

**Joint Undergraduate Program of Studies**

**Environmental Sciences and Engineering**

Regulation of studies

January 2026

**In the following text, Joint Undergraduate Program of Studies in English, or J.U.P.S.E refers to the Joint Undergraduate Program of Studies in English “Environmental Sciences and Engineering”**

## **Regulation of Studies**

***(Excerpt from the 15-01-2026 - 38739 Decision of the Senate of Aristotle University of Thessaloniki)***

### **Article 1**

#### **Awarded Title of Joint Undergraduate Program of Studies in English (J.U.P.S.E)**

The **Joint Undergraduate Program of Studies in English (J.U.P.S.E)** of the Schools of Physics (coordinator), Chemistry, Biology, Mechanical Engineering and Agriculture of the Aristotle University of Thessaloniki awards a **Diploma with Integrated Master in Environmental Sciences and Engineering**.

The successful completion of studies corresponds to level seven (7) of the National and European Qualifications Framework, in accordance with the provisions of article 47 of Law 4763/2020 (Government Gazette A' 254).

### **Article 2**

#### **Categories of Applicants**

Eligible to apply are foreign applicants who fall into one of the following categories:

(a) Graduates of high schools (lyceums in Greece) or equivalent schools that are located abroad. Applicants who have attended on a full-time basis the last two (2) grades of a high school or equivalent school in a foreign country must submit a high school diploma or another equivalent secondary education qualification that allows admission to higher education institutions in the country from which they graduate.

(b) Graduates of a recognized foreign school of other European Union Member States or third countries, located and lawfully operating in Greece, provided that the qualification awarded allows admission to higher education institutions located in the country whose educational curriculum the foreign school follows, and also provided that:

- (ba) neither the applicants nor their parents hold Greek citizenship, and
- (bb) they have attended on a full-time basis at least the last two (2) grades of high school (lyceum).

(c) Students enrolled in Schools of Natural Sciences, Environmental Studies, Polytechnic Schools, or related Schools of higher education institutions abroad, who hold the certificate referred to in paragraph 1 of Article 314A of Law 4957/2022, in order to continue their studies in a corresponding semester and be awarded a Diploma by the **Joint Undergraduate Program of Studies in English**

Foreign schools operating in Greece must be recognized for the legality of their operation by the competent local Directorate of Secondary Education.

The authenticity verification of the high school diploma and the applicant's transcript of records may be carried out in one of the following ways:

1. By an Apostille (Hague Apostille), provided that the country of origin of the documents is a party to the Hague Apostille Convention.
2. By certification by a notary public (notarial act).
3. By authentication by the Ministry of Foreign Affairs and/or the Ministry of Education of the issuing country.
4. By submission of the diploma and/or transcript, accompanied by direct notification of the foreign school by the applicant. This notification must include an official email from the foreign school, enabling the Program Secretariat to verify the authenticity of the submitted documents.

#### Proof of English Language Proficiency

Applicants are required to demonstrate English language proficiency at a minimum level of B2, in accordance with the Common European Framework of Reference for Languages (CEFR), in one of the following ways:

1. English as a native language.
2. An English language proficiency certificate at B2 level or higher, issued by a recognized examination body, in accordance with the applicable decisions of the Supreme Council for Civil Personnel Selection (ASEP) or the Ministry of Education regarding recognized language qualifications.
3. Degree from a Department of Foreign Languages and Literature or a Department of Foreign Languages, Translation and Interpreting of a Greek higher education institution, or an equivalent qualification from a recognized institution abroad.

4. Bachelor's, Master's, or Doctoral degree from a recognized higher education institution abroad, provided that the Program is conducted entirely in English.
5. Upper secondary school leaving certificate, provided that the applicant has attended at least the last two (2) years of secondary education at a school where English is the official language of instruction.
6. A license for foreign language teaching does not constitute proof of proficiency in that language by itself. Submission of the certified academic diploma on the basis of which the license was issued is required, along with an official translation, where applicable.

### **Article 3**

#### **Admitted Students, Selection Criteria and Required Documents**

The annual number of admitted students to the **Joint Undergraduate Program of Studies in English in Environmental Sciences and Engineering** is set at a **maximum of forty (40) undergraduate students**, while the minimum number of admitted students required for the Program to operate is set at twenty-four (24) undergraduate students. Upon recommendation of the Steering Committee and by decision of the Senate, the number of admitted students may be modified in each cycle of the Program.

In the event of a tie in the ranking of candidates, all candidates who are tied with the last admitted applicant shall be admitted to the Program, in accordance with their evaluation ranking.

The selection of admitted students is based on the applicants' curricula vitae, following evaluation of the application files and supporting documents by the Steering Committee, as well as the applicants' participation in the selection process. This process includes an oral interview, conducted online by members of the Steering, which assesses communication skills and ability to substantiate reasoning, academic and personal readiness, and general understanding of environmental issues. By decision of the Curriculum Steering, as specified in the call for applications, a knowledge assessment test may be conducted prior to the interview, in a format and on subject areas determined each time by the Steering Committee.

Applications are submitted electronically throughout the year until all available places are filled. Prospective students are required to submit their applications,

accompanied by the necessary supporting documents, to the Program Secretariat in electronic form.

In case the Steering Committee decides to conduct a knowledge test in the English language, the call for applications will specify the examination dates, the subject areas, as well as the scheduled dates for the interviews. The evaluation follows the chronological order of receipt of applications. The call for applications is published by the Program Secretariat in March of each year, and the corresponding required supporting documents are announced on the Program's website.

Applicants are required to submit the following documents:

- Application form for participation in the **Joint Undergraduate Program of Studies in English (J.U.P.S.E.)**, available in electronic format on the Program's website.
- Photocopy (both sides) of an **Identity Card** or **Passport**.
- **High school diploma** (with an official translation into English).
- **Official transcript of grades** for all subjects of the final year high school education (with an official translation into English), indicating that the applicant has successfully been examined in Mathematics, Physics, and Chemistry, or in the corresponding subjects as described in the relevant certificate.
- Certificate of **English language** proficiency at a minimum level of **B2**.
- **Motivation Letter**, of up to five hundred (500) words, outlining the applicant's interest in environmental sciences, the motivation for enrolling in the Program, and future academic and professional goals.
- **Short curriculum vitae (CV)** including information on education, distinctions, volunteer work, or other activities relevant to the field of study.

The above selection criteria and required documents may be amended by the Steering Committee and approved by the Senate of the Aristotle University of Thessaloniki.

The following optional academic criteria are taken into positive consideration during the evaluation of the applicant's file:

- **Minimum overall high-school diploma grade: sixty-five percent (65%)** of the maximum grade, or an equivalent qualification.
- Certifications for entry into higher education, such as:
  - International Baccalaureate (IB): minimum **28/45**.
  - GCE A-Levels: at least **BBB** in three (3) subjects, with particular emphasis on subjects such as Mathematics, Physics, Chemistry, Biology, etc.
  - Advanced Placement (AP): scores of four (4) or five (5) in relevant subjects such as Mathematics, Physics, Chemistry, Biology, etc.
  - SAT / ACT: **SAT** ≥ 1000/1600, **ACT** ≥ **24/36**.

For the evaluation and selection of applicants, additional criteria are taken into consideration. These criteria are defined and may be revised following a recommendation of the Steering Committee, in accordance with the legislation at that given time.

The original documents, if necessary, may be requested from the applicant to be submitted by post or in person to the Program Secretariat.

The **final selection procedure** for admission to the Program is carried out by the Steering Committee as follows: The Committee draws up a complete list of all applicants and after a first review, rejects those not meeting the minimum criteria set by law and by the Program. The Committee then invites shortlisted applicants to an interview, provided that they have submitted all the required supporting documents. Upon completion of the procedure — evaluation of the application file, the interview, and the knowledge assessment test (where applicable) — the final list of successful candidates is drawn up.

**The final list of admitted candidates** and any alternate candidates is validated by the Steering Committee. The selection process, publication of results, and enrolment of admitted students must be completed by September, 30, of each academic year, subject to the filling of any vacancies arising from students who voluntarily withdraw from the Program by discontinuing their studies. Such vacancies are filled in order of ranking from the alternate candidates list, as drawn up by the Steering Committee during the evaluation process.

Furthermore, the option of enrolment in the Program is also provided to students of higher education institutions abroad who hold a certificate of evaluation of a certain study period completed at a recognized higher education institution abroad (paragraph 1 of Article 314A of Law 4957/2022, as amended by Article 128

of Law 5094/2024), in order to continue their studies and be awarded the corresponding Diploma qualification.

The student submits an application for admission, together with the required supporting documents, to the Program Secretariat in hard copy or electronic form, via the Electronic Enrolment Information System of the Ministry of Education, Religious Affairs and Sports.

### Vacant Positions

In the event of a student's withdrawal or deletion, the Steering Committee may, by a duly reasoned decision, proceed to the filling of the vacant position, in excess of the number of admitted students for the respective year, in order to ensure the smooth operation of the Program by maintaining a stable number of students in each academic year.

The vacant position may be filled by students enrolled in Schools of Natural Sciences, Environmental Studies, Polytechnic Schools, or related Schools, studying in the same or a higher semester at internationally recognized higher education institutions abroad.

The selection of candidates may be carried out either from applicants who had submitted an application during the initial application cycle, or through a separate public call for applications.

Interested candidates are required to submit the following supporting documents:

- Copy of an identity card or passport,
- High-school diploma (original and official translation into English),
- Official transcript of grades of all subjects of the final year of high school (original and official translation into English),
- Official transcript from the home institution (in cases falling under paragraph 1 of Article 314A of Law 4957/2022),
- Official curriculum / study Program of the home institution for the purpose of academic equivalence assessment (in cases falling under paragraph 1 of Article 314A of Law 4957/2022),
- Proof of English language proficiency, in accordance with the relevant provision of Article 4 of the present Regulations,
- Letter of expression of interest, and

- Curriculum vitae (CV).

The Steering Committee evaluates the application files and may invite candidates to an interview prior to issuing its final decision.

**Appeals** against the results may be submitted within five (5) working days from the notification of the results, by means of a written application to the Secretariat of the **Joint Undergraduate Program of Studies in English**

Enrolment of successful candidates is carried out following an announcement by the Program Secretariat within fifteen (15) days, upon submission of any required supporting documents. In the event that a candidate fails to complete enrolment within the prescribed deadline, including the payment of the required tuition fee deposit, this shall be deemed a refusal of acceptance of the offered place, which shall then be offered to the next candidate on the reserve list.

It is clarified that applications and any acceptance of admission apply exclusively to the academic year specified in the respective call for applications. Provisional admission or reservation of a place for subsequent academic semesters or years is not provided, regardless of the reason, including, indicatively, military service or personal obligations. Candidates wishing to enrol in a later academic year must submit a new application in a subsequent application cycle and the corresponding call.

As an exception, the Steering Committee may, by a duly reasoned decision, approve a deferral of the commencement of studies for one academic year, provided that serious reasons are demonstrated and adequately documented by the interested applicant. The decision to grant or refuse such deferral lies exclusively within the discretion of the Steering Committee.

#### **Article 4**

##### **Duration and Conditions of Study.**

The duration of studies in the **Joint Undergraduate Program of Studies in English** leading to the award of the Diploma “Diploma with Integrated Master in Environmental Sciences and Engineering,” is set at **ten (10) instructional semesters**, on a full-time basis.

The duration of each semester course is thirteen (13) weeks and is delivered through lectures, coursework assignments, and other teaching methods,

depending on the requirements of each course and the discretion of the respective instructor.

All courses are conducted **in person**, using the infrastructure of the participating Schools. The exceptional use of **synchronous distance learning methods** is permitted for teaching activities involving faculty members from institutions abroad or collaborating instructors or in cases of extraordinary circumstances, where in-person instruction or the use of the participating Schools' infrastructure is not feasible. Distance learning is also permitted for the organization of advanced courses and tutorial sessions, beyond the compulsory teaching hours per course. Distance learning is carried out through the use of Information and Communication Technologies (ICT), using the technical infrastructure of the participating Schools, as well as the expertise and support of the Digital Governance Unit (DGU) of the Aristotle University of Thessaloniki.

The minimum duration of study required for the awarded Diploma is ten (10) academic semesters, while the maximum duration of study extends to six (6) additional academic semesters. Upon completion of the maximum duration of study, and subject to the applicable higher education legislation, a decision for deletion (dismissal) from the Program is issued by the competent body of the J.U.P.S.E

Provided that enrolment and all related procedures have been completed and students have not exceeded the maximum duration of study, they may apply for a temporary suspension of studies for a period not exceeding two (2) academic years in total. The suspension of studies may be exercised once or in instalments for a minimum period of one (1) academic semester at a time;. During the suspension period, student status is suspended, and participation in any educational activity is not permitted. The period of suspension is excluded from the maximum duration of regular study. Upon resumption of studies, students return to regular student status with all rights and obligations provided for by the Program. This procedure is initiated through a written application submitted by the interested student to the Program Secretariat, accompanied by the required supporting documents, and is evaluated by the Steering Committee.

For serious health-related reasons concerning the student, or a first-degree blood relative, a spouse, or a person with whom the student has entered into a civil partnership, an exceptional extension of the maximum duration of study may be granted, not exceeding one (1) academic year. Such an extension is approved by the Steering Committee, following a fully reasoned and adequately documented

application submitted by the student, and may not exceed two (2) consecutive academic semesters.

Part-time study is not available in the Program.

Matters concerning re-examination of failed courses or dismissal from the Program for reasons such as:

(a) insufficient academic progress of the student (as evidenced by lack of participation in the educational process, including attendance and examinations),

(b) conduct that violates academic ethics, and

(c) a request submitted by the student himself/herself,

are decided by the Steering Committee.

## Article 5

### Student Rights and Obligations - Responsibilities

Within the framework of the social policy of the Schools of Physics, Chemistry, Biology, Mechanical Engineering, and Agriculture, in collaboration with the Equal Access Unit of Aristotle University of Thessaloniki, the full, equitable, and meaningful participation of all students with disabilities or special educational needs is ensured in all educational, research, and administrative activities of the Schools in general and specifically of the J.U.P. S.E.

Access to the teaching and examination facilities of the Schools of Physics, Chemistry, Biology, Mechanical Engineering, and Agriculture is facilitated through appropriate infrastructure, such as ramps, handrails, and elevators. For students who, due to disability or learning difficulties, are unable to participate in written examinations, the option of an **oral** examination is provided, either in-person in an accessible classroom or remotely via a digital teleconferencing platform.

Students enrol and participate in the J.U.P.S.E under the terms and conditions set forth in this Regulation. Students of the Program enjoy all the **rights, benefits, and accommodations** provided to students of the Greek-language study Program, **except for the provision of free textbooks.**

Students admitted to the J.U.P.S.E. **are required to:**

1. Attend all courses of the Study Program, whether delivered **in-person** or, exceptionally, remotely, provided that the latter has been approved by the competent bodies of the Program. Participation in lectures, exercises, examinations, public lectures, and other educational activities is mandatory. Students are allowed absences of up to 30% of the total instructional hours per course each semester. In case of serious and justified impediments, make-up of instructional hours may be arranged in coordination with the course instructor and with the approval of the Steering Committee.
2. Submit all required assignments on time, as specified by the instructor for each course.
3. Register on time for any courses from previous years that have not been successfully completed at the beginning of each semester. These registrations are recorded electronically via the student e-office service and included in the student's individual record and this procedure is mandatory for elective courses in the final year.
4. Acquire the necessary textbooks as recommended by the instructor for each course, (or borrow when deemed necessary.)
5. Regularly monitor Program and Secretariat announcements and check their electronic correspondence.
6. Obtain an academic ID card through the relevant electronic service of the Ministry of Education, Religion, and Sports.
7. Timely pay the tuition fees before the winter and spring semesters of each academic year, in accordance with the prescribed deadlines.
8. Settle all financial or other obligations to the Program and the University prior to graduation. Failure to do so may result in the student being ineligible to participate in the graduation ceremony.
9. Fulfil any obligations associated with reciprocal scholarships, which may include supporting the educational or research functions of the Program, the library, or other School needs.
10. Respect the decisions of the Program's governing bodies and adhere to the rules of academic integrity.

Systematic or serious violation of the obligations arising from this Regulation, without sufficient and well-documented justification, may result in failure of a course, or in serious cases, exclusion from educational activities and/or dismissal from the Program, following a decision by the Steering Committee.

The same sanctions may be applied in cases of disciplinary offenses that harm the academic community and the dignity of its members, including sexist, racist, homophobic, or transphobic behavior, verbal or physical violence, inappropriate conduct within university premises, or any action contrary to the principles of respect, equality, and inclusion. Finally, the Committee reserves the right to refer relevant cases to the competent disciplinary bodies of the University or, if warranted, to the appropriate authorities of the legal system, in accordance with applicable law.

## Article 6

### Curriculum - Student Evaluation

The **Joint Undergraduate Program of Studies in English (J.U.P.S.E.)** “Diploma with Integrated Master in Environmental Sciences and Engineering” offers a full-time, integrated five (5) academic year Program, structured into ten (10) academic semesters. The curriculum comprises fifty (50) courses in total and a diploma thesis, of which thirty-four (34) courses are compulsory and sixteen (16) are elective. As a general guideline, courses are distributed at a rate of five (5) courses per semester.

**Compulsory Courses (C):** Students are required to attend and successfully complete thirty-four (34) compulsory courses, earning a total of two hundred and four (204) ECTS credits during their studies. The compulsory courses aim to provide students with fundamental knowledge and methodology in the core fields that traditionally constitute the core of Environmental Sciences and Engineering worldwide.

**Elective Courses (E):** The Program offers sixteen (16) elective courses, from which students have to choose and successfully complete eleven (11) courses during the seventh (7th), eighth (8th), and ninth (9th) semesters in any combination they wish, earning an additional sixty-six (66) ECTS credits. Elective courses are designed to introduce students, according to their interests, to specialized areas of knowledge.

During the tenth (10th) semester, students complete a diploma thesis, earning thirty (30) ECTS credits. Successful completion of the entire Program results in a total of three hundred (300) ECTS credits.

Instruction is conducted in-person, with digital support for educational materials and communication between students and instructors via the Aristotle University of Thessaloniki e-learning platform. Attendance is mandatory, and absences may not exceed thirty percent (30%) of the instructional hours per semester, except in cases of documented force majeure.

The academic year is divided into two (2) semesters (fall and spring), each consisting of thirteen (13) weeks of instruction, followed by an examination period at the end of each semester. Successful completion of the Program requires the accumulation of three hundred (300) ECTS credits.

All courses are taught in English. The Program does not require mandatory internships, but students have the opportunity to participate in environmental research projects.

## Curriculum of J.U.P.S.E

| Code | CURRICULUM   Mandatory Courses | Hours/week | ECTS |
|------|--------------------------------|------------|------|
|------|--------------------------------|------------|------|

### 1<sup>st</sup> Semester

[21]

[30]

|     |   |   |   |
|-----|---|---|---|
| 1.1 | Physics I (Mechanics, Waves, Optics, Thermodynamics, Heat transfer) | 5 | 6 |
| 1.2 | Mathematics I (Calculus, Linear algebra, Vectors)                   | 4 | 6 |
| 1.3 | Introduction to Environmental Science and Engineering               | 4 | 6 |
| 1.4 | Principles of General Chemistry                                     | 4 | 6 |
| 1.5 | Principles of Biology   | 4 | 6 |

### 2<sup>nd</sup> Semester

[21]

[30]

|     |   |   |   |
|-----|---|---|---|
| 2.1 | Physics II (ElectroMagnetism, Modern Physics)     | 5 | 6 |
| 2.2 | Mathematics II (Calculus II, Multi variable)      | 4 | 6 |
| 2.3 | Principles of Ecology                             | 4 | 6 |
| 2.4 | Programming (Python)                              | 4 | 6 |
| 2.5 | Fundamentals of Physical and Analytical Chemistry | 4 | 6 |

**3<sup>rd</sup> Semester****[20]****[30]**

|     |   |   |   |
|-----|---|---|---|
| 3.1 | Earth Sciences  | 4 | 6 |
| 3.2 | Environmental Chemistry   | 4 | 6 |
| 3.3 | Bioeconomy and Rural Sustainable Development                                      | 4 | 6 |
| 3.4 | Introduction to Data Analysis -Reporting and Management Tools                     | 4 | 6 |
| 3.5 | Applied Mathematics with programming (Differential Equations, Numerical Analysis) | 4 | 6 |

**4<sup>th</sup> Semester****[20]****[30]**

|     |  |   |   |
|-----|--|---|---|
| 4.1 | Animals and Plants   | 4 | 6 |
| 4.2 | Chemical and Biochemical processes and engineering         | 4 | 6 |
| 4.3 | Atmospheric Physics and Climate                            | 4 | 6 |
| 4.4 | Irrigation Engineering and Water Management in Agriculture | 4 | 6 |
| 4.5 | Environmental Engineering and Assessment Tools             | 4 | 6 |

**5<sup>th</sup> Semester****[21]****[30]**

|     |   |   |   |
|-----|---|---|---|
| 5.1 | Physics of Climate Change               | 4 | 6 |
| 5.2 | Environmental Policy                    | 4 | 6 |
| 5.3 | Natural Resources Management            | 5 | 6 |
| 5.4 | Industrial Process Design and Economics | 4 | 6 |
| 5.5 | Ecosystem Dynamics and Management       | 4 | 6 |

**6<sup>th</sup> Semester****[20]****[30]**

|     |  |   |   |
|-----|--|---|---|
| 6.1 | Remote Sensing of the Environment            | 4 | 6 |
| 6.2 | Climate change mitigation                    | 4 | 6 |
| 6.3 | Biodiversity and conservation                | 4 | 6 |
| 6.4 | Circular Economy and Environmental Economics | 4 | 6 |
| 6.5 | Energy Systems and Environment               | 4 | 6 |

**7<sup>th</sup> Semester****[20]****[30]**

|     |                        |   |   |
|-----|------------------------|---|---|
| 7.1 | Air quality            | 4 | 6 |
| 7.2 | Waste Management       | 4 | 6 |
|     | Elective course        | 4 | 6 |
|     | <i>Elective course</i> | 4 | 6 |
|     | <i>Elective course</i> | 4 | 6 |

**8<sup>th</sup> Semester****20****30**

|     |   |   |   |
|-----|---|---|---|
| 8.1 | Agricultural waste valorization         | 4 | 6 |
| 8.2 | Energy systems in the urban environment | 4 | 6 |
|     | <i>Elective course</i>                  | 4 | 6 |
|     | <i>Elective course</i>                  | 4 | 6 |
|     | <i>Elective course</i>                  | 4 | 6 |

**9th Semester****20****30**

|  |                        |   |   |
|--|------------------------|---|---|
|  | <i>Elective course</i> | 4 | 6 |
|  | <i>Elective course</i> | 4 | 6 |
|  | <i>Elective course</i> | 4 | 6 |
|  | <i>Elective course</i> | 4 | 6 |
|  | <i>Elective course</i> | 4 | 6 |

**10th Semester****30**

|  |                       |  |    |
|--|-----------------------|--|----|
|  | Diploma/Master thesis |  | 30 |
|  |                       |  |    |

**Table with Elective Courses (choose 11 out of 16)**

|     |  |   |   |
|-----|--|---|---|
| E1  | Atmospheric Measurement Techniques         | 4 | 6 |
| E2  | Air Quality Modeling                       | 4 | 6 |
| E3  | Solar radiation modeling tools             | 4 | 6 |
| E4  | Environmental Radioactivity                | 4 | 6 |
| E5  | Earth-Space Interactions                   | 4 | 6 |
| E6  | Environmental Impact Assessment Tools      | 4 | 6 |
| E7  | Environmental Data Science and Informatics | 4 | 6 |
| E8  | Sustainable Supply Chain Management        | 4 | 6 |
| E9  | Recycling                                  | 4 | 6 |
| E10 | Agricultural Ecosystems                    | 4 | 6 |

|     |   |   |   |
|-----|---|---|---|
| E11 | Climate-resilient cities: Floods and droughts       | 4 | 6 |
| E12 | Evolutionary Biology                                | 4 | 6 |
| E13 | Environmental Microbiology and Biotechnology        | 4 | 6 |
| E14 | Ecosystem modeling and assessment                   | 4 | 6 |
| E15 | Natural and Man-made Disaster Management            | 4 | 6 |
| E16 | Applied Experimental Design and Predictive Modeling | 4 | 6 |

## Syllabus

### A. MANDATORY COURSES

#### 1.1 – PHYSICS I (MECHANICS, WAVES, OPTICS, THERMODYNAMICS, HEAT TRANSFER)

##### **COURSE CONTENT:**

This course provides a comprehensive introduction to classical physics, covering fundamental physical quantities, vectors, and kinematics. It develops Newtonian mechanics, including forces, work, energy, momentum, and rotational motion, followed by rigid-body dynamics and equilibrium. Core thermodynamic principles are introduced, including temperature, heat, the laws of thermodynamics, and ideal gases. The course also covers oscillatory motion, mechanical waves, sound, and resonance. Finally, it introduces geometrical and wave optics, including reflection, refraction, lenses, interference, diffraction, and polarization, with applications relevant to environmental and engineering contexts.

## 1.2 – MATHEMATICS I (CALCULUS, LINEAR ALGEBRA, VECTORS)

### **COURSE CONTENT:**

The course introduces fundamental topics in differential and integral calculus, vector calculus, and linear algebra. It covers complex numbers, real functions of one variable, limits, derivatives, extrema, Taylor series, and functions expressed in parametric form. Integral calculus includes indefinite, definite, and improper integrals, with applications to real-world problems. Vector spaces and vector operations in three dimensions are presented, followed by matrix algebra and methods for solving systems of linear equations. Emphasis is placed on analytical thinking, quantitative problem solving, and mathematical tools required for environmental science and engineering applications.

## 1.3 – INTRODUCTION TO ENVIRONMENTAL SCIENCE AND ENGINEERING

### **COURSE CONTENT:**

This course introduces students to the scope and role of environmental science and engineering, focusing on the interaction between engineering principles and environmental systems. It covers major environmental challenges and corresponding engineering solutions, including water and wastewater treatment, air pollution sources and control, solid and hazardous waste management, environmental impact assessment, sustainability, and resilience. The course emphasizes basic environmental measurements, problem-solving approaches, and the application of sustainability principles in engineering practice, preparing students for interdisciplinary environmental problem solving.

## 1.4 – PRINCIPLES OF GENERAL CHEMISTRY

### **COURSE CONTENT:**

This course introduces fundamental principles of general chemistry with a strong emphasis on environmental applications. Topics include atomic structure, periodic trends, chemical bonding, molecular structure, and stoichiometry. The course examines chemical reactions, states of matter, gas laws, thermochemistry, and solution chemistry, including acids, bases, buffers, and pH. Environmental relevance is highlighted through applications to air and water chemistry, acid rain, ocean acidification, and contaminant behavior. Laboratory exercises develop basic chemical techniques, safety practices, and analytical skills relevant to environmental monitoring.

## 1.5 – PRINCIPLES OF BIOLOGY

### **COURSE CONTENT:**

This course provides an introduction to foundational biological concepts across molecular, cellular, organismal, and ecological levels. It covers the chemical basis of life, cell structure and function, metabolism and energy transfer, DNA structure and gene expression, and the principles of evolution and natural selection. The course also explores biological diversity, ecosystems, and environmental biology, emphasizing the role of biology in understanding and protecting the natural environment. Scientific methodology, critical thinking, and effective communication of biological knowledge are core components of the course.

## 2.1 – PHYSICS II (ELECTROMAGNETISM, MODERN PHYSICS)

### **COURSE CONTENT:**

This course extends classical physics into electromagnetism and modern physics. It covers electrostatics, electric potential, conductors, and magnetic fields produced by currents, including electromagnetic induction and Maxwell's equations. Electromagnetic waves, radiation, reflection, and polarization are introduced. The course then explores special relativity, including Lorentz transformations and relativistic energy and momentum. Foundations of quantum mechanics are presented through key experiments, wave-particle duality, the Schrödinger equation, and simple quantum systems. Atomic, molecular, solid-state, nuclear, and particle physics concepts are discussed, linking microscopic structure to material properties and modern cosmology.

## 2.2 – MATHEMATICS II (CALCULUS II, MULTI VARIABLE)

### **COURSE CONTENT:**

The course develops calculus and analysis for functions of several variables, with emphasis on geometric interpretation and applications. Topics include limits, continuity, partial derivatives, and the chain rule for multivariable functions. Vector calculus is introduced through vector fields, directional derivatives, gradient, divergence, and curl. Fundamental theorems such as Green's, Stokes', and Gauss' theorems are applied using line, surface, and volume integrals. The course also introduces ordinary differential equations, covering first-order equations and basic second-order linear differential equations, providing mathematical tools essential for environmental sciences and engineering.

## 2.3 – PRINCIPLES OF ECOLOGY

### **COURSE CONTENT:**

This course examines ecological principles governing organisms and their interactions with the environment, with emphasis on ecosystem structure and function. Topics include evolution, population dynamics, ecological interactions, community structure, food webs, energy flow, and biogeochemical cycles. The course addresses ecosystem dynamics in space and time and ecological responses to environmental change. Laboratory and field activities focus on population and community models, as well as measurements of productivity, abundance, and biomass in relation to abiotic factors, linking theory to applied environmental assessment.

## 2.4 – PROGRAMMING (PYTHON)

### **COURSE CONTENT:**

This course introduces fundamental principles of programming and computational problem-solving using Python. Students learn core syntax, control structures, functions, modules, and common data structures. Object-oriented programming concepts, file handling, and basic database operations are introduced. The course also covers introductory data processing and visualization using standard Python libraries. Emphasis is placed on algorithmic thinking, debugging, documentation, and best programming practices. Through hands-on exercises and a final project, students develop practical skills for designing and implementing software solutions relevant to scientific and engineering applications.

## 2.5 – FUNDAMENTALS OF PHYSICAL AND ANALYTICAL CHEMISTRY

### **COURSE CONTENT:**

This course introduces core principles of physical and analytical chemistry with applications to environmental systems. Physical chemistry topics include states of matter, thermodynamics, phase equilibria, molecular structure, transport phenomena, and chemical kinetics. Students study reaction mechanisms, rate laws, and factors affecting reaction rates, supported by experimental measurements. Analytical chemistry covers qualitative and quantitative analysis, titrimetric and gravimetric methods, chemical equilibrium, buffer systems, pH, instrumental analysis, and method validation. Laboratory exercises develop practical skills for environmental chemical analysis and monitoring.

### 3.1 – EARTH SCIENCES

#### **COURSE CONTENT:**

This course introduces Earth Sciences as an integrated Earth system, covering the interactions between the lithosphere, hydrosphere, atmosphere, and biosphere. Topics include the formation of the Earth and the Solar System, geological time, minerals and rocks, plate tectonics, faulting and mountain building. Surface processes such as weathering, erosion, and sedimentation are examined alongside the hydrologic cycle, groundwater systems, oceans, and ocean-atmosphere interactions. The course also addresses atmospheric structure, weather systems, climate, climate change, and natural hazards, linking Earth Science knowledge to sustainability, resource management, and societal challenges.

### 3.2 – ENVIRONMENTAL CHEMISTRY

#### **COURSE CONTENT:**

This course explores the chemical processes governing the atmosphere, hydrosphere, lithosphere, and built environment. It covers atmospheric composition, greenhouse effect, ozone depletion, air pollution sources, dispersion, photochemical smog, and acid rain. Aquatic chemistry topics include water pollution, heavy metals, toxic organic compounds, and pollutant fate in surface and groundwater. Soil pollution, wastewater treatment, and solid and hazardous waste management are examined. Special emphasis is placed on chemical degradation of natural stone and cultural heritage materials due to environmental stressors, biological activity, and atmospheric pollution, supported by laboratory-based experimental training.

### 3.3 – BIOECONOMY AND RURAL SUSTAINABLE DEVELOPMENT

#### **COURSE CONTENT:**

This course introduces the principles of bioeconomy and their application to sustainable agricultural and rural development. It examines biological resources, biomass utilization, and bio-based value chains, emphasizing environmental sustainability and socio-economic impacts. Students explore theories and practices of rural development, entrepreneurship, and innovation, supported by

case studies from European and Mediterranean contexts. The course highlights strategies for sustainable rural transformation, integrating environmental protection, economic resilience, and social development.

### 3.4 – INTRODUCTION TO DATA ANALYSIS – REPORTING AND MANAGEMENT TOOLS

#### **COURSE CONTENT:**

This course provides an introduction to probability, statistics, and data analysis for scientific and engineering applications. Students learn descriptive statistics, data visualization, and frequency distributions, followed by fundamental probability concepts and probability distributions. Statistical inference is introduced through sampling distributions, point estimation, confidence intervals, and hypothesis testing. The course also covers goodness-of-fit tests and simple linear regression for modeling relationships between variables. Emphasis is placed on statistical reasoning, data interpretation, and effective communication of results using modern analytical tools.

### 3.5 – APPLIED MATHEMATICS WITH PROGRAMMING (DIFFERENTIAL EQUATIONS, NUMERICAL ANALYSIS)

#### **COURSE CONTENT:**

This course integrates applied mathematics with scientific programming to solve real-world environmental and engineering problems. It covers numerical methods for root finding, linear and nonlinear systems, interpolation, numerical differentiation and integration, and ordinary differential equations. Fourier analysis and Fast Fourier Transform methods are introduced for signal processing. The course also includes probabilistic methods, Monte Carlo simulations, numerical optimization, and introductory machine learning concepts such as artificial neural networks. Emphasis is placed on algorithm development, error analysis, data visualization, and critical evaluation of numerical solutions.

### 4.1 – ANIMALS AND PLANTS

#### **COURSE CONTENT:**

This course introduces the foundations of organismal biology, focusing on the diversity, evolution, morphology, and functional adaptations of animals and plants. It covers basic principles of biological classification, evolutionary relationships, and biodiversity. Major groups of invertebrates, vertebrates, non-vascular plants, and vascular plants are examined, alongside comparative

morphology and anatomy. Functional adaptations related to respiration, circulation, transport, growth, reproduction, and environmental response are explored. Laboratory and field activities provide hands-on experience in microscopy, dissection, identification, and comparative analysis of representative organisms.

#### 4.2 – CHEMICAL AND BIOCHEMICAL PROCESSES AND ENGINEERING

##### **COURSE CONTENT:**

This course introduces fundamental principles of chemical and biochemical engineering relevant to environmental and industrial processes. Topics include mass and energy balances, thermodynamics, and reaction kinetics for chemical and biological systems. Students study the modeling, analysis, and design of chemical reactors and bioreactors, including batch, continuous, and enzymatic systems. Core concepts of heat, mass, and momentum transfer are presented, together with experimental methods for process characterization. Emphasis is placed on environmental impact, safety, sustainability, and effective communication of engineering solutions.

#### 4.3 – ATMOSPHERIC PHYSICS AND CLIMATE

##### **COURSE CONTENT:**

This course examines the physical and physicochemical processes governing the atmosphere and climate system. Topics include atmospheric composition, thermodynamics, hydrostatic balance, radiation laws, radiative transfer, and the greenhouse effect. Atmospheric dynamics are introduced through equations of motion, geostrophic and thermal winds, waves, and general circulation. The course also addresses air pollution at urban, regional, and large scales, including photochemical smog and acid deposition, as well as climate change drivers, impacts, and international policy responses.

#### 4.4 – IRRIGATION ENGINEERING AND WATER MANAGEMENT IN AGRICULTURE

##### **COURSE CONTENT:**

This course focuses on sustainable management of agricultural water resources through agro-hydrological principles. It covers soil–water–crop interactions, estimation of crop water requirements, irrigation water needs, and optimized irrigation scheduling. Students study the optimal design of on-farm irrigation systems and collective irrigation networks, groundwater and surface-water hydrology, and irrigation water quality. The course integrates drainage system

design, smart farming technologies, precision irrigation, remote sensing, and policy frameworks supporting climate-resilient and sustainable agricultural water management.

#### 4.5 – ENVIRONMENTAL ENGINEERING AND ASSESSMENT TOOLS

##### **COURSE CONTENT:**

This course introduces the principles and applications of Environmental Impact Assessment (EIA) and environmental management systems within the framework of sustainable development. It examines environmental legislation, project–environment interactions, and key components of Environmental Impact Studies. Students explore environmental management and monitoring tools, including ISO 14001 and ISO 50001 standards, with emphasis on construction sites, waste management, environmental risks, and energy–environment interactions. Case studies are used to illustrate best practices in environmental performance evaluation and decision-making.

#### 5.1 – PHYSICS OF CLIMATE CHANGE

##### **COURSE CONTENT:**

This course provides an in-depth physical understanding of climate change, focusing on atmospheric composition, radiation, and climate forcing mechanisms. Topics include spatial and temporal scales of atmospheric processes, global biogeochemical cycles, ozone chemistry and dynamics, aerosol properties and radiative effects, and solar and terrestrial radiation transfer. The course examines photochemical processes, energy balance, greenhouse effect, and radiative forcing from natural and anthropogenic drivers. Large-scale atmospheric and oceanic interactions, climate variability, teleconnections, and long-term climate change are analyzed using observational and modeling perspectives. Emphasis is placed on interpreting quantitative data, scientific writing, and independent research skills.

#### 5.2 – ENVIRONMENTAL POLICY

##### **COURSE CONTENT:**

This course introduces the foundations of environmental policy and governance, focusing on how environmental challenges are addressed through regulatory frameworks and strategic planning. Students examine governance structures, the policy cycle, and key policy instruments, including regulations, market-based tools, and voluntary approaches. Emphasis is placed on European environmental

and agri-environmental policies, including the Common Agricultural Policy, the Farm to Fork Strategy, the EU Biodiversity Strategy, and the European Climate Law. Through case studies and applied policy analysis, students learn to evaluate policy effectiveness and produce evidence-based policy briefs and recommendations.

### 5.3 – NATURAL RESOURCES MANAGEMENT

#### **COURSE CONTENT:**

This course examines principles and practices of sustainable natural resources management. Topics include integrated water resources management, irrigation efficiency, optimization of surface and groundwater systems, and interactions between land use and climate change. The course also addresses soil quality, resilience, fertility, nutrient cycling, and the role of soil organic matter. Biomass resources and bioconversion processes for energy production, such as biogas and bioethanol, are introduced. Emphasis is placed on applying quantitative methods and interdisciplinary approaches to support sustainable development and environmental decision-making.

### 5.4 – INDUSTRIAL PROCESS DESIGN AND ECONOMICS

#### **COURSE CONTENT:**

This course focuses on techno-economic analysis and design of chemical and environmental engineering processes, with particular emphasis on wastewater treatment systems. Students conduct comprehensive feasibility studies, develop process flow diagrams, and apply mass and energy balances. The course covers preliminary equipment sizing, cost estimation, economic evaluation, and profitability assessment. Specialized software tools are used for process design and optimization. Additional topics include bottleneck analysis, scale-up principles, and evaluation of environmental performance to ensure regulatory compliance and sustainable operation.

### 5.5 – ECOSYSTEM DYNAMICS AND MANAGEMENT

#### **COURSE CONTENT:**

This course explores ecosystem structure, functioning, and dynamics across terrestrial, freshwater, and marine environments. Topics include trophic levels, food webs, energy flow, ecosystem resilience, and sustainability in relation to biotic and abiotic drivers. Anthropogenic pressures such as land-use change, overexploitation, pollution, and climate change are analyzed. Laboratory and

computer-based exercises introduce trophodynamic indicators, spatial planning, and ecosystem modeling, while field trips provide hands-on experience in ecosystem assessment and management. The course emphasizes interdisciplinary approaches to ecosystem management and policy-relevant decision-making.

## 6.1 – REMOTE SENSING OF THE ENVIRONMENT

### **COURSE CONTENT:**

This course introduces the physical principles and environmental applications of satellite remote sensing. Topics include solar and terrestrial radiation, radiometric quantities, emission and propagation of radiation through the atmosphere, and radiative transfer theory. Students learn the fundamentals of remote sensing, spectral signatures, atmospheric windows, and satellite orbits. The course covers Earth observation systems and sensor technologies, including passive and active sensors, multispectral, hyperspectral, thermal, and microwave instruments. Emphasis is placed on linking radiative transfer theory to environmental phenomena and on accessing and analyzing satellite data using information technologies.

## 6.2 – CLIMATE CHANGE MITIGATION

### **COURSE CONTENT:**

This course examines scientific, technological, and policy-based approaches to climate change mitigation. Topics include greenhouse gas emissions accounting, energy-efficiency strategies, land-based mitigation in agriculture and forestry, soil and water mitigation practices, and carbon farming. Sector-specific mitigation pathways are analyzed for crop systems, livestock, urban environments, and food systems. Students explore mitigation scenarios, climate models, carbon markets, and offset programs, and evaluate policy instruments such as carbon pricing and international agreements. The course emphasizes data interpretation, integrated mitigation design, and communication of mitigation strategies through projects and case studies.

### 6.3 – BIODIVERSITY AND CONSERVATION

#### **COURSE CONTENT:**

This course explores biodiversity patterns, drivers of biodiversity loss, and conservation strategies in the Anthropocene. Topics include measurement and assessment of biodiversity, human land-use impacts, climate change, pollution, invasive species, and species extinction. Students examine trade-offs between conservation and human development, the role of biodiversity data and museum collections, and emerging conservation pathways. The course emphasizes critical reading of scientific literature, evaluation of conservation approaches, and application of scientific knowledge to biodiversity protection and management.

### 6.4 – CIRCULAR ECONOMY AND ENVIRONMENTAL ECONOMICS

#### **COURSE CONTENT:**

This course provides an interdisciplinary introduction to environmental economics and circular economy principles. Students examine market failures, externalities, environmental valuation, and transitions from linear to circular economic models. Topics include circular strategies such as reuse, recycling, nutrient recovery, and energy efficiency, as well as sustainability policies, SDGs, ESG criteria, and key EU directives. Life Cycle Assessment (LCA) and sustainability management tools are introduced through real-world case studies, with emphasis on agriculture, agri-food systems, and low-carbon transitions in European and Mediterranean contexts.

### 6.5 – ENERGY SYSTEMS AND ENVIRONMENT

#### **COURSE CONTENT:**

This course examines major energy systems and their environmental impacts, integrating engineering, environmental science, and policy perspectives. Students study fossil fuels, renewable energy technologies, emerging energy systems, and their associated emissions, efficiency, and sustainability characteristics. The course addresses energy policy frameworks, decarbonization strategies, global energy trends, and life cycle assessment (LCA) of energy systems. Real-world case studies are used to analyze energy transitions and support evidence-based evaluation of sustainable energy pathways.

## 7.1 – AIR QUALITY

### **COURSE CONTENT:**

This course provides an in-depth examination of the physical and chemical processes that determine air quality. Topics include the natural and polluted atmosphere, spatial and temporal scales of air pollution, and the role of environmental meteorology. Students study the structure and dynamics of the atmospheric boundary layer, turbulence, and pollutant dispersion using similarity theory. The course also covers atmospheric chemistry, including chemical kinetics, photochemical reactions, sources and sinks of pollutants, tropospheric ozone, nitrogen oxides, hydrocarbons, sulfur dioxide oxidation, and acid deposition. Emphasis is placed on understanding pollutant pathways from emission to removal and on quantitative analysis of air-quality processes.

## 7.2 – WASTE MANAGEMENT

### **COURSE CONTENT:**

This course introduces the principles and practices of integrated waste management within a circular economy framework. Students examine waste generation, classification, and characterization, as well as collection, transport, and storage systems. Treatment options such as recycling, composting, anaerobic digestion, thermal treatment, and landfilling are analyzed in terms of environmental performance, energy recovery, and cost. Special attention is given to hazardous, healthcare, construction, electronic, agricultural, and marine waste streams. The course also addresses environmental and public health impacts, waste-management policy and governance, and the use of decision-support tools such as life-cycle assessment, carbon footprinting, and material-flow analysis.

## 8.1 – AGRICULTURAL WASTE VALORIZATION

### **COURSE CONTENT:**

This course focuses on sustainable management and valorisation of agricultural waste within circular bioeconomy frameworks. Topics include classification and characterization of agricultural residues, waste generation and removal, collection logistics, and safe storage systems. Students study physical, chemical, biological, and thermochemical treatment processes, including composting, anaerobic digestion, biogas production, pyrolysis, and gasification. The course also covers production of biofertilisers, biofuels, bio-based materials, and high-value bioproducts. Integrated waste-management design, environmental

assessment, and real-world case studies are emphasized through project-based learning.

## 8.2– ENERGY SYSTEMS IN THE URBAN ENVIRONMENT

### **COURSE CONTENT:**

This course examines the transition of cities toward sustainable and low-carbon energy systems. Students explore energy demand in buildings, transport, and urban infrastructure, as well as renewable energy technologies suited to urban environments. The course integrates urban planning, energy policy, and environmental assessment, with emphasis on climate-resilient infrastructure and resource efficiency. Students evaluate buildings using holistic sustainability certification schemes such as LEED and BREEAM and analyze real-world urban energy case studies. The course provides analytical and practical tools for designing integrated, resilient urban energy solutions.

## **B. ELECTIVE COURSES**

### **E1 – Atmospheric Measurement Techniques**

#### **Course content:**

This course introduces state-of-the-art techniques for atmospheric measurements and environmental monitoring. Topics include remote sensing of aerosols and ozone using lidar systems, calibration of sun photometers and spectroradiometers, noise characterization, and aerosol optical depth measurements. Students are trained in experimental data acquisition, algorithm implementation, data analysis, and scientific presentation, with emphasis on air-pollution measurements and interpretation of observational datasets.

### **E2 – Air Quality Modeling**

#### **Course content:**

This course focuses on the theoretical foundations and practical applications of air-quality and atmospheric dispersion models. Students study the physical and chemical mechanisms governing pollutant transport and transformation, the mathematical formulation of dispersion equations, and assumptions used in model development. Eulerian and Lagrangian photochemical models are introduced, along with trajectory analysis. Hands-on training is provided using widely applied models such as FLEXPART, CALINE, and HYSPLIT for forward and backward simulations of air-pollution episodes.

### **E3 – Solar Radiation Modeling Tools**

#### **Course content:**

This course familiarizes students with radiative transfer modeling in atmospheric physics using the freely available model libRadtran. Students learn model installation, selection of input parameters, and sourcing of required atmospheric and surface data. Through guided exercises, they explore sensitivity of model outputs to input assumptions and solver accuracy. Applications include solar and terrestrial radiation studies, atmospheric processes, and interpretation of radiation and remote-sensing measurements for environmental analysis.

### **E4 – Environmental Radioactivity**

#### **Course content:**

This course provides an introduction to environmental radioactivity and the behavior of radioactive nuclides in natural and anthropogenic systems. Topics include cosmogenic and terrestrial radionuclides, atmospheric dispersion, radioactivity in marine and freshwater environments, soils, plants, and drinking water. Man-made sources such as uranium mining, radioactive waste, and nuclear accidents are examined, together with fallout processes and radiation dosimetry. Environmental transport mechanisms and impacts on human health are emphasized.

## E5 – Earth–Space Interactions

### **Course content:**

This course examines interactions between the Earth, the Sun, and the wider solar system as drivers of environmental and climatic evolution. Topics include planetary formation and habitability, celestial mechanics, Earth–Moon interactions, orbital perturbations, and long-term climate stability. Students explore solar activity, the heliosphere, space weather, Earth’s magnetosphere, and their environmental implications. The course also covers artificial satellites, space exploration, Earth-observation missions, and space-debris challenges, linking fundamental physics with environmental monitoring applications.

## E6 – Environmental Impact Assessment Tools

### **Course content:**

This course introduces methodologies, legislation, and practical tools used in Environmental Impact Assessment (EIA). Students study EU and national EIA frameworks, EIA report structure, and assessment procedures for projects, buildings, and industrial systems. Key environmental management and certification schemes are presented, including ISO 14001, EMAS, ISO 50001, Ecolabel, LEED, and BREEAM. Emphasis is placed on carbon-footprint reduction strategies, circular-economy principles, and proposing interventions to improve environmental, energy, and economic performance.

## E7 – Environmental Data Science and Informatics

### **Course content:**

This course equips students with data-science and informatics tools for environmental analysis and decision-making. Topics include environmental data systems, data preprocessing, statistical analysis, time-series methods, and quality assurance. Students apply machine-learning techniques for

environmental prediction, develop data pipelines, and design monitoring systems using sensor networks and IoT technologies. Citizen science, participatory monitoring, and environmental information services are also covered through project-based learning focused on real-world environmental challenges.

## E8 – Sustainable Supply Chain Management

### **Course content:**

This course introduces principles and practices of sustainable supply-chain management within circular-economy frameworks. Students analyze sourcing, production, logistics, and distribution systems using sustainability criteria, carbon-footprint analysis, and resource-efficiency metrics. Topics include supply-chain mapping, stakeholder collaboration, digital traceability, green logistics, sustainable packaging, and corporate sustainability reporting aligned with ISO 14001, GRI, and UN SDGs. Case studies highlight engineering and operational strategies to reduce emissions, waste, and social impacts across global supply chains.

## E9 – Recycling

### **Course content:**

This course provides a comprehensive introduction to recycling within the framework of sustainable development and the circular economy. Students study waste hierarchy, life-cycle thinking, and recycling methods for major material streams, with strong emphasis on polymer recycling. Topics include characterization and sorting of plastic wastes, mechanical, solvent-based, chemical, and thermochemical recycling, and recovery of value-added products. Case studies cover recycling of PET bottles, plastic packaging, WEEE, end-of-life vehicles, tires, multilayer films, composites, paper, metals, and glass. Contemporary issues such as microplastics, single-use plastics, and hazardous additives are addressed, complemented by site visits and laboratory or field investigations.

## E10 – Agricultural Ecosystems

### **Course content:**

This course examines the structure and functioning of agricultural ecosystems from an ecological perspective. Topics include soil as an ecosystem, plant biology in agroecosystems, population ecology, species interactions, water and nutrient cycling, energy flow, pest ecology, and biodiversity in agricultural systems.

Students analyze environmental impacts of farming practices and compare conventional, organic, and regenerative systems. Agroforestry, climate interactions, ecosystem services, and sustainable agroecosystem design are emphasized, with case studies and student presentations supporting ecosystem-based agricultural management.

#### E11 – Climate-Resilient Cities: Floods and Droughts

##### **Course content:**

This course focuses on climate-change impacts in urban environments, with emphasis on floods and droughts as major climate-related risks. Students explore how urban infrastructure influences vulnerability and how climate change affects people, assets, and services. Topics include meteorological hazards, flood and drought modeling, risk assessment, and future climate projections. Adaptation and mitigation strategies are examined, with particular focus on nature-based solutions and resilience planning to reduce urban climate risks.

#### E12 – Evolutionary Biology

##### **Course content:**

This course presents evolution as the unifying framework of modern biology. Topics include the history of evolutionary thought, mechanisms of evolutionary change, mutation, natural and sexual selection, genetic drift, gene flow, and population genetics. Students study phylogenetics, homology, neutral theory, evolution in the genomic era, adaptation, and evolution of behavior. Emphasis is placed on generating and testing evolutionary hypotheses, interpreting evidence from fossils and comparative data, and clearly communicating evolutionary concepts in biological and environmental contexts.

#### E13 – Environmental Microbiology and Biotechnology

##### **Course content:**

This course explores the role of microorganisms in terrestrial and aquatic ecosystems and their applications in environmental biotechnology. Topics include microbial structure, metabolism, growth, and diversity, aquatic and terrestrial microbiology, and microbial biotechnology techniques. Applications focus on bioremediation, waste management, detoxification of pollutants, treatment of xenobiotic and recalcitrant compounds, and genetic engineering

approaches. The course links microbial processes to environmental protection, agriculture, and sustainable resource management.

#### E14 – Ecosystem Modeling and Assessment

**Course content:**

This course introduces principles and tools for modeling marine and terrestrial ecosystems and assessing ecosystem status under anthropogenic pressures. Students learn model development, parameterization, validation, and scenario analysis, as well as ecosystem indicators and assessment frameworks related to sustainability, ecosystem health, and climate impacts. Practical training includes the use of Ecopath with Ecosim (EwE) software for food-web modeling, temporal simulations, spatial dynamics, and policy-relevant ecosystem assessment, supporting evidence-based environmental decision-making.

#### E15 – Natural and Man-Made Disaster Management

**Course content:**

This course provides an integrated overview of natural and technological disasters, emphasizing hazard identification, risk assessment, and vulnerability analysis. Students examine disaster prevention, preparedness, response, and recovery strategies within national and international frameworks. Practical components include field-based environmental sampling in disaster-affected areas and laboratory analysis of environmental samples to detect contamination and assess ecosystem damage. Emphasis is placed on interpreting assessment results to support remediation planning, public health protection, and post-disaster recovery.

#### E16 – Applied Experimental Design and Predictive Modeling

**Course content:**

This course introduces experimental design, predictive modeling, and forecasting for data-driven decision-making. Topics include principles of experimental design (randomization, blocking, factorial designs), regression modeling, model diagnostics, and goodness-of-fit evaluation. Students learn forecasting techniques such as time-series decomposition and ARIMA models and apply statistical software to real datasets. Emphasis is placed on interpreting results,

communicating quantitative findings, and supporting evidence-based environmental and engineering decisions.

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### **Teaching – Knowledge Assessment – Student Evaluation**

The J.U.P.S.E is delivered in-person, with instructors and students attending lectures in the classrooms. By decision of the Steering Committee, a weekly online teaching slot may be established, common to all students of the Program, which will be used for tutorials and/or seminar classes and, exceptionally, for the make-up of classes in cases where classrooms are unavailable on other days of the week. In exceptional circumstances that do not allow in-person teaching, online lectures may be conducted for a limited period of time, upon a specifically justified decision by the Program Director, to address the urgent situation that necessitates temporary transition to online education.

Examinations are generally conducted in-person, with students and examiners present in the School's facilities, whether written or oral. Exceptionally, oral exams may be conducted online, provided that student identification is ensured and best practices for online oral exams are followed to maintain academic integrity. Remote written examinations are not permitted, except in cases and under conditions mandated by current legislation. By decision of the Steering Committee, written exams using a tablet, laptop, or PC may be conducted in-person under supervision, provided a comprehensive exam protocol is implemented to guarantee integrity and equal treatment of all students.

Attendance at lectures, tutorials, and all other organized educational activities of the J.U.P.S.E. is mandatory. Students are allowed a number of absences not more than thirty percent (30%) of the total teaching hours per course per semester. Deviations beyond this limit are allowed only in exceptional cases and require the approval of the Steering Committee. Regular participation in lectures, tutorials, and examinations is considered a critical component of academic progress in the Program.

Before the start of each semester, the Secretariat of the J.U.P.S.E. prepares and publishes the detailed semester timetable, ensuring that, as far as possible, that compulsory and elective courses are evenly distributed across all weekdays, there are no extended time intervals between courses scheduled on the same day and that courses do not overlap with other compulsory or elective courses of the same semester.

By the tenth (10th) week of each semester, students are invited to participate in an anonymous online evaluation of the attended courses and of the instructors, with the aim of improving the quality of the Program.

### **Student Evaluation**

1. Students of the J.U.P.S.E. are assessed through written or oral examinations, conducted at the end of the semester for courses taught during that semester. All courses are also examined during the resit examination period in September. Participation in an oral exam excludes the student from taking the written exam of the same course during the same examination period.
2. The instructor submits two grades at the end of each examination: one corresponding to the student's performance during the course (continuous assessment grade) and one corresponding to the student's performance in the final test of the course, whether written or oral (final exam grade). The final grade is calculated as 25% of the continuous assessment grade and 75% of the final exam grade.
3. Instructors take special consideration for students with documented dyslexia prior to admission, serious mobility impairments, or visual impairments that significantly hinder participation in written exams, according to procedures specified by the applicable regulations.
4. The Program Secretariat announces, in due time, the detailed schedule of written exams for each upcoming examination period. The instructors, assisted by the Secretariat, ensure a sufficient number of proctors, typically PhD candidates or postgraduate students. Instructors must remain present during exams, supervise the proper conduct of exams, and take all necessary measures to guarantee integrity and fairness.
5. Each examinee must verify that their name appears on the computerized list of eligible students for the specific exam before attending. Examinees are prohibited from copying or manipulating the exam results in any way, and from bringing books, aids, notes, or electronic communication devices into the examination room. Any attempt to use electronic communication devices during the exam is considered a serious violation. Examinees may use only the last page of their answer sheet for notes. Violation of these rules results in automatic nullification of the exam and may incur additional penalties according to the applicable regulations.

6. Designated proctors must verify student ID, check that the student's name and registration number appear on the exam sheet, initial each exam paper, supervise students to prevent copying or communication, monitor the entrance and exit of the examination room—especially at the end of the exam—and ensure that no student leaves before 30 minutes from receiving the exam paper.
7. The maximum duration of any written exam is two (2) hours.
8. After the exams are submitted, proctors count the papers, and one of them certifies the number received. The papers are then handed to the instructor, who counts them and certifies the number received in the presence of a proctor.
9. Instructors must submit the final examination results (written and/or oral) to the Secretariat in a single grade sheet per course, no later than 25 days after the exam. For oral exams, instructors cannot disclose individual results to students but may provide aggregate results for all examinees.
10. In all courses of the J.U.P.S.E., student performance is expressed numerically on a 0–10 scale. Grades 0–4 indicate failure, while grades 5–10 indicate success.
11. Publication of exam results with visible student names or registration numbers is strictly prohibited.
12. Grade transfer from one examination period to another is not allowed. Any notes on answer sheets regarding the student's desired grade or the number of remaining courses to graduate are not allowed and will be ignored.
13. Answers to written, practical, or theoretical exams are reviewed by instructors after results are published. Students have the right to view their own exam papers and request explanations regarding the grading. Instructors are obliged to upload proposed solutions to practical exam questions on the course e-learning platform.
14. For calculation of the Diploma grade and the courses included in the diploma, the following are considered: the 34 compulsory courses (204 ECTS), the 11 selected elective courses (66 ECTS), and the final diploma project (30 ECTS), totaling 300 ECTS.

## Article 9

### Scholarships

Within the framework of the **Joint Undergraduate Program of Studies in English** of Physics, Chemistry, Biology, Mechanical Engineering, and Agriculture at AUTH, the opportunity of granting scholarships to students is provided, based on academic and objective criteria and following a decision by the Steering Committee. Indicatively:

- Up to three (3) scholarships may be awarded each academic year to students who excel during the selection process, based
- on the overall evaluation of their qualifications (including the results of the oral interview), and who ranked among the top admitted students. These scholarships consist of full exemption from tuition fees for the first academic year.
- A scholarship covering 50% of tuition fees for the forthcoming academic year may be awarded to the student achieving the highest average grade for the full set of courses, provided they have successfully completed all courses within the expected timeframe of 10 semesters. In case of a tie, the scholarship may be awarded to more than one student.
- The Steering Committee may award excellence prizes to students demonstrating outstanding academic performance during their studies. These awards may include honorary recognition and/or monetary prizes. Specifically, at the end of each academic year, a first-year award may be given based on overall performance in all courses and consistency in attendance. Likewise, a top graduate award may be granted to the student with the highest academic achievement throughout the program.
- Full or partial tuition fee exemption may be granted, at the discretion of the Steering Committee, to students coming from war zones or under international or subsidiary protection, based on documented social and humanitarian criteria.
- In exceptional cases, scholarships may be granted to applicants or students facing severe financial hardship, health issues, parental loss, or living under emergency or long-term crisis conditions, following submission and evaluation of the relevant application and supporting documents by the Steering Committee.
- Scholarships may also be awarded on a reciprocal basis, consisting of partial tuition fee exemption in exchange for the student providing specific

work to support the Program, including assistance in the library, administrative support, help with research projects, or other activities as determined by the Steering Committee in coordination with the Secretariat and faculty members. The duration and scope of the work-based scholarship are clearly defined at the time of award, and failure to fulfil the obligations may lead to revocation of the scholarship.

The award of the above scholarships and/or excellence prizes, the specific terms of granting, as well as the rights and obligations of scholarship holders, are decided by the Steering Committee and remain at its sole discretion, based on the Program's financial resources and reserves

## Article 10

### Tuition Fees

The total tuition fees for enrollment in the **Joint Undergraduate Program of Studies in English** amount to thirty thousand euros (€30,000), corresponding to six thousand euros (€6,000) per academic year. The amount of tuition fees is determined and may be amended by decision of the Senate of AUTH, while the method and timing of payment can be adjusted by decision of the Steering Committee.

Tuition fees are paid by the students themselves (or by a third party, natural or legal person, on their behalf) into a designated bank account of the AUTH Special Account for Research Funds (ELKE), in ten (10) equal installments of three thousand euros (€3,000) each. The first installment is due at the time of registration in the Program, and the subsequent installments are due before the start of each semester. After each payment, a corresponding receipt is issued and the student is notified electronically.

Upon submission of the application, candidates are required to deposit a non-refundable application processing fee of one hundred fifty euros (€150). The application is not considered complete and will not be forwarded for evaluation if the corresponding amount has not been paid and proof of payment has not been submitted by the applicant. Payment is made electronically according to the instructions provided upon confirmation of application receipt. The fee is deposited into the ELKE AUTH account and is non-refundable in case of non-acceptance or withdrawal of the application.

In case of acceptance into the Program, candidates are required to pay an additional non-refundable tuition deposit of one thousand euros (€1,000). This amount is also deposited into the ELKE AUTH account and is non-refundable in case of withdrawal from the Program.

## **Article 12**

### **Administrative Support - Facilities and Infrastructure**

**The International Student Support Unit** is responsible for assisting international students enrolled in the J.U.P.S.E in Environmental Sciences and Engineering, in accordance with Article 212 of Law 4957/2022. The mission of the Unit is to provide support to international students registered in first-, second-, and third-cycle programs at the Aristotle University of Thessaloniki (AUTH). Its responsibilities include:

1. Assisting international students with registration in English language programs at AUTH.
2. Supporting international students in obtaining entry visas and residence permits in Greece for study purposes, and liaising with the competent public authorities regarding these matters.
3. Facilitating the fast-track issuance of residence permits for study purposes, in accordance with Article 37 of Law 4251/2014 (A' 80).
4. Supporting students during their settlement in Greece.
5. Cooperating with other relevant AUTH services to ensure the effective support of international students.
6. Organizing Greek language courses or courses in other foreign languages in collaboration with the relevant AUTH units.
7. Exercising any other responsibilities defined in the University's Organization related to the mandate of the International Student Support Unit.

### **Administrative Support of the Program**

The School of Physics of Aristotle University of Thessaloniki (AUTH) (lead School of the Program), with extensive experience in organizing and implementing first-, second-, and third-cycle study programs, undertakes the overall administrative and technical support of the **Joint Undergraduate Program of Studies in English**

in **Environmental Sciences and Engineering**. The Program Secretariat provides administrative support for the Program and may be staffed by personnel from the Secretariat of the School of Physics, acting as a key operational arm of the Program's administration, under the supervision of the Steering Committee.

Specifically, the Program Secretariat:

1. Provides administrative support to the Steering Committee and the Director of the Program.
2. Handles all matters related to the educational lifecycle of students, from registration to graduation and issuance of the Diploma.
3. Maintains the Program's protocol, paper and digital archives.
4. Manages administrative processes related to the teaching staff of the Program (contracts, travel, etc.).
5. Collaborates with the Special Account for Research Funds (ELKE) of AUTH for the financial management of the Program and supports related processes.

The **coordination of the Program Secretariat**, as well as the keeping of the Steering Committee's minutes, is undertaken by a staff member of the Physics Secretariat, who possesses the formal qualifications to act as a Head of Secretariat, in accordance with Article 1 of Law 3839/2010. The assignment is made by decision of the Steering Committee.

To support the needs of the Program, the following personnel may be employed, according to Article 104 of Law 4957/2022:

1. Members of the regular administrative staff of AUTH, with additional duties beyond their statutory obligations, by decision of the ELKE Research Committee, following a recommendation by the Steering Committee.
2. Additional personnel selected according to the procedure of Article 243 of Law 4957/2022.

The costs for all categories of personnel are borne exclusively by the Program's budget.

Technical support for the Program's operation is centrally provided by specialized staff from the Digital Governance Unit of AUTH, the existing technical staff of the General Directorate of Technical Services and IT, and the technical staff of the Faculty of Sciences.

The Program courses are conducted at the existing facilities and technical infrastructure of the participating Schools of AUTH.

### **Article 13**

#### **Type of Diploma of the J.U.P.S.E**

The Diploma of the **Joint Undergraduate Program of Studies in English** is a public document and is awarded to the graduates of the Program.

The Diploma is issued by the Program Secretariat stating the names of the Schools of Physics, Chemistry, Biology, Mechanical Engineering, and Agriculture, as well as the institution (AUTH), the university emblem, the year of completion of studies, the date of issuance of the Diploma, the graduation protocol number, the title of the Program , the Diploma classification, the student's personal information, and the evaluation designation: Good , Very Good, Excellent.

Prior to the official award of the Diploma, a graduate may receive a certificate of successful attendance and completion of the Program.

In addition to the Diploma, a Diploma Supplement is issued, in accordance with Article 15 of Law 3374/2005 and \*\*Ministerial Decision F5/89656/B3/13-8-2007 (FEK 1466/B') \*\*. The Diploma Supplement is an explanatory document providing detailed information on the nature, level, content, educational framework, and legal status of the studies successfully completed. It does not replace the official Diploma or the official transcript of records issued by the institution.

### **Article 15**

#### **Study Guide of the Joint Undergraduate Program of Studies in English**

The **Joint Undergraduate Program of Studies in English** publishes a Study Guide in English to inform students about the operation of the Program. It is available on the Program's website and is updated regularly. The Study Guide includes:

1. General Information and useful online links about the University and the School, particularly administrative services or collective bodies that

undergraduate students may need to contact for the successful completion of their studies.

2. The purpose and objectives of the J.U.P.S.E, as well as the qualifications acquired upon award of the Diploma.
3. The academic calendar, including the start and end dates of academic semesters, examination periods, holidays, and any other commitments such as seminars, conferences, etc.
4. The curriculum, including courses, credit units (ECTS), study requirements, teaching staff, and the rights and responsibilities of students.
5. The official language of instruction.
6. The Steering Committee of J.U.P.S.E
7. Databases and other services.
8. Library use, according to the needs of the courses of the J.U.P.S.E
9. Learning outcomes and qualifications upon graduation.
- 10.** University services available to students.

**It is noted that in all texts, the terms “student(s)” and “professor(s)” are intended to be gender-inclusive.**