first-year students obtain a university e-mail account. In this case, just follow the link to the virtual room of each course that will be listed in the course timetable or will have been known to you in another appropriate way (e.g. with your personal mail that you registered during enrolment).

We hope you have a prosperous academic year!

The Head of the Department

Katerina Kabassi, Associate Professor

## **THE IONIAN UNIVERSITY**

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The Ionian University was founded in 1984. Like all Higher Education establishments of the country, our mission is to create and to disseminate knowledge, to foster the arts and to do this via scientific research & teaching. The Ionian University works towards addressing the social, cultural and development needs of the country. The University encourages the development of responsible citizens who have a scientific, social, and political integrity whilst it provides the necessary resources to ensure training for a successful professional career. You can find more information about the university here <https://ionio.gr/>

## THE SCHOOL OF ENVIRONMENT

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The School of Environment is located in Zakynthos, and it was founded in October 2018, according to document ΦΕΚ 142/03.08.2018 issue A. The School comprises the Department of Environment based in Zakynthos and the Department of Food Science and Technology based in Kefalonia. You can find more information here <https://ionio.gr/gr/studies/faculties/ens/>

### **ADMINISTRATION & GOVERNANCE**

The School of Environment is governed by the Deanery, which consists of:

#### ***Dean***

Koulougliotis, Dionysios, Professor of the Department of Environment

#### ***Ordinary Members***

##### ***Permanent Teaching & Research Staff***

Kabassi, Katerina, Associate Professor, Head of the Department of Environment.

Eriotou, Efimia, Associate Professor, Head of the Department of Food Science and Technology

Kalimeris, Anastasios, Assistant Professor of the Department of Environment

Kampioti, Adamantia, Assistant Professor of the Department of Environment

Karris, Georgios, Assistant Professor of the Department of Environment

Giotis, Harilaos, Assistant Professor of the Department of Food Science and Technology

Moustakas, Antonis, Associate Professor of the Department of Food Science and Technology

Bouchagier, Pavlos, Assistant Professor of the Department of Food Science and Technology

##### ***Representative of Laboratory Teaching Staff (EDIP)***

Milla Sotiria, Department of Food Science and Technology

##### ***Representative of Technical Laboratory Staff (ETEP)***

Sakadani Eleni, Department of Food Science and Technology

##### ***Student Representatives***

Regulars/Substitutes (not designated until the day of issue of this)

##### ***Administrator***

Baloutsou, Theodora, administrator.

## THE DEPARTMENT OF ENVIRONMENT

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### HISTORY OF THE DEPARTMENT

The Department was first established in Zakynthos in 2003 with the name "Department of Ecology & Environment" as part of the Technical University of the Ionian Islands (TEI). In 2009 it was renamed to "Department of Environmental Technology and Ecology". At the same time, a second department was created in Zakynthos named as "Department of Protection & Preservation of Cultural Heritage". During the National Government Project "ATHENA" in the academic Year 2013-2014, the two departments were merged. The new department was named as "Department of Environmental Technologists T.E." and it delivered two fully independent Introductory undergraduate degree programmes: a) Natural Environment Technologies, and b) Cultural Heritage Conservation. In 2015, the degree "Conservation of Cultural Heritage" was evaluated and formally declared to be an equivalent to the degree offered by the department of "Conservation of Antiquities and Works of Art" of the Technical University (TEI) of Athens (Government Gazette ΦΕΚ 639/21-4-2015) giving at the same time professional rights. In 2017, by Law 4485 (Government Gazette ΦΕΚ 114/4-8-2017) the Introductory undergraduate degree programme "Conservation of Cultural Heritage" was renamed to "Conservation of Antiquities and Works of Art".

In October 2018, with Government Gazette ΦΕΚ 142/03.08.2018 issue A, the TEI of the Ionian Islands was merged with the Ionian University and the Department of Environmental Technologists T.E. was renamed to "Department of the Environment", while no reference was made to the Introductory undergraduate degree programme "Conservation of Antiquities and Works of Art", which was therefore closed. Since then, the Department of Environment only offers one University Undergraduate Programme as part of the Ionian University.

### OUR IDENTITY

The Department of Environment is located on Zakynthos island, an island of the Central Mediterranean and as a result we are fully engaged with the study and research of the natural environment. The Department is housed in a purpose-built building with state-of-the-art scientific equipment and teaching facilities. The wide range of staff's specialisms and research interests in the Environmental Sciences, offers the opportunity to the students to obtain a high-quality education and to acquire skills to a professional level.

The curriculum of the Department's undergraduate degree programme is based on the Sciences (i.e. STEM subjects) and aims at a deep understanding of the natural, chemical, biological processes and their effects on the environment and ecosystems, as well as of the environmental technologies used. The programme is regularly updated to include up-to-date international scientific developments, and to meet the requirements of the profession in the country.



The Undergraduate degree programme is developed into two distinct learning parts. The first part, lasting four semesters (i.e. academic years 1+2) uses a series of basic compulsory modules to establish the knowledge background required to understand the main environmental phenomena and processes. The second part, which also lasts four semesters (years 3+4) provides insights into environmental sciences and technologies via many optional modules that are offered. Thus, the student has an opportunity to explore the scientific area of their interest.

Students can complete part of their degree in other European Universities using the Erasmus+ student exchange programme. They can also obtain professional experience via an optional scheme of practical training in the workplace, which is useful when seeking employment in the public and private sectors, at national or international level.

In addition to the undergraduate degree, we offer taught postgraduate programmes (Masters) as well as research postgraduate programmes (PhD). At the level of postgraduate specialization and scientific research, the Department offers targeted interdisciplinary postgraduate studies. Both taught and research programmes aim at exploring modern environmental developments that are related to issues including the management of the natural environment, pollutants, climate change, management and protection of marine and terrestrial ecosystems, energy technologies of minimum carbon footprint, solid and liquid waste management technologies, cultural heritage management and protection, environmental education and sustainable development, and the systematic recording and monitoring of parameters linked to environmental change in the natural and the urban environment.

Our objectives are achieved via teaching and research. We deliver high quality theoretical and laboratory-based teaching. Our research work experience using laboratory and field equipment allows for effective teaching of applied theory and for the development of student skills related to the following:

- Atmospheric, Marine, and Geologic environmental processes and phenomena
- Climatic variability
- Climate variability
- Environmental Technologies
- Production and management of energy from Renewable Sources
- Applied Mathematics in the Environment
- Computational methods and modelling of environmental processes and technological devices
- Information Technology for the management and processing of environmental data
- Recording, analysis and modelling of geospatial data using Geographical Information Systems and remote sensing techniques

- Assessment, monitoring and response to pollution of the natural environment (air - water - soil) as well as water quality
- Treatment and management of liquid and solid waste
- Understanding of physicochemical environmental processes
- Development of analytical methods for the identification and monitoring of pollutants in environmental samples
- Interactions between the natural and the cultural environment
- Applied ecology of plant and animal populations and recognition of ecological processes in ecosystems
- Study and management of biodiversity
- Identification, interpretation, and restoration of Mediterranean Ecosystems
- Systematic monitoring of ecological and anthropogenic activities in terrestrial and aquatic ecosystems
- Design, organisation/management and systematic monitoring of protected species and areas
- Environmental education, communication, and teaching
- Economic assessment of the environment
- Preparation of Environmental Impact Studies
- Design and evaluation of environmental policies

### **GOVERNANCE OF THE DEPARTMENT**

The Department of the Environment is governed by the General Assembly, which consists of the following members:

#### ***Chairman***

Kabassi, Katerina, Associate Professor, Head of the Department of Environment

#### ***Deputy Chairman***

Karydis, Christos, Assistant Professor, Deputy Head of the Department of Environment

#### ***Regular Members – Permanent Teaching Staff***

Apostolopoulos, Pantelis S., Assistant Professor

Aravantinos-Zafiris, Nikolaos, Assistant Professor

Kalimeris, Anastasios, Assistant Professor

Kampioti, Adamantia, Assistant Professor

Karris, Georgios, Assistant Professor

Koulougliotis, Dionysios, Professor, Dean of the School of Environment

Kyritsis, Anastasios, Assistant Professor

Manti, Panagiota, Assistant Professor

Martinis Aristotelis, Assistant Professor  
 PanagiotarasDionisios, Assistant Professor  
 Poirazidis, Konstantinos, Associate Professor  
 Tsovolos Athanasios, Application Lecturer

**Administrator for the Assembly**

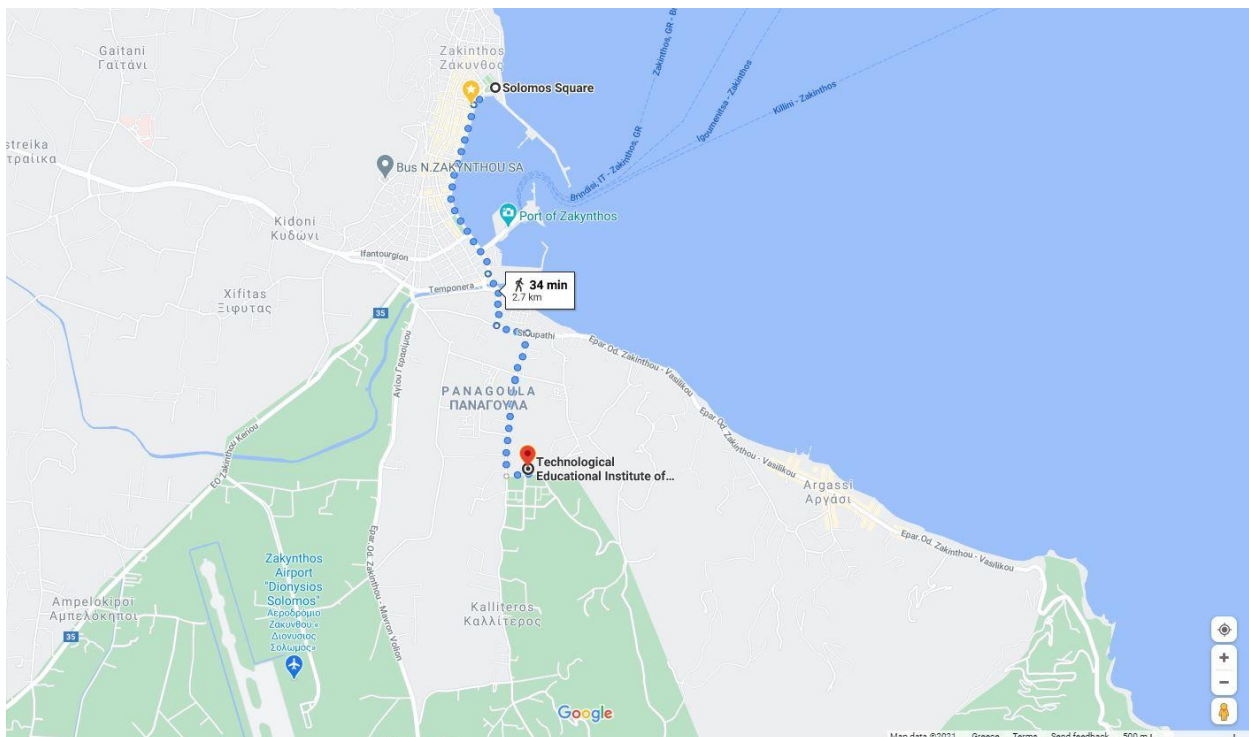
Giannouli, Georgia, Head of the Administration Office

**ADMINISTRATION OFFICE**

Giannouli, Georgia, Head of the Administration Office  
 Baloutsou, Theodora  
 Pylarinou, Evangelia  
 Duzevic-Pelika, Alexandra, temporary staff

**INFRASTRUCTURE – BUILDINGS & LABORATORIES**

The Department of Environment has a state-of-the-art building built in 2012, with a total covered area of 5500 m<sup>2</sup>, in addition to c. 3000 m<sup>2</sup> peripheral operating areas. The campus is located c. 2.8 km from the city center of Zakynthos.



**Figure 1: The location of the campus. Walking distance to Solomos Square.**

The building has full electromechanical support equipment such as central systems a/c, automation, fire safety, elevators, power generator, UPS central system, wireless Wi-Fi, video-projectors, and infrastructure for people with mobility difficulties. There are 12 scientific laboratories with state-of-the-art research equipment, small and large classrooms for teaching, an amphitheater which can host large audiences, a drawing studio, a library with reading room,

and a student restaurant within the university campus. In addition, there are several offices available for the administration of the Department and for permanent, temporary, or visiting teaching & research staff.

Our laboratory and field scientific equipment are used to support teaching & learning, and our research interests and projects. The scientific equipment that the Department holds includes:

- A network of 14 Meteorological-Environmental Stations along the Ionian Islands
- Photovoltaic generators and wind turbines
- Air tunnel and devices for fluid mechanics
- Equipment for the simulation of the operation of power generation and transmission systems
- Electricity quality analysers
- Computational systems for simulating natural processes
- Chromatographers (Ionic, Gas)
- MassSpectrometers
- AtomicAbsorption system (with flame and graphite oven)
- Total Organic Carbon and Total Organic Nitrogen analysts
- XRF (Portable & Desktop) and Benchtop XRD
- Portable RAMAN system
- FTIR& FTIR Microscopy
- Camera-connected stereoscopes and microscopes for digital photography
- Telemetry transmitters (e.g. GPS data loggers, Geolocators, VHF transmitters)
- Drone to monitor and capture ecosystems
- Birdlife and sound monitoring and recording
- Portable equipment for measuring biotic and abiotic parameters

## **FORMALLY ESTABLISHED RESEARCH LABORATORIES**

The mission of the Research Laboratories is to promote scientific research (basic and applied), with emphasis on excellence, as well as to support teaching in the subjects-areas that each laboratory focuses on. There are five (5) formally established research laboratories (via publication in the Government Gazette) that operate in the Department of Environment. These are:

### **Software Technology and Geoinformatics**

The research laboratory «Software Engineering and Applications of Geoinformatics» was established in the Department of Environment of the Ionian university according to GG 2669/1-7-2020 issue B. The Laboratory's mission is to promote scientific research, with an emphasis

on excellence, as well as to support teaching in the wider field Software Engineering and Applications of Geoinformatics.

Webpage: [ΤΕ.ΛΕ.ΓΕ](#)

### **Environmental Physics, Energy, and Environmental Biology**

The Laboratory of "Environmental Physics, Energy, and Environmental Biology" was established at the Department of Environment of the Ionian University according to Government Gazette ΦΕΚ 2669 / 1-7-2020 issue B'. The main aim of the Laboratory is the promotion of scientific research, with emphasis on excellence; at the same time the laboratory aims to support teaching in the wider field of Environmental Physics, Energy, and Environmental Biology. The use of scientific equipment, computational techniques, and new technologies as well as the theoretical study in the scientific fields of the lab, support both teaching and research. In particular, the laboratory's work focuses on the monitoring, observation, and study of major evolutionary environmental indices and processes evolution related with Environmental Physics, Energy and Renewable Energy Sources, as well as in Environmental Biology.

Webpage: [Ε.Φ.Εν.Βι.](#)

### **Mathematical Physics and Computational Statistics**

The "Mathematical Physics and Computational Statistics" Research Laboratory (ΜΑ.ΦΥ.ΥΠ.ΣΤ.) was founded in October 2020 at the Department of Environment of the Ionian University (Greek Government Gazette 4597 / 19-10-2020 B'). The aim and scope of the Laboratory is the promotion of scientific research, with emphasis on excellence, as well as the support of teaching, in the field of Mathematical Physics and Computational Statistics using powerful programming platforms. The subjects covered in the laboratory consist of Applied Mathematics in Physical Sciences, Statistics / Modelling and Computational Applications.

Relevant WebSite: [ΜΑ.ΦΥ.ΥΠ.ΣΤ.](#)

### **Environmental and Sustainable Development Management**

The Laboratory "Environmental Management and Sustainable Development" was founded in 2020 (Government Gazette B' 4597/19-10-2020). The Laboratory aims to cover the teaching needs of the Undergraduate Programme of Studies and research needs of the Department. The Mission of the Laboratory is to promote scientific research, with emphasis on excellence, as well as to support teaching in the wider field of management and monitoring of the natural environment, the study of the impact of anthropogenic and natural activities on ecosystems, the restoration and improvement of ecological processes and integrity, the evaluation of the implementation of environmental policy, environmental education for sustainable development.

Webpage: [ΔΙ.ΠΕΡ.Α.Α](#)

### **Chemistry and Environmental Protection**

The Laboratory of Chemistry and Environmental Protection (Chem.Envi.Pro. – ΧΗ.Π.ΠΕΡ.) is part of the Department of Environment of the Ionian University. It was founded in October 2020 (FEK B - 4624/21-10-2020). The mission of the lab is to advance scientific research and to support teaching in the field of chemistry and the protection of the natural and cultural environment. This is accomplished via both basic and applied research based on the principles of academic excellence.

Webpage: [ΧΗ.Π.ΠΕΡ.](#)

## UNIVERSITY RESEARCH CENTER

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The University Research Center (URC) was established in 2018 at the Ionian University as a private, non-profit legal entity under the supervision of the Senate and the Ionian University. URC is based in Corfu at the premises of the Ionian University, where it is housed and it operates, using the University's facilities and infrastructure by decision of the University Senate, until it acquires privately owned premises. URC aims are:

- Conducting basic and applied research.
- The exploitation of research results for the benefit of Greek society.
- Contributing to the specialisation of young scientists
- The provision of services to public and private bodies, mediation between the public and private sectors for the development of research units in enterprises, including the promotion of the Greek language and Greek culture abroad, in particular in the fields of: (a) life sciences, (b) food sciences, (c) the environment and sustainable development, (d) music and artistic creation and (e) history.

The University Research Center (URC) is governed by a five-member Board of Directors. The Board of Directors comprises:

Vlamos, Panagiotis -Professor, Department of Informatics, Chairman

Koulougliotis, Dionysios -Professor, Department of Environment, Deputy Chairman

Dimitriadis, Dimos Professor, Department of Music Studies, member

Psallidas, Gregorios Professor, Department of History, member

Kentrotis, Georgios Professor, Department of Foreign Languages, Translation and Interpreting, member

The University Research Center consists of four Institutes:

- **Institute of Biosciences, Biotechnology, Food Science and Environment,**  
Director: Koulougliotis, Dionysios Professor of the Department of the Environment
- **Institute of Music and Artistic Creation,**  
Director: Dimitriadis, Demos, Professor of the Department of Music Studies.
- **Institute of Historical Studies,**  
Director: Psallidas, Gregory, Professor of the Department of History.
- **Institute of Language Studies and Translation and Interpretation Sciences,**  
Director: Centrotis, Georgios, Professor of the Department of Foreign Languages, Translation and Interpretation.

**Institute of Biosciences, Biotechnology, Food Science and Environment**

The Institute of Biosciences, Biotechnology, Food and Environmental Science, is based on Zakynthos island, at the premises of the Department of Environment. The Institute specializes in the following research directions: food biotechnology, environmental biotechnology, bioinformatic applications in biomedicine, food quality and safety, the development of new products through the application of modern methods and technologies and chemical and microbiological food analyses, meteorology and climate change, renewable energy sources, chemistry and environmental quality control and environmental management and ecology. The Institute holds an annex in Corfu, which specializes in the applications of bioinformatics in biomedicine.

Webpage: [URC](#)



## UNDERGRADUATE STUDIES IN THE DEPARTMENT OF ENVIRONMENT

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To obtain the undergraduate university degree, the student must meet the following conditions:

1. Successfully complete eight (8) semesters of study.
2. To collect two hundred and forty (240) teaching units(ECTS).

Students have the option to write a dissertation or to register to three (3) Optional modules of four (4) teaching units each, instead. The undergraduate dissertation is carried out during the 8<sup>th</sup> semester and it is on a subject related to the subject of the Department of Environment. The teaching members of staff of the Department, undertake the supervision of dissertations, within the context of their employment. The dissertation supervisor/s is/are responsible for guiding the students, supervising them, and providing the necessary facilities and equipment when necessary. The dissertation subjects are formally submitted to the administrators' office at the Department usually at the beginning of each academic semester by the supervisor/s and by the student/s. More information can be obtained from the website [Program of Studies – The Department of Environment](#).

Lectures and laboratory exercises start in the last week of September or the first week of October. The winter semester ends in mid-January and is followed by the winter examination period until mid-February. The spring semester starts in mid-February and ends at the end of May after which the spring exams take place. The resit examinations period takes place from the end of August to the middle of September.

The graduate of the Department of Environment of the Ionian University, who is defined as an Environmental Scientist, has as his main professional and/or research activity one (or a combination of some) of the following directions:

- The preparation, writing and evaluation of Environmental Impact Studies.
- The conduct of environmental quality controls, the implementation and supervision of waste management and treatment methods, the implementation and supervision of anti-pollution methods.
- The development of Renewable Energy Sources.
- The assessment of Climate Change impact; environmental policy planning and evaluation, and environmental system management.
- The preparation and implementation of studies for the evaluation, monitoring and sustainable management of terrestrial and aquatic ecosystems; the processing, modelling and analysis of environmental and geographical data.
- The evaluation and management of elements of the natural and cultural heritage.
- Environmental education and Communication

## DETAILS OF THE UNDERGRADUATE DEGREE PER YEAR OF STUDY

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A summary of the modules offered to the undergraduate students is found in the table at the Appendix at the end of the document.

\*Students are given the opportunity to either prepare a dissertation or to be successfully examined in register to three (3) Optional modules of four (4) teaching units each, instead.

The following is a brief description of the content of each module.

### YEAR ONE MODULES (A' SEMESTER – AUTUMN)

#### ΤΠ-1001 Principles of Environmental Science

**Module type – Hours/week - ECTS:** Compulsory, 4 Hours/week, 5 ECTS

##### **Short Description - Module Details**

- Introduction to environmental sciences, what is environmental science and why it is important. How science can support theories about environmental issues.
- Ecological systems - building blocks of life - energy transfer. Ecosystems - ecological pyramids - food chains - networks Biogeochemical cycles. Productivity of ecosystems - interactions between abiotic and biotic elements of the environment - dynamics of populations and habitats - virulence processes.
- Solid waste - what it is and how much we produce - how we can reduce the volume of waste and of the pollution we produce. What is recycling - the pros and cons of recycling, waste management methods.
- Indoor-outdoor gas pollution, with brief references to topics such as: air structure and processes, outdoor air pollution (pollutants, clouds and acid deposition), indoor air pollution, effects of gas pollution and ways to reduce and prevent of air pollution.
- Global warming, with key subsections on issues such as the Greenhouse effect, the possible effects of global warming and potential solutions.
- Environmental policy and sustainability, with references to the historical evolution of the concept of sustainability, ecological thinking and development, human growth, the ecological footprint with aim the creation of sustainable economies.

**ΤΠ-1002 Mathematics I****Module type – Hours/week - ECTS:** Compulsory, 5 Hours/week, 6ECTS**Short Description - Module Details**

- The concept of function, its practical applications in Physics, Engineering, and Technology. The basic functions and their properties.
- Trigonometric functions, physical interpretation and applications in periodic phenomena and oscillations.
- Trigonometric series.
- Introduction to Complex Numbers.
- Single variable functions, ordinary derivative, derivatives calculation rules.
- Multi-variable functions, partial derivative, partial and total differential.
- Derivatives numerical computation through finite differences.
- Indefinite and definite integrals, and calculation methods.
- Fundamental rules and methods of numerical integration.
- Double –sequential- integrals (introductory examples).

**ΤΠ-1003 General Chemistry****Module type – Hours/week - ECTS:** Compulsory, 4 Hours/weeklecturers and 3 Hours/weeklaboratory exercises, 5 ECTS (Theory) και 2 ECTS (Laboratory).**Short Description - Module Details**

- Atomic theory and Atomic structure – Chemical formulas
- Terminology of inorganic compounds
- Chemical reaction types – Stoichiometry
- Thermochemistry
- Principles of atomic quantum theory – Atom electronic structure
- The Periodic table of the elements
- Chemical bond (ionic – covalent) – Intermolecular interactions
- Chemistry of solutions – Colligative properties
- Chemical equilibrium
- Acids and Bases – Ionic equilibrium
- Solubility equilibrium
- Principles of chemical kinetics
- Principles of electrochemistry

### ΤΠ-1004 Biology

**Module type – Hours/week - ECTS:** Compulsory, 3 Hours/week, 4 ECTS

#### **Short Description - Module Details**

- Introduction to Biology
- The chemical composition of living matter
- Properties of Water that contribute to Earth's suitability as an environment for life
- Carbon and the molecular diversity of life
- Structure and function of large biological molecules
- Cell membranes structure and function
- Basic principles of metabolism. Cellular respiration as a process of transforming chemical energy into forms usable by the cell or organism. Stages of Photosynthesis.
- The concept of genetic information and gene
- The chromosome theory of inheritance and the Mendel's laws
- The molecular basis of inheritance and the mechanism of protein synthesis
- Types of microorganisms. Use of microorganisms in Anti-Pollution Technologies, Biotechnology and Genetic Engineering

### ΤΠ-1005 Geology

**Module type – Hours/week - ECTS:** Compulsory, 3 Hours/week, 4 ECTS

#### **Short Description - Module Details**

- Historical Data and Flashback of Geology, Definition, Object and General Principles of Geology, Scientific Branches and Methods of Geology.
- The Solar Planetary System, Earth as Planet, The Structure of the Earth Sphere, Continents and Oceans, Age of Earth.
- Structural Characteristics of the Earth. Formation of core, mantle, crust, hydrosphere, atmosphere and biosphere. Convection in Earth's core and production of its magnetic field. Mechanical layering of the Earth. Surface Dynamics, Intrinsic and Extrinsic Processes.
- Lithospheric Plates, Plate Tectonics, Movements of the crust, Hydrographic Networks, Lithospheric Plate Movement Mechanism, Thermal Transfer Currents, Lithospheric Convergence Types. Sea-floor spreading and continental drift, Geodynamic elements of Earth- Mid Oceanic Ridges, trenches, transform faults and island arcs, Origin of oceans, continents, mountains and rift valleys.
- Rocks and Minerals, igneous rocks, metamorphic rocks and sedimentary rocks, Mechanisms of rock deformation, Geological Cycle or Rock Deformation Cycle, Classification of Cracks.
- Earthquake Genesis, Seismology, Geological Discontinuities, Gutenberg Discontinuity, Seismic Waves, Detection of seismic waves, Categories, Genesis Mechanisms, Seismic Sequences, Accompanying Phenomena. Volcanoes, Magma categories, Life-time of a Volcano, The Volcanoes Worldwide and in Greece.

### **ΤΠ-1006 Databases**

**Module type – Hours/week - ECTS:** Compulsory, 2 Hours/week lecturing and 2 Hours/week laboratory exercises, 3 ECTS (Theory) and 1 ECTS (Laboratory).

#### **Short Description - Module Details**

- Introduction to data, information and environmental data
- Introduction to databases
- Architectural and Physical Organisation of files
- Modelling and Designing Issues
- Relationship Entity Charts
- Transforming Relationship Entity Charts to Databases
- Implementing Databases for Environmental Data
- Relational algebra
- Queries in Databases
- Structured Query Language SQL
- Examples of Queries in SQL

## **YEAR ONE MODULES (B' SEMESTER – SPRING)**

### **ΤΠ-2001 Ecology**

**Module type – Hours/week - ECTS:** Compulsory, 2 Hours/week lecturing and 2 Hours/week laboratory exercises, 3 ECTS (Theory) and 1 ECTS (Laboratory).

#### **Short Description - Module Details**

- Introduction to the science of Ecology and definitions. Basic research principles in the field and organization of experiment in both laboratory and physical conditions.
- Organisms in the ecosystem. Introduction to the concept of energy flow, nutrient recycling and biogeochemical cycles. The biogeochemical cycles of carbon and nitrogen. Photosynthesis and cellular respiration in the carbon cycle. Biological and atmospheric nitrogen fixation.
- The biogeochemical cycles of phosphorus and the hydrological cycle. The role of the shallow marine sediments and of coastal zones.
- Definitions and efficiency of different ecosystems. The concept of ecological efficiency and the effects of energy loss on the length of food chains.
- Light & Temperature as environmental factors in bio-activity
- The importance of water in structure, support, nutrient transport and cooling for plants. The adaptations-types of plants in extreme conditions of soil moisture.
- Types of interactions (positive, negative and neutral) among organisms. The basic model of population dynamics and the parameters that affect it.

**ΤΠ-2002 Mathematics II****Module type – Hours/week - ECTS:** Compulsory, 4 Hours/week, 5 ECTS.**Short Description - Module Details**

- The simplest Differential Equations (DE).
- Practical examples and physical interpretation of DE solutions.
- Types and notation of Differential Equations. DEs of separated variables, linear DEs of 1<sup>st</sup> and 2<sup>nd</sup> order.
- An example application of DEs in some problems of increased environmental and technological significance (bodies free fall with resistance, the time evolution of pollutants concentration in a lake or a semi-enclosed basin, oscillations, mechanical sensors of 1<sup>st</sup> and 2<sup>nd</sup> order, time evolution of electrical charge production in a photovoltaic cell, R-L-C circuit behaviour).
- Vectors, practical use, definition, and designation. Vector components, coordinates, directional angles, and magnitudes. Vectors addition and difference.
- Multiplication of a scalar and a vector (and examples from Physics). Vectors dot (interior) product and physical interpretation.
- Vectors cross (exterior) product and applications. Scalar and Vector fields.
- Field mapping methods. The gradient of a scalar field and physical interpretation.
- Divergence of a vector field and physical interpretation.
- Gradient analytical computation and geometrical specification on a two-dimensional scalar field. Introduction to vector fields flows, the Stoke's and Green's theorems and their physical meaning.

**ΤΠ-2003 Biology and management of wildlife****Module type – Hours/week - ECTS:** Compulsory, 4 Hours/week, 5 ECTS.**Short Description - Module Details**

- The diversity and value of Greek fauna.
- Biology, habitat ecology of selected species of wildlife (mainly birds, mammals, reptiles, inland fauna).
- The concept of habitat and the range of levels of analysis, the interaction of habitat and different groups of fauna species. Area of endemic fauna, the effect of space and time.
- Forest and fauna structure (critical elements of ecosystems, heterogeneity, mosaicism and fragmentation). Analyses with examples of species.
- Habitat suitability, the concept of intermediate nuisance (case studies). Threats and problems to fauna.
- Management practices and examples of wildlife management efforts in Greece. Protection of endangered species, examples of implementation, institutional - legislative framework.

**ΤΠ-2004 Physics I****Module type – Hours/week - ECTS:** Compulsory, 4 Hours/week, 5 ECTS.**Short Description - Module Details**

- Electrostatics: Coulomb's law, Electric Field, Gauss's law, Electric Potential Energy, Electric Potential and equipotential surfaces, Potential gradient.
- Conductors and Dielectrics. Capacitors and capacitance, Connection networks of capacitors-equivalent capacitance (in Series and Parallel), Energy storage in Capacitors and Electric-field energy.
- Motion of charges, current, drift velocity and current density, Resistivity and resistance, Resistors, connection networks of resistors equivalent resistance (in Series and Parallel), Electromotive force and direct current circuits, Kirchhoff's rules, Thevenin-Norton's Theorems, R-C circuits (R-C filter), Differentiators and Integrators.
- Stationary electromagnetism: magnetic fields and flux density, Lorentz's force, Biot-Savart's law, Magnetic Field and Magnetic Forces, Ampere's law for B-field and magnetic materials, Principles of electric motors.
- Electromagnetic induction: Faraday's and Lenz' laws, Inductance, L-R circuits, Maxwell's equations.
- Elements of Atomic Physics: Bohr's atomic model-Sommerfeld's extension of atomic structure, Electronic configuration and Quantum numbers, Shapes of s,p,d,f orbitals, Pauli's exclusion principle, Emission and absorption spectra, line and band spectra; Hydrogen spectrum – Lyman, Balmer, Paschen, Brackett and Pfund series. de Broglie's theory, Heisenberg's uncertainty principle – wave nature of electron – Schrodinger wave equation.
- Crystal structures, growth of semiconductor materials, electronic states of semiconductors, Direct and indirect bandgap semiconductors, density of states function, effective mass, Statistics of donors and acceptors, Drift current, I-V (current-voltage) characteristics, electrical mobility, carrier scattering, Hall effect.

**ΤΠ-2005 Statistics****Module type – Hours/week - ECTS:** Compulsory, 3 Hours/week, 4 ECTS.**Short Description - Module Details**

- Population, Sample, Types of Variables (Discrete and Continuous), Data Counting, Grouping, Collections, Data Classes, Frequency, Frequency Distributions.
- Graphical methods (Histograms, Circular Charts, Pies, Time series, Scatter Charts, Color and Multidimensional Charts).
- Numerical descriptive measures, Standard deviation and its meaning, Statistics of central tendency and variability, Position and dispersion measures, calculations from simple or grouped frequency tables, Nyquist frequency, Bayes' theorem.

- Probability Density and Cumulative Probability Functions (Sample Distributions, Random Variable Sum Distributions), Normal (Gaussian) Distribution, Normalized Normal Distribution Values, Probability Calculations with Normal Distribution, chi-squared Distribution, Poisson, Weibull, Maxwell–Boltzmann Distributions.
- Simple Linear Regression and Correlation (parametric spaces, construction of estimators using the least squares method), Non-Linear Regression.
- The central limit theorem and its consequences, Point and space estimators, Unbiased minimum dispersion estimators, flow method and maximum probability method, Confidence intervals and case checks for one and two samples (independent or paired), the chi-squared test method

### **ΤΠ-2006 Scientific Software**

**Module type – Hours/week - ECTS:** Compulsory, 2 Hours/weeklecturing and 2 Hours/weeklaboratory exercises, 3 ECTS (Theory) και 1 ECTS (Laboratory).

#### **Short Description - Module Details**

- Scientific text on MS Word. Page layout, text location, fonts, special symbols, writing rules, the equation editor, insert object, text frame, graph, image, table.
- Introduction to LaTeX; the professional document preparation system.
- Mathematical computations of numerical data in MS Excel. Basic types of numerical data, the Excel spreadsheet and matrix configuration, basic mathematical and statistical functions in Excel, column algebra.
- The interface of Grapher. Import numerical data and time series with Grapher software. Illustration of time series and data graphs, Grapher drawing objects, multiple graphs in a common coordinate system. Function graphs and syntax rules in Grapher.
- Numerical data transformations, basic statistical computations, and column algebra with Grapher. Polar, Wind, Rose charts.
- Elementary analytical and symbolic calculations with Derive software.
- Visualising numerical fields. Time series and Fields. Field maps and isostatic curves. Constructing the grid file and display it on a map.
- Map formatting. Isostatic curves, line forming. Pseudo-chromatic field imaging.
- Three-dimensional field display.
- The field gradient and its physical significance. Gradient vector in Surfer.
- Least squares method. Polynomial approach of least squares in Grapher. Linear regression, recognition of linear tendencies and confidence intervals.



### **ΤΠ-2007 Economics and the Environment I**

**Module type – Hours/week - ECTS:** Compulsory, 3 Hours/week, 4 ECTS.

#### **Short Description - Module Details**

- The market forces of supply and demand
- Elasticity of supply and demand
- Consumer choices
- The supply in competitive markets
- Principles of the Economics of Well-Being – Market efficiency
- Public goods – Common resources – Merit goods
- Market failure – Externalities
- Monopoly – Monopolistic competition - Oligopoly
- Interdependence and the gains from trade

### **YEAR TWO MODULES (Γ' SEMESTER – AUTUMN)**

### **ΤΠ-3001 Environmental Fluid Mechanics**

**Module type – Hours/week - ECTS:** Compulsory, 6 Hours/week, 6ECTS

#### **Short Description - Module Details**

- Our fluid environment (atmosphere, oceans, Earth, Sun, planets, and stars).
- Fluid properties, equations of state for gases and liquids.
- Viscosity, shear velocity, boundary layers and free flow zones.
- Newton's rheological law. Flow types, turbulent flow, turbulent vortices. Boundary layer separation and bodies' wake.
- Flow velocity convergence – divergence, physical meaning and environmental results.
- Flow field and its Eulerian and Lagrangian description.
- Flow of volume, mass, heat, kinetic energy, and other properties. Aeolic power and energy.
- The continuity equation and its applications in the Geophysical fluid flows.
- Hydrostatic equilibrium. Fluid bodies' internal structure under hydrostatic equilibrium.
- General description of the Atmosphere, Oceans, and Earth's internal structure.
- Accelerations acting on fluid volume elements. Equations of momentum and energy. The equation of Navier-Stokes.
- Solvability of the fluid dynamics equations in the framework of computational fluid dynamics (an introductory reference to flow domain geometry, mesh, equations discretization, turbulence models, initial and boundary conditions, solution, post-processing and flow field mapping, solution validation).
- Geostrophic equilibrium, geostrophic flow, and the influence of friction.
- Cyclonic and anti-cyclonic flow. The differential equation of Euler, the equation of Bernoulli and its applications.

**ΤΠ-3002 Physics II**

**Module type – Hours/week - ECTS:** Compulsory, 4 Hours/weeklecturing and 2 Hours/weekLaboratory Exercises, 5 ECTS (Theory) και 1 ECTS (Laboratory).

**Short Description - Module Details**

- Alternating current, Rotating Phase Vectors (Phasors), Alternating Current in terms of Complex Analysis, Resistance and Reactance, The R-L-C circuit in series, Power, Resonance in a R-L-C circuit, Three-phase Alternating Current.
- Production of Single-phase and Three-phase Voltages and Currents, Generators, Real and Inactive Generator Power, Interconnected Generators, Inverters, Transformers (Single-phase and Three-phase), Connection Topologies, Control Transformers.
- Maxwell Equations, Electromagnetic Waves, Harmonic Electromagnetic Pulses, Energy Density - Momentum - Intensity, Stationary Electromagnetic Waves, Fourier Theorem, Spectrum of Electromagnetic Radiation, Interaction of Electromagnetic Field with Matter.
- Wave Nature of the Electromagnetic Field, Geometric Optics, Reflection, Refraction, Total Reflection, Electromagnetic Wave Polarization, Electromagnetic Radiation Dispersion.
- Particle Nature of the Electromagnetic Radiation, Wavelength and de Broglie Theory, The Photoelectric Phenomenon, X-Ray Production, Scattering.
- Ionizing and Non-Ionizing Radiation, Dosimetry, Special Absorption Rate, Electric power transmission lines and effect on Humans.

**ΤΠ-3003GeographicInformation Systems**

**Module type – Hours/week - ECTS:** Compulsory, 2 Hours/weeklecturing and 3 Hours/weekLaboratory Exercises, 2 ECTS (Theory) και 2 ECTS (Laboratory ).

**Short Description - Module Details**

- What is GIS? Who uses GIS; what can we do and how does a GIS work?
- Spatial and descriptive data.
- The Geo-database model and the elements of a geo-database.
- Basic spatial functions in a GIS in vector and rasterdata models.
- Distance - connectivity measurements. The reclassification and overlay functions. Zone statistics (Zonalstatisti). Modelling data in a GIS environment.
- Types of models. Descriptive and Deterministic models. Abductionand induction models.
- Models based on rules and linear regression. Multi-criterial methods and sensitivity analysis.
- Spatial interpolation.
- Visualization of interference surfaces, spatial interference methods, Geostatistics, Kriging.
- Configuration standard models to perform spatial operations

### ΤΠ-3004 Introduction to Environmental Chemistry

**Module type – Hours/week - ECTS:** Compulsory, 3 Hours/week lecturing and 3 Hours/week Laboratory Exercises, 4 ECTS (Theory) και 2 ECTS (Laboratory).

#### **Short Description - Module Details**

- Chemical processes in the atmosphere
- Introduction to atmospheric pollution
- Chemical processes in the hydrosphere
- Hydrosphere pollutants
- Heavy metals – Toxic organic substances – Oil hydrocarbons
- Principles of Green Chemistry
- Laboratory safety – Measurement errors
- Solution preparation
- Determination of total organic carbon in water
- Soil sampling – Granulometric analysis
- Soil pH and hydrolytic acidity
- Measurement of physicochemical parameters of water samples
- Chromatography
- Determination of residual chlorine in potable water
- Bibliographic research – Project presentation

### ΤΠ-3005 Organic Chemistry

**Module Type-Teaching Hours-ECTS:** Compulsory, 4 Hours/week, 4 ECTS

#### **Short Description - Module Details**

- Introduction on Organic Chemistry. Structure and Bonds
- Nomenclature- IUPAC system
- Alkanes & cycloalkanes. Stereochemistry of alkanes & cycloalkanes
- Overview of organic reactions
- Alkenes: structure - reactivity - reactions - synthesis
- Alkynes: structure - reactivity - reactions - synthesis
- Stereochemistry- Stereoisomerism
- Alkyl Halides Reactions of Alkyl Halides: Nucleophilic aliphatic substitution and elimination
- Aromatic hydrocarbons
- Alcohols and Ethers
- Carbonyl compounds

**ΤΠ-3006 Programming I**

**Module type – Hours/week – ECTS:** Compulsory, 2 Hours/weeklecturing and 2 Hours/weekLaboratory Exercises, 3 ECTS (Theory) και 1 ECTS (Laboratory).

**Short Description - Module Details**

- Introduction to Programming
- Problem Solving – Data flowcharts
- Selection Structure
- Repetition structure
- Combining structures – solving complicated problems
- Data Structure
- Tables, Stuck – Queue, Sorting
- Sub-programs – Functions
- Sub-programs – Procedures
- Mathematical Problem Solving
- Emphasis in environmental problems

**YEAR TWO MODULES (Δ' SEMESTER – SPRING)****ΤΠ-4001 Meteorology - Climatology**

**Module type – Hours/week – ECTS:** Compulsory, 4 Hours/week, 5 ECTS

**Short Description - Module Details**

- The vertical structure of the Atmosphere.Geometry, chemical composition, and thermal structure of the Atmosphere. The prototype Atmosphere, pressure maps, isobars, isobaric surfaces.Meteorological parameters, instruments, stations, and Meteorological data.
- General Circulation of the Atmosphere.The three-cell model, zonal distribution of pressure, wind, cloudiness, and precipitation. The influence of the Earth's topography and the main centers of action.
- Higher atmosphere planetary winds, Rossby waves, and Jet streams.Atmospheric air flows – Wind.Pressure gradient and geostrophic wind – The influence of friction and of the Earth's topography.Weather patterns (cyclones and anti-cyclones), pressure maps.
- Wind convergence – divergence and their results. Local winds.Vertical air motion and thermal instability.
- Atmospheric convection and results. Dry and wet temperature lapse rate.Free (thermal) and forced (mechanical) convection in the Atmosphere.Thermal instability and the effects of vapor. Humidity and its measurement.
- Cloudiness and cloud types. Precipitation and its measurement. Convective clouds, Cumulonimbus, and thunderstorms.Air masses and fronts – Depressions, formation and evolution.Frontal depressions and evolutionary stages.Anticyclones, types, blocking highs.

- Meteorological maps and Meteorological Remote Sensing.
- Wind, cloudiness, precipitation estimations on pressure maps. Higher troposphere maps.
- Satellite Remote Sensing, gridded data, radar measurements.
- Weather conditions in the Euro-Mediterranean area. Mediterranean cyclogenesis and variability. Weather conditions in Greece.
- Anomalous atmospheric circulation and the significant modes of natural climatic variability.
- The El-Nino Southern Oscillation.
- The North Atlantic Oscillation and its climatic impact on the Euro-Mediterranean sector. The NAO index.
- Climate and climatic variability. Anthropogenic effects on the global climate and the greenhouse effect. Climatic trends detection and principles of Statistical Climatology.

### **ΤΠ-4002 Environmental Analysis**

**Module Type – Hours/week - ECTS:** Compulsory, 3 Hours/week lecturing and 3 Hours/week Laboratory Exercises, 3 ECTS (Theory) και 2 ECTS (Laboratory).

#### **Short Description - Module Details**

- Principles of analytical chemistry
- Sampling methods and sampling categories
- Pretreatment and preservation of samples
- Statistical data analysis and estimation of errors
- Spectroscopic methods. Visible, ultraviolet and infrared spectroscopy
- Atomic Absorption Spectroscopy
- X-ray (XRF) spectroscopy
- Principles of Chromatography
- Column Chromatography, Planar Chromatography
- Gas Chromatography (GC)
- Liquid Chromatography (HPLC)
- Ion Chromatography
- Mass Spectrometry
- Electroanalytical methods
- Techniques for solid sample analysis
- Determination of air pollutants -Chemical analysis of particulate matter
- Physicochemical monitoring of water. Parameters of organic water pollution
- Metals and toxic elements
- Radiation measurement
- Noise measurement

**ΤΠ-4003 Thermodynamics****Module Type – Hours/week - ECTS:** Compulsory, 5 Hours/week, 6 ECTS**Short Description - Module Details**

- Basic Thermodynamics Concepts
- Energy Forms – Energy Transfer – First Law of Thermodynamics
- Pure substances – Phase Transitions – Equations of state
- Energy analysis of closed systems: Work, Internal Energy, Enthalpy, Heat Capacities
- Second Law of Thermodynamics: Thermal engines – Refrigerators and Heat Pumps – Reversible and Irreversible Processes – The Carnot Cycle - Energy quality
- Entropy – Entropy balance for a closed system – Principle of Entropy Increase
- Chemical Thermodynamics: Reaction Heat – Thermodynamics and Chemical Equilibrium
- Principles of Thermodynamics of the atmosphere

**ΤΠ-4004 Environmental Engineering****Module Type – Hours/week - ECTS:** Compulsory, 4 Hours/week lecturing and 2 Hours/week Laboratory exercises, 3 ECTS (Theory) and 2 ECTS (Laboratory)**Short Description - Module Details**

- Ecological methods of constructing production units and generally construction of the urban, peri-urban, rural and regional sectors.
- The production of energy using renewable and certified reserves. Limiting energy consumption.
- Exploitation of by-products, secondary energy produced.
- Sources of raw materials, extraction mechanisms and environmental effects. Introduction to materials engineering. Use of environmentally friendly materials, their shelf life. New and upgraded materials.
- Mechanisms for monitoring and reducing environmental pollution from the industrial and production process in general. Mechanisms for the reintegration of 'by-products'. Gaseous pollutants. Snap, convert, manage by-products.
- Construction of H.Y.T.Y., K.E.L. Methods of construction and protection of operation. Removal of by-products and their exploitation.
- Balances of mass and energy. Definitions. Fixed and non-fixed systems. The use and management of natural resources.
- Mechanisms for converting wind and solar energy into electricity. Kinetic energy from natural and renewable resources. Gearboxes.
- Storage of electricity. Continuous and alternating electricity. Conversion mechanisms.
- Acoustic pollution. Machines that produce it and ways of limiting it. The urban environment and industrial production

**ΤΠ-4005 Terrestrial Ecosystems**

**Module Type – Hours/week - ECTS:** Compulsory, 4 Hours/week lecturing and 2 Hours/week Laboratory exercises, 3 ECTS (Theory) and 2 ECTS (Laboratory)

**Short Description - Module Details**

- Global vegetation zones - ecosystems
- Vegetation zones in Greece
- Environmental conditions: introduction. Temperature: introduction.
- Basic concepts and introduction to Mediterranean ecosystems. Data on the biotic and abiotic environment of Greece.
- Effect of temperature on the level of populations and species. Climate classification systems - Climate classifications by Kopen and Thornwaite - Bioclimatic classifications - The climate of Greece.
- Mediterranean biomes: Flora, vegetation.
- Structure of Mediterranean ecosystems, evolution, types.
- Diversity of the terrestrial flora of Greece - Phytogeographical position and phytogeographical departments of Greece.
- Threats for the Mediterranean ecosystems
- Forest Fires in Mediterranean ecosystems.
- Threat coping strategies (drought, grazing, fires).
- Grazing: effects at the level of organism, species and ecosystem.
- Post-fire ecology of Mediterranean ecosystems.
- Coastal & Mountain Ecosystems of Greece. Coniferous, deciduous broadleaf forests.

**ΤΠ-4006 Programming II**

**Module Type – Hours/week - ECTS:** Compulsory, 2 Hours/week lecturing and 2 Hours/week Laboratory Exercises, 3 ECTS (Theory) και 1 ECTS (Laboratory).

**Short Description - Module Details**

- Introduction to the programming language Python.
- Environments for writing code in Python.
- Program development
- Variables and expressions. Logical expressions.
- Data input and output of results.
- Data types.
- Flow control structures, iteration-loop structures, functions
- Data structures. Lists, tuples, sets and dictionaries.
- Tables using the NumPy and Scipy libraries.
- Mathematical functions, application to simple arithmetic problems.
- Input and output data to files. Error checking

## YEAR THREE MODULES (E' SEMESTER – AUTUMN)

### ΤΠ-5001 Renewable Energy Sources I (Solar PV and Wind Energy Conversion Systems)

**Module Type – Hours/week - ECTS:** Compulsory, 6 hours, 7 ECTS

Short Description - Module Details

- Introduction to RES: Current situation and Trends in RES Energy Production and Utilisation – The Impact of Distributed Generation
- Solar Photovoltaic Systems: Characteristics of Solar Radiation – Measurement of Solar Radiation – Photovoltaic Effect - PV Technologies – The Equivalent Circuit of a PV Cell – I-V and P-V Characteristic Curves – Power Conversion (DC/DC and DC/AC converters) and Technical Requirements – Maximum Power Point Tracking – Islanding Detection – Design Principles of PV plants – Energy Yield and Efficiency Calculations – Environmental Life-Cycle Assessment of PV systems – National Legislation and Energy Pay-Back Time of PV investments
- Wind Farms: Wind Characteristics – Basic Aerodynamics – Wind Turbines – Stall and Pitch Control – The Power Curve of a Wind Turbine – Basic Principles and Technical requirements of Generators and Power Converters for Wind Turbines— Maximum Power Point Tracking – Environmental Life-Cycle Assessment of Wind Farms – National Legislation and Energy Pay-Back Time of Wind Farms

### ΤΠ-5002 Aqueous Ecosystems

**Module Type – Hours/week - ECTS:** Compulsory, 4 Hours/week, 4 ECTS

Short Description - Module Details

- Introduction to Aquatic Ecosystems, the concept of wetland systems and their ecological characteristics. Legislative framework for the protection and management of aquatic ecosystems at national, European and international level.
- Types of wetlands, River Deltas and Lakes, analysis and comments for the various wetland types (marine and inland aquatic systems) - Part I, Wetland types, Artificial Lakes. Swamps, Lagoons and Rivers. Biotic Factors of Aquatic Ecosystems, Values of Aquatic Ecosystems and Threats: The Case of the Gialova Lagoon
- Introduction to Marine Ecosystems, description of the marine abiotic environment. Marine ecosystem productivity and food networks. Understanding the key factors affecting marine ecosystem productivity (e.g. upwelling systems), food webs and energy flow through marine ecosystems. Biotic factors of marine ecosystems
- Introduction to biology and ecology of the living organisms of marine environments
- Values of Marine Ecosystems and Threats: the case of the Zakynthos National Marine Park, Management and restoration of aquatic ecosystems, wetland management principles. Monitoring of wetland management programs and use of biomonitoring indicators.



### **ΤΠ-5003 Liquid Waste**

**Module Type – Hours/week- ECTS:** Compulsory, 5 Hours/week, 6 ECTS

#### **Short Description - Module Details**

- Origin, quality and quantitative characteristics of Liquid Waste
- Determination of physicochemical characteristics(BOD, COD,Solid)
- Calculation of wastewater benefits
- Disposal legislation
- Pre-treatment methodologies, Primary LW treatment (precipitation, flotation)
- Elements of microbiology and kinetic development of microorganisms
- Removal of nutrients (nitrization, denification, removal of phosphorus).
- Biological treatment of HR, the presence of toxic substances, heavy metals and organic micro-pollutants.
- Natural waste water treatment systems
- Disinfection of Liquid Waste
- Sludge management
- Disposal-reuse of liquid waste

### **ΤΠ-5004 Environmental Policy and Legislation**

**Module Type – Hours/week - ECTS:** Compulsory, 4 Hours/week, 5 ECTS

#### **Short Description - Module Details**

- Nature - Society - Economy. Principles and dimensions of environmental policy.
- Review of the environmental policy of Greece. Environmental policy and Constitution.
- Environmental policy in the European Union.
- The role of local communities in planning and implementing environmental policy.
- The role of Non-Governmental Environmental Organizations, the scientific community, international organizations, governments, courts, public administration.
- Cross-border Pollution in the international legal order.
- Economic development and environmental protection
- Introduction to legislation
- Legislative models
- Basic concepts of law
- The institutions of the legislature
- Greek and European law - Correlations and interaction
- Environmental law in Greece and Europe. The basic legislation
- Legislation of environmental rights and obligations
- Environment and the Constitution Environmental law as a policy tool
- The European courts.

### ΤΠ-5005/1 Hydrology

**Module Type – Hours/week - ECTS:** Optional, 3 Hours/week, 4 ECTS

#### **Short Description - Module Details**

- The water cycle in our environment, evaporation, evapotranspiration, precipitation, rivers runoff, and underground water.
- Seasonal variability of the natural water cycle components.
- Land-atmosphere, land-sea, sea-atmosphere, land surface-underground water fluxes.
- Freshwater balance along the Greek area.
- Computation of the hydrologic balance along an area.
- Water cycle components measurement instruments and monitoring sensors.
- Measurement of hydrological parameters.
- Estimation of rivers flood drainage.
- European and Greek legal framework and policies about water resources and sustainable water treatment.

### ΤΠ-5005/2 Physical Oceanography

**Module Type – Hours/week - ECTS:** Optional, 3 Hours/week, 4 ECTS

#### **Short Description - Module Details**

- General description and marine climatology of the Oceans.
- The main enclosed and semi-enclosed basins. The Mediterranean basin.
- Chemical composition and thermodynamic properties of the seawater. Salinity.
- The major circulation patterns of the global Ocean. Wind-generated and thermohaline circulation. Oceanic flow scales, geostrophic currents. Heat, salt, and other properties flow through the oceanic circulation.
- Seawater equations of state and buoyancy. Vertical pressure distribution under hydrostatic equilibrium. Horizontal pressure variations, barotropic and baroclinic conditions.
- The Geoid, equipotential surfaces under hydrostatic equilibrium – Sea surface dynamic topography. Tides. Static properties of seawater masses and vertical motions development. Typical thermodynamical structure of a seawater column.
- Wind-generated waves and evolution. Ocean waves spectrum and wave propagation. Evaporation, sea-atmosphere mass fluxes, and salinity.
- Evaporation and freshwater flux climatology in the global Ocean and the Mediterranean Sea.
- Sea-atmosphere heat and energy fluxes and the sea surface temperature.
- Wind-generated currents, the Ekman zone, mass transport in Ekman zones. The atmospheric forcing on the development of oceanic convection.

- Development of oceanic meridional circulation systems. The global ocean thermohaline circulation and its climatic impact. Major ocean-atmosphere processes and interactions of special interest in the Pacific and the Atlantic Oceans.
- Concentration and dilution basins, baroclinic currents. General circulation of the Mediterranean Sea, characteristics and variability. Coastal circulation, sediment, and mass transport. Coastal erosion. Coastal up- and down-welling. Coastal wave types and characteristics. Wave propagation through straits and channels. Tidal waves propagation.

### **ΤΠ-5006/1 Quality, evaluation and environmental management standards**

**Module Type – Hours/week - ECTS:** Optional, 3 Hours/week, 4 ECTS

#### **Short Description - Module Details**

- International standards and regulations. Health and safety at the workplace
- Challenges encountered in the production process due to population-growth
- Internationalisation of standards and regulations with a view to an integrated and globalised market.
- The ISO 9001 and 9002 protocols.
- The need for the creation of a group of standards to ensure quality in environmental management in the production, handling, administration and trade areas.
- The development of ISO 14001. Procedures, directs actions and controls for environmental management in the fields of production and administration.
- Implementation of the ISO 14001. Results from its implementation.
- The ability to compare with other international standards and to support conclusions.

### **ΤΠ-5006/2 Environmental Education and Communication**

**Module Type – Hours/week - ECTS:** Optional, 3 Hours/week, 4 ECTS

#### **Short Description - Module Details**

- Historical Review of Environmental Education, Key Features of Environmental Education (EE), The integration of the environment in education, The role of the environmental educator, Methods and Techniques of Environmental Education (EE)
- The EE in Greece (historical background), The EE in Greece today, Problems in the implementation of the EE, Evaluation of EE Programs, Presentation of work on lesson
- Historical Background of the environmental movement, Key Characteristics of the EE Education, Types of Environmental Education
- Environmental Communication, Mass Media and Environmental Education, The Role of Journalists
- Environmental Education and Citizen's participation, Methods and Techniques of Citizen's participation in Environmental Issues, Environmentally Responsible Behaviour, Models of Environmentally Responsible Behaviour,

## YEARTHREE MODULES (ΣΤ' SEMESTER – SPRING)

### ΤΠ-6001 Atmospheric Pollution

**Module Type – Hours/week - ECTS:** Compulsory, 4 Hours/week, 6 ECTS

#### **Short Description - Module Details**

- Structure and composition of the atmosphere. Main quantities and units, Chemical composition of the atmosphere, Major pollutants in Atmosphere
- Air Pollution Sources
- Biogeochemical cycles.
- Atmospheric Photochemistry- Exothermic and endothermic reactions in the environment - Atmospheric lifetimes of pollutants.
- Tropospheric ozone, source emission, reactivity and impacts. Photochemical smog, urban pollution.
- Stratospheric ozone, source emission, reactivity and impacts. The effect of Halogens, Ozone depletion.
- Organic volatile compounds, nitrogen and sulfur compounds in the atmosphere.
- Greenhouse effect and climate change (energy balance, greenhouse gases, climate role of greenhouse gases and aerosols, carbon dioxide emissions into the atmosphere)
- Particulate matter in the atmosphere, characterization, sources and removal from the atmosphere, effects, Acid rain.
- Dry and wet deposition of pollutants, Dry deposition velocity.
- Air pollution and health, Air quality guidelines in EU and U.S.A.

### ΤΠ-6002 Solid Waste

**Module Type – Hours/week - ECTS:** Compulsory, 5 Hours/week, 6 ECTS

#### **Short Description - Module Details**

- Qualitative and quantitative characteristics of solid waste.
- Integrated management of solid waste.
- Source sorting and recycling. Handling and storage at source. Systems collection.
- Landfill of solid waste. Mechanical separation.
- Heat treatment methods (burning, cracking, gasification).
- Methods of biological treatment (composting, anaerobic digestion).
- Calculation of qualitative and quantitative characteristics of solid municipal waste
- Composting systems
- Design of a Territorial Waste Disposal Unit: Calculations of basic parameters. Location methodology. Environmental impact assessment.
- Design and Methodology for upgrading waste management systems. Relevant legislation and management bodies

**ΤΠ-6003 Remote sensing**

**Module Type – Hours/week - ECTS:** Compulsory, 2 Hours/weeklecturing and3 Hours/weekLaboratory Exercises, 3 ECTS (Theory) και 2 ECTS (Laboratory).

**Short Description - Module Details**

- Advantages of remote sensing, Basic principles of electromagnetic radiation, spectral response and spectral signatures, multispectral images, hyperspectral images.
- Satellite and airborne sensor systems.
- Radiometric resolutionof satellite images, atmospheric image correction, geometric image correction.
- Image transformation and multi-image management (multispectral ratio and difference).
- Vegetation indicators, principalcomponents analysis (PCA), the Tasseled-Cap index.
- Unsupervised image sorting
- Supervised image classification (Spectral libraries, training areas)
- Fuzzy classifiers (Fuzzy logic – sub-pixel classification and neural networks),
- Object-oriented classification.

**ΤΠ-6004 Applications of Informatics in the Environment**

**Module Type – Hours/week - ECTS:** Compulsory, 2 Hours/weeklecturing and2 Hours/weekLaboratory Exercises, 3 ECTS (Theory) και 2 ECTS (Laboratory).

**Short Description - Module Details**

- Computer Aided Design -Cad
- Environmental Information Systems,
- Environmental Monitoring and Control Systems Design,
- Decision Making Systems
- Machine Learning
- Environmental Learning with new technologies and Sustainable Development
- Environmental Education

**ΤΠ-6005/1 Marine Biology**

**Module Type – Hours/week - ECTS:** Compulsory, 2 Hours/weeklecturing and2 Hours/weekLaboratory Exercises, 4 ECTS (Theory) και 0 ECTS (Laboratory).

**Short Description - Module Details**

- Introduction to marine environment, and physicochemical characteristics with emphasis on the differences between terrestrial and marine ecosystems
- Ecological principles of marine environment, geography and geomorphology of marine ecosystems. The thermal stratification and the level of dissolved oxygen concentrations in marine ecosystems as factors affecting the formation of biocommunities
- Types of Marine Ecosystems, ocean ecosystem, description and analysis of the basic types of marine ecosystems and the corresponding adaptations of organisms

- Biotic factors in marine ecosystems, marine fauna and flora. Description and analysis of the structure and composition of fauna communities in marine ecosystems
- Productivity of marine ecosystems, understanding the effect of ecological factors on primary productivity in coastal and pelagic waters and consequently on species distribution
- Values of marine ecosystems and threats, marine ecosystem services and threats arising from anthropogenic activities-pressures at sea
- Protection and management of the marine environment, general principles for managing marine ecosystems. Monitoring of marine environment management programs by using biomarkers, legal framework for the protection and management of the marine environment.

### **ΤΠ-6005/2 Dynamic and Restoration of Ecosystems**

**Module Type – Hours/week - ECTS:** Compulsory, 4 Hours/week, 4 ECTS

#### **Short Description - Module Details**

- Analysis of the concept of an ecosystem, structure and operation of the Ecosystem. Management of water and soil resources in natural ecosystems
- Erosion and its effects on ecosystems
- Effect of pollution on agro-ecosystems
- Desertification
- Climate change and its effects on ecosystems
- Forest fires and natural ecosystems
- Concept of ecosystem restoration
- Factors that affect the restoration's dynamic of ecosystems
- Integrated sustainable ecosystem management
- Interaction of agricultural and forest ecosystems
- Ecosystem's restoration applications (forest, rural, marine & coastal, aquatic, river & lake)
- Pollution and restoration of ecosystems
- Pollution and eutrophism
- Tourism development and protection of ecosystems

### **ΤΠ-6006/1 Drinking Water Treatment**

**Module Type – Hours/week - ECTS:** Optional, 3 Hours/week, 4 ECTS

#### **Short Description - Module Details**

- Water on earth. Hydrological cycle. Types of water.
- Physical-Chemical Characteristics of Water. Uses of water.
- Identification of the microbiology of water.
- Select source and water treatment process.
- Design of water treatment plants.

- Bottled water. Processes and treatment plants.
- Flocculation - Aggregation. Water dispersion systems.
- Sedimentation. Sedimentation chemistry. Elements of electrochemistry.
- Theory of subsidence. Principle of flotation process. Comparison of sedimentation and floating. Filtration.
- Water disinfection. Mechanisms of main disinfection techniques. Oxidizing agents. Disinfection by-products.
- Advanced water treatment processes.
- Sustainable water resources management
- Drinking water, nutrition and health.

### **ΤΠ-6006/2 Environment & Materials**

**Module Type – Hours/week - ECTS:** Optional, 3 Hours/week, 4 ECTS

#### **Short Description - Module Details**

- Basic introductory concepts in materials science.
- Categories of materials and their uses. Products and main materials used.
- Composite products and difficulties they present in their management.
- Metals & metal alloys. Uses, products, recycling and their general management in environmental protection.
- Mechanical properties of metal, strength and deformations.
- Exploitation of materials science in the manufacture of products with more environmentally friendly behaviour.
- Glass, wood, paper and fabric.
- Plastic. Types of plastics and their uses. Source of raw materials for their production. Recycling of plastics and problems from their widespread use.
- Complex and upgraded materials as a means of manufacturing environmentally friendly products and constructions.
- The protection of raw material sources from the use of composite materials and the reduction in energy expenditure through their use.
- Plant fibres and mineral fibres in the manufacture of composite materials and products.
- Life cycle of materials and its importance in the protection of the environment.
- Environmental degradation from raw material extraction, transport, processing, energy expenditure for use to final disposal, recycling or reuse.

## YEAR FOUR MODULES (Z' SEMESTER – AUTUMN)

### ΤΠ-7001 Management of Protected Species and Areas

**Module Type – Hours/week - ECTS:** Optional, 4 Hours/week, 5 ECTS

#### **Short Description - Module Details**

- Basic concepts of protected species and habitats. Protected areas in Greece.
- Legislation for the protection and conservation of species and habitats. Evaluation of species and areas to set priorities for the protection of species and protected areas.
- Planning for the management and monitoring of protected species.
- Best practices for the management of protected species
- Appropriate planning of protected areas (management plan) and habitats as a measure to regulate land use for the coexistence of man and nature
- Use specialized software in the design and management of species and protected areas.
- Scientific monitoring systems
- Problems with the management and operation of protected areas.
- Management bodies and the local community. The search for tools for the coexistence of local society with protected areas

### ΤΠ-7002 Water and Soil Pollution

**Module Type – Hours/week - ECTS:** Compulsory, 5 Hours/week, 6 ECTS

#### **Short Description - Module Details**

- Natural waters: parameters for physicochemical testing and levels of organic pollution
- Categories of pollutants: Organic and inorganic compounds
- Physicochemical properties of pollutants: Lipophilia, Water solubility, adsorption
- Bioconcentration, Transport between water and atmosphere.
- Physicochemical processes in soils - Transfer of pollutants to soil
- Methods of pollutant treatment
- Minimisation and prevention of pollution - green chemistry

### ΤΠ-7003 Renewable Energy Sources II

**Module Type – Hours/week - ECTS:** Compulsory, 4 hours, 5 ECTS

#### **Short Description - Module Details**

- Operating principles and technology basics of: Solar Thermal power stations – Geothermal power stations – Small Hydroelectric power stations – Combined Heat and Power systems (CHP) – Biomass
- Energy Storage: Electrochemical Energy Storage – Pumping Storage Stations – Hydrogen Stations – Thermal Storage – Impact of Energy Storage on Electrical Grids



- Innovative Electricity Network Architectures for increased penetration of Variable RES: Hybrid Autonomous Systems – micro-Grids – Smart Grids
- Nearly Zero-Energy Buildings (nZEB) and Zero-Energy Buildings (ZEB).
- RES Directives-Policies and National Legislation
- Life Cycle Cost Assessment of RES Investments

### ΤΠ-7004/1 Indoor Air Quality

**Module Type – Hours/week - ECTS:** Optional, 3 Hours/week, 4 ECTS

#### **Short Description - Module Details**

- Indoor air pollutants (chemicals)
- Indoor Aerosols
- Bioaerosols
- Indoor electromagnetic radiation
- Indoor air quality management
- Health effects from indoor air pollution
- Indoor air quality models
- Case studies on indoor air quality

### ΤΠ-7004/2 Geochemistry

**Module Type – Hours/week - ECTS:** Optional, 3 Hours/week, 4 ECTS

#### **Short Description - Module Details**

- Basic geochemical concepts and processes. Lithosphere, hydrosphere, biosphere, atmosphere. Magma and magma rocks. Sedimentary Rocks. Atmosphere.
- Physical characteristics of sediments and their importance in geochemical processes.
- Chemical characteristics of sediments. Elements and geochemical phases as indicators of sedimentary environments.
- Chemical characteristics of rocks.
- Geochemical processes.
- Chemical degradation processes.
- Chemical diagenesis processes.
- The geochemistry of heavy metals. Behaviour of metals in soil and water. The bioavailability of heavy metals. The relationship between heavy metals and environmental living systems
- Elements of marine geochemistry. Biogeochemical processes
- Specific extreme environments: importance of knowledge of geochemical processes in extreme environments in environmental management. Black sea, lagoons, Persian Gulf, Red Sea, underwater hydrothermal areas.
- Geochemistry and environmental pollution

**ΤΠ-7005/1 Agroforestry Ecosystems****Module Type – Hours/week - ECTS:** Optional, 3 Hours/week, 4 ECTS**Short Description - Module Details**

- Introduction to the concept of agroforestry ecosystems
- Agroforestry as a traditional land use in Greece - The agricultural history of Greece.
- Physiognomy of agroforestry ecosystems
- Agro-climatic types - Factors shaping agro-climatic types
- Analysis of agroforestry ecosystem's formation factors: demographic factors - ecological factors - economic factors
- Agroforestry ecosystems and biodiversity
- Landscape indicators - Evaluation of agroforestry ecosystems with landscape indicators
- Mediterranean agroforestry ecosystems: creation-management
- The contribution of environmental and agricultural policy to the management of the agroforestry areas - The contribution of agri-environmental measures of CAP in the management of the agroforestry area.

**ΤΠ-7005/2 Spatial analysis and modelling of ecological data****Module Type – Hours/week - ECTS:** Optional, 3 Hours/week, 4 ECTS**Short Description - Module Details**

- Introduction to spatial analysis and programming language R (Installation, Basic functions)
- Spatial regression: Introduction to regression – Generalized-Linear-Models (GLM), Spatial regression packages in R
- Advanced regression models and modelling: Random Forest regression, applications in R
- Geographically Weighted Regression (GWR)
- Interference and spatial statistics: Nearest neighbour, spatial self-association measurements, reverse distance method (IDW), Kriging and semi-variograms
- Species distribution modelling (SDM) and ecological analysis of eco-positioning
- Species distribution modelling applications and understanding - integration of uncertainties in the process of modelling, applications and mapping in R

**ΤΠ-7005/3 Population Ecology-biodiversity****Module Type – Hours/week - ECTS:** Optional, 3 Hours/week, 4 ECTS**Short Description - Module Details**

- Introduction to the concept of biodiversity. The components of biodiversity and its basic types. The abundance of species as a common measure of biodiversity.
- The value of biodiversity, the threats to biodiversity and the legal framework of its protection and management, understanding the self-efficacy and economic or

utilitarian values of biodiversity. Presentation of the main threats to biodiversity and the legal regime for the conservation and sustainable use of biodiversity components.

- Presentation of methods for quantifying the  $\alpha$ - and  $\beta$ - biodiversity by using indicators such as Simpson, Shannon and Sorenson, Measurement of Biodiversity (applications). Estimation of the optimum sampling unit size for the assessment of the  $\alpha$ -biodiversity of soil-surface arthropods.
- The temporal dimension of biodiversity dynamics and the use of tools (e.g. fossils) for its study. The spatial dimension of biodiversity dynamics and the tools (e.g. telemetry) for mapping biodiversity. Factors affecting the spatial patterns of species biodiversity
- Introduction to the concept of population ecology. The basic model of population dynamics. Factors that affect population size changes. The structure (e.g. age-based) of populations.
- The use of models to predict changes in population sizes of species not subject to environmental pressures: the Malthusian model of population growth.
- Model of population growths subject to environmental pressures. Intraspecific competition in response to the constraints imposed by the environment on population growth.
- The Lotka-Volterra interspecific competition model including intraspecific competition. Detection of competitive exclusion conditions in a system of species with interspecific competition.
- The Lotka-Volterra predator-prey model including intraspecific competition. Detection of equilibrium conditions of the predator-prey system.

### **ΤΠ-7006-7/1 Economics and the Environment II**

**Module Type – Hours/week - ECTS:** Optional, 3 Hours/week, 3 ECTS

#### **Short Description - Module Details**

- Subsidies – Tradable Pollution permits
- Economic valuation methods for the environment (revealed- or stated-preferences)
- Management of renewable and non-renewable natural resources
- Trade and the Environment
- The economics perspective of major environmental problems (acid rain, greenhouse effect, stratospheric ozone depletion, loss of biodiversity, waste management) Principles of the Economics of Well-Being – Market efficiency

### **ΤΠ-7006-7/2 Environment and Cultural Monuments**

**Module Type – Hours/week - ECTS:** Optional, 3 Hours/week, 3 ECTS

#### **Short Description - Module Details**

- Introduction to the Protection and management of the natural and cultural environment. Measures and legislation for the protection of natural and cultural heritage
- Factors influencing preservation.

- Anthropogenic and naturally caused changes in the environment
- Recording and documentation of damage to cultural monuments
- Economic development in relation to the protection and promotion of the natural and cultural environment
- Research, exhibition and use of monuments. Types of monuments.
- Effects of climate variability on the natural and cultural environment.
- The impact of tourism
- Case studies - preservation of historical settlements, preservation of historical paths, preservation of archaeological sites / excavations and mines, natural sources of historical interest, important natural monuments of archaeological interest,
- Case studies - protection of landscapes and trees-monuments. Preservation and protection of natural geological monuments of particular interest.

### **ΤΠ-7006-7/3 Scientific Report Writing**

**Module Type – Hours/week - ECTS:** Optional, 3 Hours/week, 3 ECTS

#### **Short Description - Module Details**

- Introduction to the main report aims & objectives –
- The audience of the report -structure
- Data presentation – tables, photos and diagrams
- Bibliography & the Internet sources
- Footnotes& citations
- Ethics in scientific research
- Identifying & avoiding plagiarism
- Summarising your work

### **ΤΠ-7006-7/4 Health and Safety in the Workplace**

**Module Type – Hours/week - ECTS:** Optional, 3 Hours/week, 3 ECTS

#### **Short Description - Module Details**

- Introduction to Health & Safety. Greek and International Legislation, International Organizations, Sources of Information.
- Health & Safety in industry and the laboratory
- Obligations and duties of a Health & Safety Officer
- Occupational risks (definition, occupational risk assessment)
- Accidents at work (definition, causes, prevention, reporting, statistics, costs)
- Waste management. Handling Chemicals
- Writing a risk assessment - exercise

### ΤΠ-7006-7/5 Teaching Methodologies

**Module Type – Hours/week - ECTS:** Optional, 3 Hours/week, 3 ECTS

#### **Short Description - Module Details**

- Basic concepts of teaching methodology.
- Learning and teaching theories
- Planning and organisation of teaching
- Basic structural characteristics of teaching
- Teaching objectives & learning outcomes
- Evaluation of teaching
- Reflection as a teaching method

## **YEAR FOUR MODULES (H' SEMESTER – SPRING)**

### ΤΠ-8001 Assessment of Environmental Impact

**Module Type – Hours/week - ECTS:** Compulsory, 2 Hours/week lecturing and 3 Hours/week Laboratory Exercises, 2 ECTS (Theory) και 2 ECTS (Laboratory).

#### **Short Description - Module Details**

- Introduction to the new legislative framework regarding the environmental assessment of projects and activities which are likely to have effects on the environment
- Basic groups in which projects and activities are classified
- Steps in conducting environmental impact assessment of projects and activities depending on the category to which they belong
- The control mechanisms in Environmental Impact Assessments (EIAs)
- Methodology, outline and *contents* list of an *environmental impact assessment*
- The concept of synergism of environmental impacts from processes which interact so that the product of their effects is greater than the sum of their separate effects
- Use of tools (e.g. Geographic Information Systems, maps, GPS devices, databases such as NATURA Viewer <http://natura2000.eea.europa.eu/> and geodata [http://geodata.gov.gr/geodata /](http://geodata.gov.gr/geodata/)) in conducting environmental impact assessments
- Type of accompanying documents required for conducting environmental impact assessments
- Qualitative content analysis of EIAs for various projects and activities in Greece
- Public engagement processes in EIAs, and appeal or the cancellation of an *environmental* impact assessment certificate

### **ΤΠ-8002 Sustainable Development**

**Module Type – Hours/week - ECTS:** Compulsory, 3 Hours/week, 3 ECTS

#### **Short Description - Module Details**

- Basic concepts of "sustainable and integrated development"
- Carrying capacity, critical loads, acceptable levels of change, endurance of a place, etc.
- Methodology of searching for alternative ways of thinking-intervention, through the parallel physiocentric, social and anthropocentric approach
- Alternative applications of integrated development (with emphasis on small and island's areas), through mild and environmentally friendly actions.
- Measuring Sustainable Development
- Sustainable Development Indicators
- Sustainable Development Models
- International pilot implementation of mild forms of intervention in the field
- Case studies from international experience
- Innovation for sustainable development
- Public engagement in the protection and conservation of natural space
- Sustainable touristic development in small island areas
- Design and study for the sustainable development of an area

### **ΤΠ-8004/1 Advanced Treatment Processes of Hazardous Waste**

**Module Type – Hours/week - ECTS:** Optional, 3 Hours/week, 4 ECTS

#### **Short Description - Module Details**

- Definitions and characterization of hazardous waste
- Hospital, Domestic hazardous waste, Other special waste
- Quantitative and qualitative characteristics of Hazardous waste (HW)
- Storage, collection and transport of HW
- Hazardous waste management systems: Strategies and tactics hazardous waste management decisions
- Source reduction: quantity and toxicity
- Treatment processes and material and energy recovery: Physicochemical and aerobic - anaerobic biological processes
- Final disposal of HW
- Design of Waste Disposal plant: Calculations of basic parameters
- Location of Waste Disposal plant. Environmental impact assessment
- Hazardous waste, legislation and management bodies

### ΤΠ-8004/2 Restoration of polluted soils and groundwater

**Module Type – Hours/week - ECTS:** Optional, 3 Hours/week, 4 ECTS

#### **Short Description - Module Details**

- Technologies for the restoration of unsaturated soils
- Physicochemical
- Biological
- Thermal
- Technologies for the restoration of saturated soils - groundwater
- Ex-situ
- In-situ
- Case studies

### ΤΠ-8004/3 Environmental Microbiology

**Module Type – Hours/week - ECTS:** Επιλογής Compulsory, 3 Hours/week, 4 ECTS

#### **Short Description - Module Details**

- Introduction to Microbiology
- Cellular structure
- Prokaryotic and Eukaryotic micro-organisms
- Evolutionary course of microorganisms - Biological evolution & creation of life
- Metabolism of heterotrophic micro-organisms
- Nutrition and physiology of microorganisms
- Microbial development
- Micro-organisms as biogeochemical agents
- Aquatic microbiology (Water -sewage)
- Microbiological water quality
- Resolution of faecal water contamination problems - environmental protection
- Organic Cleaning of Municipal Waste
- Disinfection. Removal of pathogenic micro-organisms during waste water treatment
- Other ways of sanitizing waste water and active sludge. Reuse of Treated Waste
- Factors affecting the survival of viruses in the environment. Fate of pathogenic microorganisms in the soil
- Modern Environmental Problems/Climate Change and Microorganisms
- Environmental Microbiology applications in environmental protection: Bio-cleaning, biological waste water treatment, biodegradation

### **ΤΠ-8005/1 Management and safeguarding of natural & cultural heritage**

**Module Type – Hours/week - ECTS:** Optional, 3 Hours/week, 4 ECTS

#### **Short Description - Module Details**

- Introduction to the protection and showcasing of the natural and cultural environment.
- Legislation for the protection of the natural and cultural heritage
- Culture & environment
- Methodologies for the recording, monitoring and promotion of natural and cultural heritage
- Public involvement
- Case studies of UNESCO World Natural and Cultural Heritage Sites

### **ΤΠ-8005/2 Ecological Sampling Methods - Field Techniques**

**Module Type – Hours/week - ECTS:** Optional, 3 Hours/week, 4 ECTS

#### **Short Description - Module Details**

- Introduction to the basic sampling methods for environmental science (the case of fauna)
- Introduction to the basic sampling methods for environmental science (the case of flora)
- Criteria employed for finding the optimal plot and sample size for reliable estimates of population and biodiversity parameters values in flora and fauna biocommunities
- Presentation of basic equipment and field techniques for data collection
- Sampling design and implementation of ecological studies in the area of Zakynthos
- The phytosociological approach in the Braun-Blanquet concept, design and implementation of flora surveys
- Sampling design and implementation for the estimation of biomass in ecosystems
- Introduction to statistical analysis of ecological raw data by using software tools

### **ΤΠ-8005/3 Acoustic Ecology**

**Module Type – Hours/week - ECTS:** Optional, 3 Hours/week, 4 ECTS

#### **Short Description - Module Details**

- Introduction to acoustic ecology and soundscape ecology
- The theory of ecological acoustics (ecoacoustics) and its applications
- Introduction to theories - hypotheses of bioacoustics
- Acoustic ecology's applications (interdisciplinarity)
- Acoustic ecology as an important parameter of sustainable development
- Introduction to the use of acoustic ecology tools: soundrecorder, digital recorder
- Introduction to the use of acoustic ecology's software: Audacity, R Statistics, SPSS, CadnaA
- Behaviour in the field - sampling methods
- Acoustic ecology's data analysis. Sound walks. Noise sampling for the purpose of creating noise maps. Soundscape analysis in order to create thematic sound maps
- Record and analysis of soundscapes as well as ecologically important sound activities such as Dawn Chorus



### ΤΠ-8006/1 Environmental Impact on cultural heritage

**Module Type – Hours/week - ECTS:** Optional, 3 Hours/week, 3 ECTS

#### **Short Description - Module Details**

- Legislation and Global Cultural Heritage
- Introduction to the concepts of preservation of works of art, international literature
- Introduction to recording and documentation of cultural heritage
- Environmental parameters and preventive conservation. Air pollution and works of art
- Damage caused on organic works of art due to environmental factors
- Damage caused on inorganic works of art due to environmental factors
- Methods to record & control environmental parameters
- Casestudies

### ΤΠ-8006/2 History of Technology

**Module Type – Hours/week - ECTS:** Optional, 3 Hours/week, 3 ECTS

#### **Short Description - Module Details**

- The Newtonian "Enlightenment" and the separation of Chemistry from alchemy.
- The transition to the Industrial Revolution. The discovery and use of the locomotive as a tool in all social aspects and professional practices.
- The discovery of electromagnetism as a technological achievement.
- From the first to the second industrial revolution. Direct and alternating current, Electromagnetic Radiation, the discovery of photovoltaics.
- The quantum theory revolution as a precursor to a new technological paradigm.
- The dawn of Nuclear Technology. Historiographical Approach.
- The post-war changes in the field of electronics industry, computer systems, and the early 21st century research into quantum computers and gene therapy.
- The need of using Renewable Energy Sources (Solar, Wind, Wave) and the "race" for controlled nuclear fusion.

### ΤΠ-8006/3 Green Entrepreneurship

**Module Type – Hours/week - ECTS:** Optional, 3 Hours/week, 3 ECTS

#### **Short Description - Module Details**

- Innovation and Entrepreneurship
- Green & Social Entrepreneurship
- Economic development and environmental protection
- Examples of green businesses
- Natural Resource Management
- Exploitation of renewable energy sources
- Planning green business actions

### ΤΠ-8006/4 English Language

**Module Type – Hours/week - ECTS:** Optional, 3 Hours/week, 3 ECTS

#### **Short Description - Module Details**

- General translation theory, dictionaries, translators.
- Identifying your level.
- Oral and written English for foreigners.
- Translation of general and scientific terms.
- Understanding a text.
- Practical exercise.
- Thematics cover throughout the module: fitness description, chemical status description, ecology, description of organic materials, description of inorganic materials.

### ΤΠ-8006/5 Teaching Methods for the Physical Sciences

**Module Type – Hours/week - ECTS:** Optional, 3 Hours/week, 3 ECTS

#### **Short Description - Module Details**

- The concept of scientific literacy
- Learning theories in science education
- Students' ideas for natural phenomena and science concepts
- Teaching models in Science Education
- New Technologies in Science Education
- Formal and non-formal science learning methods and resources
- Teaching proposals of basic science concepts and natural phenomena

## POSTGRADUATE STUDIES

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The Department of Environment has developed and operates two interdepartmental postgraduate programmes. For more information visit: [Postgraduate Studies](#):

### NEW TECHNOLOGIES IN ENVIRONMENTAL EDUCATION AND SUSTAINABLE DEVELOPMENT

The Departments of Environment of the School of Environment, and the Department of Sound and Image Arts of the School of Music and Audiovisual Arts, of the Ionian University, offer the Interdepartmental Postgraduate Programme of Studies (MSc) entitled "New Technologies in Environmental Education and Sustainable Development". The MSc is organised and operates in accordance with Senate decision No. 18/29-05-2020 (Government Gazette 3610/29.08.2020, p. B'). The MSc awards a Master's level Degree entitled "New Technologies in Environmental Education and Sustainable Development". The programme of study is full-time only, with no option for part-time studies. Admission places offered to this programme for the academic year 2020-2021 is limited to 30.

Webpage: [N-TEES](#)

### PRESERVATION & MANAGEMENT OF CULTURAL HERITAGE

The Department of Environment in collaboration with the Department of Archives, Libraries & Museology of the Ionian University, founded and operate since 2020-21 a Postgraduate Programme (MSc) entitled "Preservation & Management of Cultural Heritage" in accordance with the provisions of Law 4485/2017.

This taught postgraduate programme examines the current problems of protecting, preserving and highlighting cultural heritage objects (works of art & antiquities) in the current framework of strong economic and social changes, and worsening environmental conditions. Within this framework, preservation of cultural heritage is vulnerable and poses many challenges. The fast changing, and often unpredictable factors that challenge the preservation of cultural heritage act on a wide range of heritage venues, including archaeological excavations, private and public museums, galleries, churches, historical cemeteries et al.

The MSc is addressed to all professionals working in the field of cultural heritage preservation, including conservators, historians, archaeologists, museologists, educators, librarians and cultural heritage management specialists who wish to expand their knowledge background and focus on the management of cultural heritage within a fast changing, challenging environment.

Webpage: [Διατήρηση & Διαχείριση Πολιτισμικής Κληρονομιάς](#)

## **DOCTORAL STUDIES (PHD)**

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The Department of Environment of the School of Environment of the Ionian University provides the opportunity to conduct Doctoral Studies (PhD) in fields that are within the research interests and/or the specialist knowledge field of the staff members of the Department. Ph.D. Studies aim to produce high quality scientific research and to create scientists capable of contributing to the advancement of science, research, and applications.

The successful PhD candidates are intended to staff the research, business, and educational workforce of Greece and abroad. The Department, inline with the University's culture, values doctoral research students as a source of academic prestige and of international distinction and that they ought to contribute to the qualitative and quantitative advancement of research.

Admissions are accepted (Article 38 of Law 4485/ 2017) from candidates that hold a Master's Degree from a National University or a university which is formally recognised as an equivalent to the Greek Universities, or an advanced undergraduate degree which offers an integrated Master qualification according to Article 46 of Law 4485/2017. Candidates should be proficient in advanced writing and spoken Greek and/or English languages. If the doctoral thesis is written in another language, the candidate submits an extensive summary in Greek attached to the doctoral thesis.

Webpage: [Διδακτορικές Σπουδές](#).

## **LIFELONG LEARNING TRAINING PROGRAMMES**

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The Greek State by law 4485/4-8-2017 states that one of the main aims of Universities is "to contribute to lifelong learning through modern teaching methods, including distance learning, based on scientific and technological research at the highest quality level in accordance with internationally recognised criteria" and to this end enables to Universities to establish Centers for Training and Lifelong Learning.

The Ionian University Lifelong Learning Center (KE.DI.VI.M. ) was founded by the 47268/Z1 decision of the Minister of Education, Research and Religious Affairs (Government Gazette ΦΕΚ 1149/29-03-2018 issue B.). The 13<sup>th</sup> / 07-02-2019 meeting of the University Senate formed the Council and with the Government Gazette ΦΕΚ 1186/09-04-2019, the Rules of Procedure of the Center were formally adopted.

The Centre for Lifelong Learning(KE.DI.VI.M.) of the Ionian University aims to connect the University's expertise in science and culture to all interested parties. The Centre aims to offer programmes that meet the changing needs of the society and to promote equality by offering access to further education and knowledge. The programmes offer both theoretical background and links to practice, and the applied sciences where relevant, enabling the acquisition of professional skills for the workforce.

The staff of the Department of Environment contribute to the Lifelong Learning Center by offering their expertise and by developing educational programs, that are delivered by the Lifelong Learning Centre of the University.

Webpage: [KEΔΙΒΙΜ](#).

## STUDENT MATTERS

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### YEAR– ONE STUDENTS

Year-one students, once they find out, via the Ministry of Education webpage (with their personal codes), that they were successful in their exam and they have the right to enrol to the degree of the Department of Environment, must regularly visit the Departmental webpage to find out about current opportunities and provisions. In summary, all year-one students:

- Complete the **enrolment**, after the relevant announcement of the Ministry of Education and that of the Department of Environment found on our website.
- Once completing the registration process via our departmental webpage, students get their **personal electronic access codes**, which can be used when seeking access to Student Welfare or other Electronic Academic Services. It is important to keep these codes because using these, first-year students can electronically issue their **academic student card**. (following the instructions found on the relevant webpage). A second announcement for **module selection** asks students to enrol electronically to the modules of their choice of the first semester.
- Students may be eligible for free subsistence (when they meet the criteria seen in FEK. No. Φ5 / 68535 / B3 / 18-6-2012 Joint Ministerial Decision). Information on the procedure for issuing of the **subsistence card** will be announced on our website (announcements tab). Students holding this card can eat for free in the university restaurant, located in the campus.
- At present, the Department does not offer University **Accommodation**, so students need to seek private accommodation on the island of Zakynthos.
- The Departmental website provides a wealth of information including the academic calendar and teaching timetable. Students are advised to visit our website regularly.
- A **Student Bus Service** operates during the semester to facilitate students traveling from the centre of Zakynthos city to the Department. This is a cooperation between the Department and the local public bus company (KTEL) of Zakynthos. There are 4 or 5 bus services during workdays from downtown Zakynthos (stops Solomos Square station or Saint Dionysius) to the Department with return. There are two bus services in the weekend to facilitate students who want to visit the university restaurant. Students can issue a monthly travel card valid for this route. The bus timetable is planned based on the teaching and exam timetable. The travel card is issued at the offices of KTEL to those students exhibiting the evidence of their student status (student card or letter of enrolment). Information on the bus route timetable is found on our website.

### LIBRARY

The Library of the Department of Environment of the Ionian University, is a hub where information is collected, being processed, and disseminated. The library supports learning, teaching and research and holds a collection of hard-copy books, a collection of digital books

and scientific journals, doctoral dissertations, and undergraduate dissertations. The library thus covers a substantial range of the needs of the academic community, i.e. its users. The Departmental library is housed within the University's main building at Zakynthos Campus. There are study spaces including a reading room with computer facilities for the library users. The library provides the following user services: Borrowing books, Interlibrary Loans, Wireless Network, Secure Network Access, Library Catalogue, Dissertation Repository, access to Electronic Resources (IP controlled), Module Bibliographies.

### **SUBSISTENCE – STUDENT RESTAURANT**

The Department of Environment offers subsistence to their students and it is free of charge to those students who meet the criteria detailed at the Φ5 / 68535 / B3 / 18-06-2012 Ministerial Decision. The student restaurant is located within the campus, and it is located only a few meters from the main building. For any further information contact the Departmental Administration Office, tel. 26950 21050.

### **ERASMUS+**

Via the Erasmus+ Programme, the European Commission grants university students, and staff to visit organisations and institutions abroad. Erasmus + aims at improving skills and employability, as well as modernising education and training systems.

The Department of Environment of the Ionian University participates in the LLP/ERASMUS Programme with the following activities: teaching staff mobility for teaching or training, administrative staff mobility for training, student mobility to study abroad, student mobility for vocational training. These actions are carried out at European Universities or organisations with which the Department has concluded a bilateral agreement. Erasmus + activities that students can participate are:

#### **Study abroad –undergraduate student mobility**

Students enrolled in a programme of study offered by the Department of Environment of the Ionian University are eligible to participate. Students can go abroad to study for 3 to 12 months.

#### **Student mobility for vocational training**

Undergraduate students and doctoral candidates who are enrolled in the Department of Environment of the Ionian University, as well as recent graduates, have the right to participate.

For more information, visit the [Department of International and Public Relations](#).

### **IONIO OPEN E-CLASS [WEB-BASED LEARNING PLATFORM]**

The **IonioOpen-Class** platform is an integrated Electronic Course Management System and it has been proposed by the Greek Universities Network (GUNET, [www.gunet.gr](http://www.gunet.gr)) to support asynchronous web-based distance Teaching and Learning. It is designed to assist the educational processes, it is actively supported by GUNET and it is distributed freely as it is developed based on the philosophy of open-source software. The introduction of asynchronous

distance-learning offers new opportunities to education, giving a means of interaction and continuous communication between instructor and trainee. The platform supports the management and presentation of educational material which can be accessed by the student at their own time, eliminating the limiting factors of space and time of classical teaching, and thus creating the conditions for a dynamic educational environment.

The IonioOpene-Class is designed to implement new Learning & Teaching models. Central to this are the role of the users, that is both of the teacher and of the learner. The user-teacher can quickly create easy-to-use and functional electronic courses, by uploading the relevant educational material, which can be in several different digital formats (e.g. pdf notes, presentations, texts, images, videos, weblinks etc.). All registered users have access to the knowledge offered without the restrictions of obtaining special software, because e-Class can be accessed from any web browser, from a desktop or mobile phone, without much background knowledge to be of essence.

Access to this service is provided here: [IonioOpeneClass](#).

## EDUCATIONAL AND ADMINISTRATIVE OPERATION DURING THE SARS-COV-2 VIRUS PANDEMIC

The Ionian University Chancellor's Executive Board, considering the Joint Ministerial Decisions for "Extraordinary measures to protect public health against the risk of further spread of SARS-COV-2" has decided until further notice, that:

- The **educational process** of all University programmes including Lifelong Learning offered by ULC will be conducted exclusively using distance learning methods; any kind of educational process, which requires physical presence is suspended. This includes attendance to **laboratory teaching**, laboratory exercises, and the **vocational work placement** in host institutions, that is otherwise required by the academic curriculum of a programme of studies.
- Any **examination** that requires physical presence shall be suspended for the entire period of validity of the exceptional measures.
- **Student restaurants** shall provide only food packed to take away during the period of validity of these exceptional measures, in accordance with Article 6 of Regulation No 115744/Z1/4.9.2020 KYA (B' 3707).
- The operation of **administrative services** will be by distance as much as possible considering the nature of the tasks. Working by distance is compulsory up to further notice, for administrative members of staff who belong to the high risk group, as defined by the government. When the nature of the task does not permit home-working, it will be carried out by appointment. This procedure is Compulsory.
- In all cases of **in situ activity** at all premises of the Ionian University, Compulsory personal protective measures must be followed. These include social distancing of 1.5 meters, and the use of a non-medical face mask in all indoor and outdoor areas of the University. Exception



to this is (a) for those who work in an individual area without the presence of any other person., and (b) persons for whom the use of a mask is not prohibited for medical reasons proven by appropriate documents.

## APPENDIX

A summary table of the programme modules with information on their ECTS is presented in the following 3 pages.

	Theory hrs	Laboratory hrs	Practical Exercises	Total Hours/week	ECTS Theory	ECTS Labc
Environmental Science	4			4	4	5
	5			5	5	6
	4	3		7	7	5
	3			3	3	4
	3			3	3	4
	2	2		4	4	3
	<b>21</b>	<b>5</b>	<b>0</b>	<b>26</b>	<b>26</b>	<b>27</b>
	2		2	4	4	4
	4			4	4	5
Environment of wildlife	3			3	3	4
	4			4	4	5
	3			3	3	4
	2	2		4	4	3
Environment I	<b>3</b>			<b>3</b>	<b>3</b>	<b>4</b>
	<b>21</b>	<b>2</b>	<b>2</b>	<b>25</b>	<b>25</b>	<b>29</b>
Mechanics	4		2	6	6	6
	4	2		6	6	5
En Systems	2	3		5	5	2
Environmental Chemistry	3	3		6	6	4
	4			4	4	4
	2	2		4	4	3
	<b>19</b>	<b>10</b>	<b>2</b>	<b>31</b>	<b>31</b>	<b>24</b>
Ecology	4			4	4	5
Statistics	3	3		6	6	3
	5			5	5	6

	Theory hrs	Laboratory hrs	Practical Exercises	Total Hours/week
	4		2	6
	2		2	4
	3		2	5
	4			4
	3			3
	3			3
total management standards	3			3
communication	3			3
	<b>19</b>	<b>0</b>	<b>6</b>	<b>25</b>
	4			4
	3		2	5
	2	3		5
environment	2	2		4
	2		2	4
skills	2		2	4
	3			3
	3			3
	<b>16</b>	<b>5</b>	<b>4</b>	<b>25</b>

	Theory hrs	Laboratory hrs	Practical Exercises	Total Hours/week	ECTS Theory	ECTS Laboratory
Protected Species and Areas	4			4	4	5
Pollution	3		2	5	5	6
Quality Sources II	4			4	4	5
Quality	3			3	3	4
Quality	3			3	3	4
Ecological systems	3			3	3	4
Ecological systems and modelling of ecological data	3			3	3	4
Ecological systems-biodiversity	3			3	3	4
Ecological systems	3			3	3	3
Ecological systems and Cultural Monuments	3			3	3	3
Ecological systems-Port Writing	3			3	3	3
Ecological systems-Safety in the Workplace	3			3	3	3
Ecological systems-Methodologies	3			3	3	3
<b>Σ</b>	<b>23</b>	<b>0</b>	<b>2</b>	<b>25</b>	<b>25</b>	<b>30</b>
Environmental Impact	2	3		5	5	2
Environmental Impact	3			3	3	3
Environmental Impact						12
Environmental Processes of Hazardous Waste	3			3	3	4
Environmental processes-polluted soils and groundwater	3			3	3	4
Environmental Microbiology	3			3	3	4
Environmental and safeguarding of natural & cultural heritage	3			3	3	4
Environmental sampling Methods - Field Techniques	3			3	3	4
Environmental Quality	3			3	3	4
Environmental Impact on cultural heritage	3			3	3	3
Environmental Quality	3			3	3	3