Joint Undergraduate Program of Studies in English (JEUPS)

Bachelor of Science in Clean Energy Science and Engineering

Mechanical Engineering School General Assembly No.: 20/20.02.2026

2026-2027 Program Handbook

ARISTOTLE UNIVERSITY

BSc in
Clean Energy Science and Engineering

2026-2027 Program Handbook

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A welcoming message from the Program Director

Dear Students,

It is with great joy and respect that I welcome you to the **BSc in Clean Energy Science and Engineering** at Aristotle University. Whether you have travelled from across the world or from nearby regions of Greece, you are now part of a diverse and dynamic academic community coming together for a shared purpose: shaping the future of clean energy.

Our university has a long tradition of excellence in teaching and conducting open research with scientific rigor. The three Collaborating Schools – Mechanical Engineering, Chemistry, and Agriculture – bring together different scientific cultures, research traditions, and ways of approaching science. This spirit of collaboration of different principles is what makes our Program fresh and truly international. Here, your background is not just welcomed; it is valued as an essential part of the learning environment we are building together.

The clean energy transition is a global challenge that requires global perspectives. In your classrooms, laboratories, group assignments, and individual projects you will work alongside peers whose experiences, languages, and worldviews differ from yours. This diversity will prove one of your greatest strengths. It will broaden your understanding, sharpen your creativity, and prepare you to contribute meaningfully to a rapidly changing world, where innovation and communication become increasingly important.

Throughout your studies, you will explore the science and engineering behind energy materials, thermal and electrochemical systems, hydrogen technologies, bioenergy, and sustainable design. You will learn to think critically, collaborate effectively, and approach complex problems with both scientific rigor and engineering practicality. You will be supported by faculty members who are internationally recognized in their fields and deeply committed to your academic growth and personal well-being.

But beyond the curriculum, I hope you will discover something equally important: a sense of belonging. Thessaloniki is a city known for its vibrant character, long history, and multicultural character. Our campus is a place where friendships are formed, ideas are exchanged, and new possibilities emerge. I encourage you to engage fully by asking questions, sharing your perspectives, participating in student life, and allowing yourself to grow not only as a scientist or engineer, but as a global citizen.

As you begin this journey, remember that you are not alone. You are part of a supportive community that believes in your potential and is here to help you succeed. The path ahead will challenge you, inspire you, and ultimately empower you to contribute to a cleaner, more sustainable future.

On behalf of the Collaborating Schools, I welcome you to the Program and I am excited to introduce you to this new chapter of your life.

Welcome to the world of Clean Energy Science and Engineering!

Warm regards,

[Name]

Program Director
BSc in Clean Energy Science and Engineering
Aristotle University of Thessaloniki

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Background, History

Aristotle University (AU) is one of Greece's most historic and influential academic institutions. Founded during the first Greek Republic, it began its journey in 1925, when the Fourth National Assembly approved the establishment of five foundational Schools: Theology, Philosophy, Law and Economics, Natural and Mathematical Sciences, and Medicine. The Faculty of Philosophy was the first to open its doors in 1926 with around 100 students, marking the beginning of a university that would grow into the largest in the country and a vibrant hub of learning and cultural exchange.

Among AU's long-standing academic pillars are the Schools of Mechanical Engineering, Chemistry, and Agriculture who form the three collaborative partners of the Joint Program on Clean Energy Science and Engineering. Each School has played a significant role in shaping scientific education and research in Greece and internationally. Their work spans a wide spectrum - from mechanical engineering and energy systems to chemical science and process technology, to agricultural innovation and biomass utilisation - forming a rich and interconnected foundation for modern energy science and engineering.

The School of Mechanical Engineering, with more than fifty years of continuous academic activity, is deeply rooted in the core of energy engineering. Its teaching and research cover thermal and mechanical systems, energy conversion and utilisation, the design and optimisation of energy installations, and the modelling of complex technical systems. The School has a strong international research presence and prepares engineers with rigorous theoretical grounding, advanced analytical skills, and high technical competence.

The School of Chemistry, with over eight decades of history, embraces all major branches of Chemistry. It places particular emphasis on biochemistry, chemical technology, materials science, environmental chemistry, and electrochemical systems. By combining theoretical knowledge with modern lab practices and industrial applications, it trains scientists who contribute to the international industry. Its research excellence is reflected in numerous publications, patents, and collaborations with the private sector.

The School of Agriculture, one of AU's earliest established academic units, has been shaping the field of agricultural science for nearly a century. With more than 14,500 graduates, it has significantly supported national agricultural development and scientific progress. In recent years, the School has expanded its focus to include the energy utilisation of biomass, circular economy practices, and the integration of alternative energy sources in rural environments, contributing to global sustainability priorities.

In line with AU's strategic vision for internationalisation, academic innovation, and outward engagement, these three Schools joined forces to create this unique Undergraduate Program in Clean Energy Science and Engineering. Taught entirely in English, the Program brings together the strengths of Mechanical Engineering, Chemistry, and Biomass science to offer a truly interdisciplinary and globally oriented education. Throughout this Guide, these three units are referred to collectively as *the Collaborating Schools*.

The purpose of the Program is to provide students with a comprehensive understanding of the principles, processes, and technologies that drive the transition to clean and sustainable energy systems. It integrates knowledge from Chemistry, Engineering, and Environmental Sciences, with emphasis on energy materials, thermal and electrochemical systems, bioenergy, and process sustainability. Its mission is to cultivate graduates with strong scientific foundations, technical proficiency, and ecological awareness - individuals ready to contribute to the global effort toward a more sustainable future.

This Guide to Undergraduate Studies is prepared in accordance with the Study Regulation and the provisions of Chapter G' of Law 4957/2022 (Government Gazette A', 141/21.07.2022) "New Horizons in Higher Education Institutions (HEI): Strengthening the quality, functionality and connection of HEIs with society and other provisions", which concern the organisation and operation of study programs, as well as Chapter IA of the same law, which specifically concerns Foreign Language Undergraduate Degree Programs. In addition, it is harmonised with the Regulation of Operation of Undergraduate Degree Programs of Aristotle University, ensuring that the regulations herein are in line with the current institutional framework.

1 Program Objectives, Learning outcomes

The Schools of Mechanical Engineering, Chemistry and Agriculture of the Aristotle University, jointly organise and operate an Undergraduate Degree Program (hereinafter referred to as the *Program*) on Clean Energy Science and Engineering. The Program consists of four-year studies and leads to the awarding of a Bachelor of Science in Clean Energy Science and Engineering.

The subject of the Program is education in Clean Energy Science and Technology, fundamental scientific principles with applied technological knowledge to develop competencies in the design, analysis and optimization of clean energy systems and low- and zero-carbon technologies.

The aim of the Program is to provide interdisciplinary training in the principles, processes and technologies that determine the transition towards clean forms of energy. It incorporates knowledge from Chemistry, Engineering and Environmental Sciences, focusing on energy materials, energy conversion and storage systems (solar, electrochemical, bioenergy), as well as on the sustainable production and use of hydrogen. It offers competence, technical capacity and ecological awareness, capable of contributing to the global energy transition.

Learning outcomes and qualifications. Upon successful completion of the Program, students will have acquired:

- Understanding fundamental concepts of physics, chemistry, mathematics, statistics, technical engineering, and data processing.
- Familiarity with the subjects of energy processes, electrical and mechanical energy devices and computer programming.
- Supervision in the fields of energy technology, electrochemistry, energy materials, biochemical processes and sustainable design, as well as knowledge of writing and presenting a technical report, while through relevant work they will have deepened in relevant technological and scientific subjects of clean energy applications.
- Ability to continue studies in the second cycle of studies, as well as access, under certain conditions, to related professions in Greece and abroad.

The program provides students with the academic prerequisites for progression to postgraduate and doctoral studies, as well as with the scientific and technological competencies necessary for professional careers in fields related to clean energy and sustainable technologies. The degree awarded is structured in accordance with international academic standards and is comparable to internationally recognized Bachelor of Science (BSc) degrees.

2 Awarded Title

The Program awards a **Bachelor of Science in Clean Energy Science and Engineering**. The degree is issued by the Program Secretariat on behalf of the Schools of Mechanical Engineering, Chemistry and Agriculture.

The degree classification is awarded according to the following descriptors: Good, Very Good, and Excellent. Prior to the formal award of the degree, graduates may be issued a Certificate of Successful Attendance and Completion of the Program.

In addition to the Degree, a Diploma Supplement is also granted, in accordance with article 15 of Law 3374/2005 and Ministerial Decision Φ5/89656/Β3/13-8-2007 (Government Gazette 1466/Β'). The Diploma Supplement is an explanatory document, which provides detailed information on the nature, level, content, educational context and legal status of successfully completed studies. It is not a substitute for the official degree or the transcript of grades issued by the Institution.

The successful completion of the Program leads to a qualification corresponding to Level six (6) of the National and European Qualifications Framework, in accordance with the provisions of article 47 of Law 4763/2020 (Government Gazette A' 254).

3 Eligible Candidates

Candidates eligible to apply are non-Greek citizens, who are either:

- **Graduates of high-schools or equivalent schools with physical headquarters outside Greece**. Applicants, who have completed the last two grades of secondary education or equivalent school in a foreign country on a full-time basis, must present a high school diploma or other equivalent secondary education certificate, which gives them admission rights to higher education institutions in the country where it was awarded,
- **Graduates of a recognised foreign school of other European Union Member States or third countries**, legally established and operating in Greece, provided that the awarded title grants access to higher education in the country of origin of the school, and on the condition that: (i) neither the applicant nor their parents holds Greek citizenship, and (ii) the applicant has attended at least the last two grades of secondary education on a full-time basis, or
- **Students enrolled in natural sciences Programs at higher education institutions abroad**, who hold a studies certificate, as defined in Paragraph 1 of Article 314A of Greek Law 4957/2022, to continue their studies in a corresponding semester of the Program.

Foreign schools in Greece must be officially recognised as legally established and operating by the locally competent Directorate of Secondary Education. The authenticity of the high-school diploma and the applicant's official transcript (detailed grade report) may be verified through one of the following procedures:

- By the Hague Apostille, if the country of origin of the documents is a member of the Convention,
- By a notarial endorsement (notarial deed),
- With validation by the Ministry of Foreign Affairs and/or the Ministry of Education of the issuing country,
- By the candidate submitting the graduation certificate and the detailed courses grading, while at the same time informing their school for their application to the Program. The information is accompanied by an official email from the foreign school, giving the Program Secretariat the opportunity to check the authenticity of the documents in question.

In addition, candidates must demonstrate proficiency in the English language at a minimum of Level B2, in accordance with the Common European Framework of Reference (CEFR), by one of the following means:

- Mother language is English,
- Possession of an English language certificate at a minimum of Level B2, issued by a recognised examination body, in accordance with the applicable decisions of the Supreme Council for Civil Personnel Selection (ASEP) or the Ministry of Education regarding recognised language qualifications
- University degree awarded by a School of Foreign Language and Literature or a School of Foreign Languages, Translation and Interpreting in Greece, or an equivalent degree from a recognised institution abroad,
- A Bachelor's / Master's / Doctoral degree awarded by a recognised foreign university, provided that the studies curriculum is entirely conducted in English,
- A high-school diploma, provided that the applicant has attended at least the last two (2) years of secondary education in a school where English is the official language of studies curriculum,

- An English language teaching proficiency permit does not constitute per se proof of English language proficiency, unless accompanied by an officially recognised degree upon which the license was is granted, as well as an official translation of that degree, where required.

4 Admission

The **maximum number of admissions** to the Program is set at forty (40) students per academic year. By decision of the Study Program Committee, the maximum number of admissions may be adjusted for each admission round of the Program.

The **selection** of candidates is made based on the evaluation of their application file and supporting documentation, including their curriculum vitae, by the Study Program Committee and presentation of the candidates in the evaluation process. As part of the selection process, candidates are required to participate in an online oral interview conducted by members of the Committee. The interview aims to assess the candidate's ability to articulate and justify their thinking, academic and personal readiness, and overall understanding of subjects in Physics, Chemistry and Mathematics. By decision of the Study Program Committee, as specified in the call for applications, a written English language assessment may also be conducted prior to the interview. T format and content of the assessment are determined by the Committee for each admission round.

Applications are submitted electronically on a rolling basis throughout the year and until a deadline announced annually during the operation of the Program. Candidates are invited to submit their applications together with the necessary supporting documents to the Program Secretariat in electronic form. In case the Program Committee decides to conduct a knowledge test in English, the announcement specifies the examination dates and the relevant subject areas. The English language proficiency test and interviews are conducted on predetermined dates set by the Program Committee, while applications are evaluated in chronological order of submission. The official call for applications and the list of required supporting documents is published in due time on the Program's website prior to the completion of each admission cycle.

Applicants are required to submit the following supporting documents:

- Studies application, available in electronic form on the Program's website,
- Photocopy of two sides of the ID Card or Passport,
- High-school transcript of the last year of studies (original and official translation into English),
- Detailed grades of all subjects of the last year of high school (with official translation into English), where this must show the successful examination in Mathematics, Physics and Chemistry courses or as respectively described in the relevant certificate (baccalaureate),
- Certificate of English language proficiency of at least level B2,
- Motivation Letter of up to 500 words, which presents the candidate's interest in science, motivation for studying in the program, and future goals,
- A short curriculum vitae (in English) that includes details of studies, distinctions, volunteering or other activities related to the subject.

In addition, the following optional academic criteria are positively considered in the evaluation of the candidate's file:

- Minimum overall baccalaureate grade: seventy percent (70%) of the maximum grade or equivalent,
- Possession of admission tests in higher education, such as:
    - *International Baccalaureate (IB):* ≥23/45,
    - *SAT / ACT*: SAT: ≥ 1200/1600 | ACT: ≥ 25/36,
    - *TSA (Thinking Skills Assessment):* ≥ 60/100 or raw score ≥ 25/50,

For the evaluation and selection of candidates, the above additional criteria are taken into consideration and may be revised by decision of the Program Committee, in accordance with the applicable legal framework.

Where deemed necessary, the applicants may be requested to submit the original supporting documents either by post or in person to the Program Secretariat for verification purposes.

The **final selection process of candidates** is conducted by the Program Committee, as follows: The Committee compiles a complete list of all candidates and verifies their eligibility. Applicants who do not meet the minimum eligibility requirements set by the applicable legislation and the Program regulations are excluded from further consideration. Eligible applicants who have submitted all required supporting documents are invited to participate in the interview process. Upon completion of the evaluation process (which includes assessment of the supporting documents, the interview and, where applicable, the written English language assessment), the Committee draws up the final list of successful candidates as well as a list of runners-up.

The **final list of admitted candidates**, and the list of runners-up, is formally approved by the Program Committee. The selection process, the publication of results, and the enrolment of admitted students must be completed by 30 September of each academic year. Any vacancies arising from admitted students who do not complete their enrolment or who voluntarily withdraw from the Program prior to the commencement of studies are filled in order of ranking from the approved list of runners-up.

In addition to the above provisions, students enrolled in foreign higher education institutions, who hold an official certificate confirming the completion of defined period of studies, conducted at a recognised higher education institution abroad (Paragraph 1 of article 314A of law 4957/2022 as amended by article 128 of Law 5094/2024), may apply for admission to the Program for the purpose of continuing their studies and, upon fulfilment of all academic requirements, being awarded the corresponding degree.

Interested applicants must apply together with all required supporting documents to the Program Secretariat either in printed or electronic form, through the Electronic Registration Information System of the Ministry of Education, Religious Affairs and Sports.

Filling Vacancies: In the event of withdrawal, non-enrolment or deletion of a student, the Program Committee may, by duly reasoned decision, fill the resulting vacancy, to ensure the smooth academic operation of the Program and maintain the approved number of students per year of study.
Vavant positions may be filled by students enrolled in the same or a more advanced semester in a related field of natural sciences at an internationally recognised higher education institution abroad, subject to academic evaluation and recognition of prior studies in accordance with the Program regulations. Selection may take place either from among eligible candidates who applied during the initial admission cycle of the respective academic year or through a separate public call for applications, as determined by the Study Program Committee.

Interested applicants are required to provide the following supporting documents:

- Copy of ID card or passport,
- High-school diploma (original and official translation into English),
- High-school transcript of the last year of studies (original and official translation into English),
- Academic transcript from the institute of origin (in the cases of par. 1 of Art. 314A of Law 4957/2022),
- The official studies curriculum of the institute of origin to check academic correspondence (in the cases of par. 1 of Art. 314A of Law 4957/2022),
- Proof of English language proficiency in accordance with section 3 eligibility criteria,
- Letter of expression of interest, and
- Curriculum vitae.

The Committee evaluates the candidates' files and may invite them for an interview before the final decision is issued.

Objections to the results may be submitted within five (5) working days from the date of notification of the results, by means of a written request addressed to the Program Secretariat.

The enrolment of the admitted candidates must be completed within fifteen (15) days from the official announcement of the results by the Program Secretariat, through submission of all required supporting documents and payment of the prescribed advance tuition fee, where applicable. Failure to complete enrolment within the specified deadline shall be deemed a refusal to accept the offered position, which shall then be offered to the next eligible candidate from the approved list of runners-up.

Applications and the potential admission of the candidates apply exclusively to the academic year specified in the respective call for applications. No provision is made for provisional admission or automatic deferral to subsequent semesters or academic years, irrespective of the reason, including, but not limited to, military service or personal obligations. Candidates who wish to enrol in a subsequent academic must submit a new application in the relevant admission cycle.

Exceptionally, the Program Committee may, upon dully reasoned decision, approve the deferral of the commencement of studies for up to one (1) academic year, provided that serious and adequately documented reasons are demonstrated by the applicant. The decision to grant or reject such deferral lies within the competence of the Program Committee.

5 Duration and Terms of Study

The duration of studies is set at **eight (8) semesters**. Each semester comprises thirteen (13) teaching weeks and includes lectures, laboratory works, assignments, and other educational activities, as specified in the syllabus of each course.

All courses are delivered **in person**, utilising the educational and laboratory infrastructure of the three participating Schools. The exceptional use of **synchronous distance learning methods** may be permitted exclusively in specific cases, such as: (a) lectures delivered by Professors from foreign institutions or Collaborating Professors, (b) force majeure or dully justified extraordinary circumstances that prevent-person teaching, or (c) the organization of in-depth courses or tutorial sessions, in addition to the mandatory teaching hours. Distance learning activities, where approved, are conducted using Information and Communication Technologies (ICT), relying on the technical infrastructure of the three Participating Schools and the know-how and support of the Digital Governance Unit (M.D.D.) of the Aristotle University.

The minimum period of study required for the award of the degree is eight (8) academic semesters, while the maximum permitted duration is set at twelve (12) academic semesters, corresponding to the minimum duration plus four (4) additional semesters. Upon completion of the maximum permitted duration, and in accordance with the applicable legislation governing Higher Education Institutions, the competent body of the Program shall issue a formal act of deletion of the student from the Program.

After enrolment and the formal commencement of studies, students who have not exceeded the maximum duration of study may apply for an interruption of studies for a total period not exceeding two (2) academic years. The interruption may be granted either once or in separate periods of at least one academic semester each, provided that the cumulative duration does not exceed two academic years. During the period of interruption, student status is suspended and participation in educational activities or examinations is not permitted. The period of interruption shall not be counted towards the maximum duration of study. Upon resumption, students regain full academic status, with all rights and obligations provided for under the Program Regulations.

For serious health reasons affecting the student, or a first-degree blood relative, spouse, or a person with whom the student has entered into a civil partnership, the maximum duration of study may be exceptionally extended beyond the prescribed limit by up to one (1) additional academic year. Such extension is granted by the Program Committee, following the submission of a dully reasoned and adequately documented application submitted by the student. The total extension may not exceed two

(2) consecutive academic semesters.

The Program does not provide for part-time study.

Matters concerning the re-examination of courses in subsequent examination periods, as well as decisions relating to the deletion of a student from the Program for reasons including:

- insufficient academic progress, as evidenced by persistent failure to participate in the educational process (e.g., attendance, assessments or examinations),
- conduct in breach of academic ethics or institutional regulations, or
- a formal request submitted by the student,

shall be decided by the Program Committee, in accordance with the applicable institutional regulations and national legislation.

6 Student's Rights and Obligations

Within the framework of the social inclusion policy of the Collaborating Schools, and in cooperation with the Equal Access Unit of Aristotle University, the Program supports and facilitates the full, equal and effective participation of students with disabilities and/or special educational needs in all educational, research and administrative activities.

Access to the teaching and examination facilities of the Collaborating Schools is ensured through appropriate infrastructure, including ramps, handrails, lifts and other accommodations. For students who, due to documented disability or learning difficulties, are unable to participate in written examinations, alternative forms of assessment may be provided, such as oral examinations conducted in person in an accessible environment or, where appropriate, via a secure digital teleconferencing platform. All such arrangements are implemented in accordance with institutional regulations and applicable national legislation, following consultation with the competent support services of the Aristotle University.

Students enrol in and participate in the Program under the terms and conditions set out in these Regulations and in the applicable institutional and national legal framework. Students of the Program enjoy all academic rights, benefits and facilities provided to students of the Greek-language undergraduate study Program of Aristotle University, except for the provision of free textbooks, in accordance with the applicable legislation governing international or tuition-fee-based Programs. Access to meals at the University Student Club of Aristotle University is available under the conditions and fees defined by the Club's operating regulations and relevant institutional decisions.

Students admitted to the Program must:

1. Attend and actively participate in all courses and educational activities of the Study Program, whether delivered in person or, in dully approved exceptional cases, remotely. Participation in courses, laboratory exercises, examinations, seminars and other educational activities is mandatory. Absences may not exceed thirty per cent (30%) of the total teaching hours of each course per semester. In cases of serious and dully justified impediment, missed teaching hours may be compensated following consultation with the course instructor and approval by the Program Committee.
2. Submit all required coursework and assignments within the deadlines set by the course instructor.
3. Declare, at the beginning of each semester, any courses from previous academic years in which they have not yet been successfully completed the examination. Course declarations are submitted electronically through the electronic Program Secretariat service and recorded in the student's academic file. During the final year of studies, elective courses must also be formally declared.
4. Obtain or have access to recommended textbooks and other required learning materials as specified by the course instructor.
5. Regularly monitor official Program and Secretariat announcements through their institutional e-mail accounts.

6. Issue an academic identity card through the competent electronic service of the Ministry of Education, Religious Affairs and Sports.
7. Pay tuition fees within the deadlines set prior to the commencement of the winter and summer semesters of each academic year.
8. Settle any financial or other outstanding obligations to the Program and the Institution prior to graduation. Students who have not fulfilled such obligations shall not participate in the degree-award ceremony.
9. In the case of a contributory scholarship, fulfil the required duties associated with the scholarship, which may include supporting educational, research or administrative activities of the Program.
10. Respect the decisions of the Program's governing bodies and adhere to the principles of academic integrity and institutional regulations.

Systematic or serious breaches of the obligations arising from these Regulations, without sufficient and dully documented justification, may result in academic sanctions, including failure in a course. In particularly serious cases and following a dully reasoned decision of the Program Committee, in accordance with the applicable institutional and national regulatory framework, such breaches may lead to suspension from specific educational activities or deletion from the Program.

Sanctions may be also imposed in cases of disciplinary offences that undermine the academic community and the dignity of its members, including but not limited to sexist, racist, homophobic or transphobic behaviour, verbal or physical violence, harassment, inappropriate conduct on university premises, or any action contrary to the principles of respect, equality and inclusion. Where required, cases of disciplinary nature shall be referred to the competent disciplinary bodies of the Institution and/or to the relevant judicial or administrative authorities, in accordance with applicable legislation.

7 Studies Curriculum

The Program offers a single, full-time study curriculum with a duration of four (4) academic years, structured over eight (8) academic semesters. The curriculum comprises a total of thirty-four (34) courses, including twenty-seven (27) compulsory courses and three (3) specialization tracks (or modules). Each specialization track (module) consists of three (3) compulsory courses, two (2) elective courses and two (2) semester-ling projects (Senior and Capstone projects).

Compulsory Courses (M). Students are required to attend and successfully complete twenty-seven (27) compulsory courses, through which they accumulate one hundred and eighty (180) ECTS credits. These courses provide the fundamental scientific principles, engineering methodologies, and interdisciplinary foundations that define the field of Clean Energy Science and Engineering.

Elective Courses (E) and Specialization tracks (modules). The Program offers three (3) specialisation tracks (modules): Plant Design, Clean Energy Applications, and Smart Systems. Students are required to select one (1) track (module) and complete five (5) courses during the seventh and eighth semesters, in addition to two (2) compulsory semester projects (Senior Project and Capstone Project), one in each of these semesters. Of the five (5) courses within each track (module), three (3) are compulsory courses specific to the selected specialisation, while two (2) are chosen from a list of elective options offered within the track (module). The elective courses are designed to allow students to further specialise in selected thematic areas aligned with their academic interests and career objectives

Upon successful completion of all required courses and semester projects, students accumulate a total of two hundred and forty (240) ECTS credits.

For all compulsory and elective courses, as well as the two semester projects, one (1) ECTS credit corresponds to an estimated workload of twenty-seven (27) hours, in accordance with the European Credit Transfer and Accumulation System (ECTS).

Teaching is delivered primarily in person, with digital support provided for educational materials, assignments and communication between students and instructors through the official e-learning platform of Aristotle University.

Attendance is compulsory. Absences exceeding thirty per cent (30%) of the total teaching hours of each course per semester are not permitted, except in dully documented cases of force majeure and subject to approval by the competent academic bodies.

The academic year is divided into two semesters (Winter and Spring), each comprising thirteen (13) weeks of teaching, followed by an examination period. Successful completion of the Program requires the accumulation of two hundred and forty (240) ECTS credits.

The language of instruction for all courses is English. Students may attend optional Greek language courses, particularly during the fourth year of studies, to facilitate their integration into the professional environment in Greece. Additional elective courses of special academic interest may also be offered.

The Program does not include a compulsory internship. However, students are provided with academic advisory and opportunities to participate in research-oriented activities and applied projects, particularly through the structured semester projects (Senior and Capstone Projects) implemented in the seventh and eighth semesters.

8 Academic Calendar

Courses and exams

Winter semester enrolment period	16/09/2026 - 03/10/2026
Winter semester electronic course registration	4/10/2026 - 31/10/2026
Winter semester teaching period	5/10/2026 - 10/01/2027
Winter semester examination period	11/01/2027 - 31/01/2027
Publication of winter semester examination scores (results)	until 28/02/2028
Spring semester electronic course registration	08/02/2027 - 07/03/2027
Spring semester teaching period	08/02/2027 - 30/05/2027
Spring semester examination period	07/06/2027 - 27/06/2027
Publication of spring semester examination scores (results)	until 04/07/2027
Re-sit examination period	01/09/2027 - 24/09/2027
Publication of re-sit examination results	until 08/10/2027

Winter semester Holidays and Closures

Liberation of Thessaloniki	26/10/2026
National Day (OXI Day)	28/10/2026
Polytechnic Uprising Remembrance Day	17/11/2026
Winter Break (Christmas Recess)	24/12/2026-7/1/2027
Education Day	30/1/2027

Spring semester Holidays and Closures

Spring Break	15/3/2027-16/3/2027
Independence Day	25/3/2027
Easter Break	26/4/2027 – 7/5/2027
Labour Day	1/5/2027
Education Day	21/6/2027

9 Courses structure – Curriculum

Course Code	Compulsory Courses	Hours/week	ECTS
1st Semester		**18**	**30**
CESE01	General Chemistry	5	9
CESE02	Calculus	4	6
CESE03	Physics for Energy Materials Engineers	4	6
CESE04	Introduction to programming	5	9
2nd Semester		**21**	**30**
CESE05	Technical Mechanics	4	6
CESE06	Physical Chemistry for Energy Systems	5	7
CESE07	Linear Algebra and its Applications	4	6
CESE08	Energy Resources	4	5
CESE09	Statistics	4	6
3rd Semester		**18**	**30**
CESE10	Data analytics and Modelling	5	8
CESE11	Thermofluids	4	7
CESE12	Materials Science and Engineering	5	8
CESE13	Energy Systems	4	7
4th Semester		**21**	**30**
CESE14	Engineering Design and Analysis	4	5
CESE15	Electrochemical Energy Storage	5	7
CESE16	Computational Methods for Simulating Energy Materials	5	7
CESE17	Circuitry and Electronics	5	6
CESE18	Bioengineering and Biotechnology	4	5
5th Semester		**23**	**30**
CESE19	Sustainability Engineering and Circular Economy	4	5
CESE20	Electrical Machines	5	5
CESE21	Clean Combustion	4	6
CESE22	Bioprocessing for Clean Energy Production	5	7
CESE23	Electronic Structure: Computational Approaches for Materials in Energy Systems	5	7
6th Semester		**18**	**30**
CESE24	Engineering Professionalism	4	10
CESE25	Renewable Energy Technologies	4	6
CESE26	Chemical and Physical Processes for Clean Energy Production	5	6
CESE27	Life Cycle Sustainability Assessment (LCSA)	5	8
Module 1: Plant Design			
7th Semester		**12**	**30**
CESEPD01	Industrial Processes Design	4	6
CESEPD02	Operations Research and Optimization	4	6
CESE0XEL	Elective Course	4	6
CESE28	Senior Project	-	12
8th Semester		**8**	**30**
CESEPD03	Energy Finance	4	6
CESE0XEL	Elective Course	4	6
CESE29	Capstone Project	-	18

Module 2: Clean Energy Applications			
7th Semester		**12**	**30**
CESECEA01	Heat Devices and Engines	4	6
CESECEA02	Energy Systems Control	4	6
CESE0XEL	Elective Course	4	6
CESE28	Senior Project		12
8th Semester		**8**	**30**
CESECEA03	Applications in Agriculture	4	6
CESE0XEL	Elective Course	4	6
CESE29	Capstone Project		18
Module3: Smart Systems			
7th Semester		**12**	**30**
CESESS01	Distributed Energy Production	4	6
CESESS02	Hydrogen and Fuel Cells	4	6
CESE0XEL	Elective Course	4	6
CESE28	Technical Work - Senior Project		12
8th Semester		**8**	**30**
CESESS03	Smart Grids	4	6
CESE0XEL	Elective Course	4	6
CESE29	Thesis - Capstone Project		18
Course Code	**Elective Courses**	**Hours/week**	**ECTS**
7th Semester			
CESE01EL	Energy Systems in the Built Environment	4	6
CESE02EL	Energy and Environment	4	6
CESE03EL	Turbomachines	4	6
8th Semester			
CESE04EL	Modelling and Optimization of Energy Systems	4	6
CESE05EL	Battery Management in Electric Vehicles	4	6
CESE06EL	Energy from the Chemical Recycling of Waste Plastics	4	6

10 Course Content

A. COMPULSORY COURSES

[CESE01] - General Chemistry

The course provides a comprehensive introduction to the fundamental principles of General Chemistry, which constitute the basic scientific infrastructure for subsequent studies in clean energy science and engineering. The content consolidates basic concepts of Inorganic, Physical and Organic Chemistry, with emphasis on the structure-property relationships that determine the chemical behaviour of energy-related systems. They are introduced into atom structure, quantum concepts, and chemical bonds, including ionic, covalent, and metallic bonds, as well as molecular structure and intermolecular interactions. Basic concepts of the solid state are presented, such as crystalline and amorphous materials, chemical bonds in solids, and phase changes. The Physical Chemistry strand includes the states of matter, the behaviour of gases, phase equilibrium, electrolytic solutions, and fundamental spectroscopic techniques (IR, Raman, UV-Vis) for the characterization of molecules and materials. Introduction to Organic Chemistry covers structure, stereochemistry, hydrocarbons, functional groups, and aromatic systems, with a focus on molecular structure and activity related to materials and energy applications. Upon completion of the course, students will have gained a solid understanding of the chemical principles that govern materials, reactions, and processes that are central to clean energy technologies.

[CESE02] – Calculus

This course provides a concise and structured overview of the basic concepts of Infinitesimal Calculus, with an emphasis on conceptual understanding, graphical interpretation, and practical problem-solving. Here is the outline of the course:

- Repeat functions and graphs. Real functions of a variable: Exponential, circular, extraordinary, and their inverses. Introduction to the concept of limits and continuity.
- Differential Calculus: Derivative. The derivative as a rate of change. Applications in the optimization and study of movement. Differentials and linear approaches. Tangent line. Introduction to sequences and series. Power series. Taylor polynomials and series.
- Integral Calculus: Definite and indefinite integrals. The Fundamental Theorem of Infinitesimal Calculus. Non-genuine integrals. Applications in the calculation of area, curve length and volume of rotational surfaces.
- Multivariable functions. Some derivatives. Gradient field gradient. Derivatives by direction and differentiability. Differential and linear approaches, tangent planes and vertical lines. Local and total extremes. Lagrange multipliers.

[CESE03] – General Physics for Energy Materials Engineers

The course "General Physics for Energy Materials Engineers" introduces students to the fundamental principles of physics that form the basis for energy science and technology. Starting from mathematical tools and kinematics, a solid background in classical mechanics is developed, with emphasis on Newton's laws, the dynamics of bodies, energy, momentum, impact, rotational motion and oscillations. The course then covers basic concepts of electricity, such as electrostatics, electric fields, potential, and capacitance, as well as the operation of simple electrical circuits through Ohm's and Kirchhoff's laws. This is followed by an introduction to magnetism and electromagnetic induction, so that students can understand the basic interactions and prepare for more advanced courses. Teaching combines theory, examples, and exercises, with the aim of developing analytical and problem-solving skills. By the end of the semester, students will have gained a coherent understanding of the laws governing mechanical, electrical, and magnetic systems, creating a strong foundation for further study in materials science, thermodynamics, and clean energy technologies.

[CESE04] – Introduction to programming

The course "Introduction to Programming" offers a comprehensive introduction to the basic principles of algorithmic thinking and software development, with an emphasis on the Python language. Students learn to design and implement algorithms to solve scientific and engineering problems, acquiring skills in structured, efficient and reusable coding. The course covers fundamental concepts, such as variables, data types, loops, and functions, while moving on to more advanced topics such as tables, files, and libraries for numerical analysis and visualization (NumPy, Pandas, Matplotlib).

Teaching combines theoretical lectures with laboratory exercises, so that students gain hands-on experience through interactive environments such as Jupiter notebooks. Particular emphasis is placed on the application of programming skills in examples from engineering, thermodynamics and materials science, as well as on the automation of computational workflows. At the end of the semester, students will be able to connect computationally models with scientific applications, collaborate on laboratory projects and present integrated programming projects, laying the foundations for further deepening in scientific computing and data analysis.

[CESE05] – Technical Mechanics

This course forms the foundation of mechanical analysis, covering the fundamental principles of forces exerted on bodies. The curriculum focuses on the drawing of Free-body Diagrams (DES), the calculation of Internal Forces and Moments in structures, as well as the analysis of friction.

The second part of the course introduces the concepts of Stress and Deformation to understand material deformation, elasticity, and structural integrity.

Key Topics:

- Free Body Diagrams & Balance: Systems modelling and balance of forces.
- Internal Forces: Calculating axial forces, cutting forces, and bending moments.
- Stress & Strain: Analysis of the reaction of materials to loading.
- Elasticity: Understanding the deformation and stiffness of materials.

[CESE06] – Physical Chemistry for Energy Systems

The course introduces the basic principles of Physical Chemistry that govern the behaviour of chemical and electrochemical systems used in modern clean energy technologies. The main subjects include the thermodynamic properties of gases, liquids and solids, the First, Second and Third Laws of Thermodynamics, as well as the chemical and phase equilibrium in multi-component systems related to energy processes. Students study the properties of solutions and electrolytes, ionic activity and basic concepts of electrochemistry, with emphasis on electrochemical

potentials and energy conversion. Fundamental concepts of chemical kinetics and catalysis are also covered, with a focus on reaction rates, the effect of temperature, and the mechanisms critical for combustion, electrolysis, hydrogen production, and catalytic conversion processes. Laboratory exercises introduce basic experimental techniques for characterizing the physical and chemical behaviour of matter, such as calorimetry, conductivity measurements, equilibrium studies, and basic electrochemical diagnostic methods.

[CESE07] - Linear Algebra and its Applications

The course provides a comprehensive approach to presenting the theoretical background and principles of linear algebra in n-dimensions along with the applications that trainees will encounter in the analysis of energy systems. The outline of the course is as follows:

- Elementary registry theory
- Solving systems of equations - Opened scaled form - Gaussian method - Numerical application in MATLAB and python.
- Linear algebra in n-dimensions - Vector spaces, bases, row and column spaces, zero space, representation of rows and levels. Numerical application in MATLAB and python.
- Orthogonality - Orthogonal and orthonormal bases - Projections in spaces - Numerical application in MATLAB and python.
- The eigenproblem - Eigenvectors and eigenvalues - Eigenproblem solving - Numerical application in MATLAB and python.
- Quadratic Formats - Numerical application in MATLAB and python.
- Applications of linear regression, simulation and optimization of energy problems.

[CESE08] – Energy Resources

Introduction to Energy Resources: Global Energy Demand, Power Plants, Energy Investment Return Index, Sustainability Concepts, Fossil Fuels: Coal, Oil, Natural Gas – Reserves, Imports/Exports, Extraction Methods, Oil Refineries, Natural Gas Processing, Uses, Environmental Impact, Nuclear Energy: Fission, Fusion Prospects, Safety Issues, Radioactive Waste Management, Hydropower: Large Dams, Small hydroelectric, pumped storage, Solar Energy: Photovoltaics, solar thermal systems, CSP, Wind Energy: Wind turbines, onshore and offshore wind farms, wind potential assessment, Biomass & Bioenergy: Types and characteristics of biomass, thermochemical conversion (combustion, gasification, pyrolysis), biochemical processes (fermentation, aerobic and anaerobic digestion), biofuels, biomass/waste utilization technologies for energy production, Geothermal Energy: Types of geothermal resources, technologies, constraints, Marine Energy: Tidal, wave, ocean thermal energy, Energy Storage: Mechanical and thermal storage methods, electrochemical storage, batteries, hydrogen technologies (generation, storage, transportation, combined heat and power) and applications, Power-to-X technologies, alternative fuels (ammonia, methanol, Integrated Energy Systems: Smart Grids, Hybrid Systems, Energy Economics & Policy: Cost Analysis, Subsidies, Carbon Pricing, Future Perspectives & Review: Energy Transition Scenarios.

[CESE09] – Statistics

This course introduces the fundamental concepts of probability and statistics used to analyse data and draw conclusions. Students learn to summarize and visualize data using descriptive statistics, frequency distributions, and histograms, and quantify key features such as central trend and variability. The course covers basic principles of probability, including random variables, expected values, and the main discrete and continuous probability distributions, along with the central limit theorem. Students then explore statistical estimation through sampling distributions, point estimators, confidence intervals, and sample size determination. Building on these foundations, the course deals with hypothesis testing for parameters and good fit, before concluding with an introduction to simple linear regression for modelling relationships in data.

[CESE10] – Data analytics and modelling

This course introduces fundamentals of data analysis and modelling with machine learning processes. The course prepares students for the professional arena in the field of energy and environmental consulting, in government agencies, research institutions and technology companies focusing on clean energy. Graduates will be able to tackle complex challenges in the field of clean energy using scientific data processing and computing methods. Course contents: Introduction to energy and environmental data, data cleaning and basic descriptive statistics, identification and visualization of patterns and trends, introduction to regression, classification methods, prediction of time series, pattern recognition - clustering and PCA, introduction to neural networks, comparison of methods and selection of models, key elements in information services design. Application of the methods that students have been taught to learn in a selected topic - Options: energy forecasting, consumption analysis, environment forecasting

[CESE11] – Thermofluids

Introduction to the science of fluid thermomechanics with application to energy technology. The course presents a holistic approach to the sciences that govern modern energy engineering. In particular, the basic principles of Thermodynamics, Fluid Mechanics and Heat Transfer in Energy Engineering are presented and analysed. The main teaching objective of the course is to present the main elements of the science of Thermo-fluid-mechanics. A corresponding number of applications from practice serves to better consolidate the basic principles of science and technology.

1. Thermodynamics: the course develops the basic principles of Thermodynamics, including the First and Second Laws of Thermodynamics. The application of the relevant technologies is covered using practical examples.
2. Fluid Mechanics: The fundamentals of Fluid Mechanics are introduced in their simple form. The Conservation of Mass (Continuity Equation) of Energy (Bernoulli Equation) and Momentum (Second Law / Force-Momentum Equation) in all directions is presented with a 0D approach. The practical application of the transfer of mass, momentum and energy is consolidated with examples from practice.
3. Heat Transfer: The Fundamentals of Heat Transfer in Thermo-fluid-Mechanics are presented in their simple form. The basic concepts of conductivity, convection and thermal radiation are presented using practical applications. The importance of thermal energy transfer in the design and development of thermal machines is thoroughly analysed. Applications and examples from practice are used to consolidate the principles of Thermo-fluid-mechanics.

[CESE12] – Materials Science and Engineering

Materials Science and Engineering course examines how the internal structure of a material determines its properties and, ultimately, its performance in real-world applications, emphasizing design trade-offs and the "example of materials" that connects processing, structure, properties, and function. The course introduces the main categories of materials and their typical uses, introducing microstructure as a key indicator of material behaviour. Fundamental topics include atomic bonding, crystal structures, and amorphous solids, followed by crystal imperfections (empty positions, perturbations, and grain boundaries) and the basic principles of diffusion. Students learn to interpret phase diagrams (phases, lever rule, eutectic reactions) and gain an introductory understanding of phase transformations. The mechanical behaviour is covered through elastic and plastic deformation, reinforcement mechanisms, and basic breaking principles. An overview of functional properties (electrical, thermal, magnetic, and optical), along with the core concepts of corrosion, highlights performance beyond engineering. The course concludes with an introduction to the main machining methods (casting, forming machining, heat treatment, polymer machining, fusion and additive manufacturing) and basic concepts of material selection with sustainability criteria.

[CESE13] – Energy Systems

The Energy Systems course provides an integrated approach to the development of mathematical models for the simulation and analysis of energy systems.

The outline of the course is as follows:

- Thermodynamic properties and phase equilibrium
- Mass and energy balances - Basic principles
- Processes - Development of mass and energy balances models of concentrated-constant parameters and distributed parameters
- Separation processes and processes with chemical reactions
- Heat exchange processes
- Analysis and Design of Heat Exchanger Networks - Pinch Analysis
- Pumps, compressors and expanders
- Steam production systems and evaporators
- Fundamentals of Energy Systems Simulation
- Simulation of energy systems (ASPEN plus)
- Energy Systems Optimization (GAMS)

[CESE14] - Engineering Design and Analysis

The course focuses on integrating design principles with practical engineering applications. Students are taught systematic methodologies—including approaches to safety and durability—to guide the design process, from problem definition and idea generation to final optimization.

These principles are directly applicable to energy conversion systems, such as piping networks, pressure vessels, wind turbines, and solar panels. Key learning outcomes include understanding system components, evaluating performance, selecting materials, as well as weighing economic and sustainability factors in advanced engineering projects. Key Topics:

- Systematic Design Methodology: Application of structured phases (Initial Design, Configuration Design, and Detailed Design) to solve complex engineering problems.
- Energy Conversion Systems Analysis: Detailed study of how systems (e.g., heat engines, turbines, or photovoltaic arrays) convert one form of energy into another, with a focus on efficiency.
- Sustainable Engineering Principles: Integrating environmental impact, Life Cycle Analysis, and material selection to ensure efficient and eco-conscious designs.
- Optimization and Modelling: Using analytical and computational tools to refine design parameters for maximum efficiency or cost-effectiveness.

[CESE15] – Electrochemical Energy Storage

The course introduces the principles and technologies of electrochemical energy storage, with an emphasis on rechargeable batteries, electrochemical supercapacitors and basic fuel cell concepts. Students study electrode reactions, ion transfer, the properties of electrolytes and the role of interfaces in determining the performance and degradation of devices. including lithium-ion, sodium-ion systems, flow batteries, metal-air and emerging solid-state architectures. The course also examines electrochemical supercapacitors, covering electric bilayer and pseudocapacitance mechanisms, material selection criteria, and trade-offs between power and energy. Fuel cells are presented at an introductory level, with a focus on their working principles, efficiency, and broader role in integrated clean energy systems. Laboratory exercises emphasize the experimental characterization of electrochemical devices, including charge-discharge cycles of battery cells, measurement of specific capacitance and Coulomb performance, open circuit potential analysis, and basic electrochemical diagnostic techniques such as circular voltametry. Upon completion of the course, students will understand the scientific foundations, performance indicators, and challenges of electrochemical devices used in modern sustainable energy applications.

[CESE16] - Computational Methods for Simulating Energy Materials

The course "Computational Methods for the Simulation of Energy Materials" focuses on learning practical modelling and simulation techniques, with the aim of understanding and optimizing materials used in clean energy technologies. Students are trained in the creation of atomistic models and the preparation of input files with Python and open-source tools, such as ASE and LAMMPS. Through laboratory exercises, they apply Molecular Dynamics (MD) and Monte Carlo (MC) methods to study phenomena such as adsorption, diffusion, phase stability and thermal conductivity.

The teaching combines theoretical introduction with hands-on practice, emphasizing workflow automation, data analysis, and connecting microscopic interactions to macroscopic material properties. Through case studies, students explore applications such as hydrogen storage, CO_2 reduction, nanoporous structures, and battery alloys. At the end of the semester, they will be able to design and interpret simulations with scientific precision and mechanical targeting, enhancing their ability to combine computational and experimental data to develop advanced energy materials

[CESE17] – Circuitry and Electronics

The course begins with the fundamental principles of electrical circuit analysis, establishing the necessary background for understanding complex energy systems. Students will master the theory of direct and alternating current circuits, including Ohm's law, Kirchhoff's laws, node and grid analysis, as well as network theorems such as Thevenin and Norton equivalences. alternating current, in the resistance, phases and the concept of Power Factor for energy transfer and grid stability.

The course introduces the physics of semiconductors and the operation of nonlinear electronic devices, the study of PN contacts and diodes, focusing on their application in rectification (conversion of AC to DC) and voltage regulation. Students will examine BJTs and MOSFETs, analysing their behaviour as electronic switches, necessary knowledge for modern energy management systems.

Analog signal processing in Op-Amps will also be taught. Students will learn to design/analyse inverted and non-inverting amplifiers, integrators and differentiators. This module highlights the application of Op-Amps in sensor interconnection and signal processing, necessary knowledge for renewable energy technologies.

[CESE18] - Bioengineering and biotechnology

The Biomechanics and Biotechnology course introduces the fundamentals of cellular structure and function, covering prokaryotic and eukaryotic cells, cell membranes, organelles, and their roles in biological and biochemical systems. Biological macromolecules are examined, with emphasis on the structure and function of proteins, nucleic acids, carbohydrates and lipids, in direct relation to bioprocesses. Cellular metabolism is broken down through metabolic pathways, energy production, catabolism, anabolism, and metabolic regulation in industrial systems. Applications of enzymes include their structure, catalytic mechanisms, enzyme kinetics, inhibition, and industrial

uses. Cell development covers the growth phases of microbes and cell cultures, kinetic models, nutritional requirements, and environmental impacts. The course covers genetics, DNA structure, replication, transcription, translation, genetic organization, and the regulation of gene expression. Molecular techniques, such as PCR, DNA sequencing and real-time DNA sequencing and analysis, are presented for qualitative and quantitative applications. Finally, applications in microbial, plant, animal and aquatic biotechnology, pollutant bioremediation and sustainable waste biotechnology are examined.

[CESE19] – Sustainability Engineering and Circular Economy

This course provides an interdisciplinary introduction to the principles of the circular economy and the environmental economy. Students will explore how economic systems affect the environment, how circular strategies can reduce waste and resource use, and which policy and business models support the transitions to sustainability. After analysing the basic background of the concepts in line with the Objectives of the Sustainable Development and ESG (Environmental, Social and Governance) criteria, students will have the opportunity to delve into indicative legislative milestones with an emphasis on the CSRD Directive, as well as the SEVESO Directive.
The course also includes a study of sustainability management tools, with an emphasis on Life Cycle Analysis (LCA). The aim is to highlight case studies of sustainable production and service design and to promote green technologies and environmental responsibility strategies.

[CESE20] – Electrical machines

The course begins with an introduction to the principles of machines (magnetic field production in electrical machines, magnetic circuits, core losses (hysteresis and eddy current losses), Faraday's law, electromagnetic and magnetic excitatory forces, production of force and torque).

- Transformers (theory and function of single-phase and three-phase transformers, construction, equivalent circuit, phase diagram, transformer power losses and performance, voltage and current relationships, three-phase transformer connections, nominal values and self-transformer).
- Basic principles of DC motors and DC motors and generators (manufacturing, voltage and torque generation, equivalent circuitry, analysis of DC motors and generators, connections, speed and voltage control, speed and torque characteristics).
- Three-phase and single-phase induction motors and generators (construction; voltage and torque relationships, equivalent circuit, speed and torque characteristics, speed control, theory and operation of single-phase induction motors).
- Synchronous generators (construction, equivalent circuit, phase diagrams, power and torque characteristics, operation of synchronous generators in parallel with the grid, transient operation).
- Permanent magnet motor movements (permanent magnet theory, construction, speed and position control of motors and generators, closed-loop control system, power converters, topologies).

[CESE21] – Clean Combustion

Thermodynamics of chemical reactions: Mass conservation and stoichiometry of mixtures, λ value and equivalence ratio, conservation of energy in chemical reactions, Gibbs free energy, chemical equilibrium, combustion temperature, equilibrium products. Chemical kinetics: Elementary reactions, propagation and branching, reaction velocity, reaction velocity constant, partial equilibrium and steady-state approaches, reversible reactions, chain reactions, explosion limits, some important combustion mechanisms, pollutant formation kinetics, chemical time scales. Combustion Reactors: Fixed volume, constant pressure, fully stirred reactor, piston flow reactor, dimensioning, stability, energy requirements. Laminar flame structure: Mallard theory, flame thickness, flame velocity. Conventional and alternative fuels: Including the combustion of biofuels, biomethane, larger hydrocarbons, H_2, NH_3 and bio-alcohols. Main fuel properties of interest. Formation of greenhouse gases and air pollutants and pollution control principles (catalytic and non-catalytic methods, filtration, electrostatic precipitators, scrubbers).

[CESE22] - Bioprocessing for Clean Energy Production

The Bioprocesses for Clean Energy Production course introduces global energy requirements, modern sustainability challenges, and the transition to renewable energy systems, highlighting the role of different bioprocessing methods in achieving carbon neutrality, circular resource utilization, and integration with existing waste management infrastructure. The main biomass raw materials, such as agricultural residues and algae, as well as physical, chemical and biological pretreatment technologies are covered. Basic engineering principles include the design and operation of single-fill and continuous feed bioreactors, with a focus on mass transfer, stirring, and sensor integration. The fundamentals of anaerobic degradation are examined through anaerobic microbiology, methanogenesis and reactor types, followed by process optimization with the ADM1 model, kinetic models, physicochemical dynamics and reactor design. The course showcases AI and machine learning tools for

optimization, predictive control, and increasing methane production. Emerging CO2-to-CH4 technologies, biohydrogen production, microbial fuel cells, bioelectrochemical systems and liquid biofuels, such as bioethanol, biobutanol and biodiesel, are also analysed. Finally, integrated biorefinery systems for converting waste into bioproducts and future innovations in synthetic biology are presented.

[CESE23] – Electronic-Structure Computational Approaches for Materials in Energy Systems

The course "Computational Approaches of Electronic Structure for Materials in Energy Systems" introduces students to the basic concepts and methods of analysis of the electronic structure of molecules, solids and interfaces related to clean energy technologies. It focuses on the connection of electronic properties with the functionality of materials used in batteries, catalysts, photovoltaics and other energy applications. learn to construct and evaluate models, perform calculations with semi-empirical and first-principal methods (HF, DFT), and interpret IR/UV–Vis spectra, energy levels, charges and dipole moments.

The teaching combines theoretical training with laboratory practice through the WebMO platform, offering practical experience in electronic structure simulations. Emphasis is placed on the understanding of phenomena such as the energy gap, load distribution and adsorption on surfaces, as well as on the use of electronic indicators to evaluate the performance of materials. Design and present a focused study of electronic structure in an energy system, acquiring skills in computational analysis, scientific communication and critical evaluation. The course offers a strong foundation for understanding and utilizing electronic processes in advanced energy materials.

[CESE24] – Engineering professionalism

The course introduces students to the ethical, communicative, and professional standards expected in modern engineering practice. It examines codes of conduct from professional engineering bodies, emphasizing how regulations, standards, and ethical frameworks guide responsible decision-making. Students study the concept of accountability in modern technological environments, including the proper use of AI tools, technical project ownership, proper resource allocation, and professional reputation management.

Emphasis is placed on professional communication: structuring and writing technical reports, preparing effective presentations, and using digital tools that support clear and persuasive verbal communication. Students are also introduced to the practices of scientific and conference publications, including research methods, citation rules, and ways of disseminating knowledge.

The course supports students' professional development through guidance on CV writing, understanding labour market demands and planning lifelong learning. Throughout the semester, students collect, analyse, and synthesize data to produce a technical report and present their findings in a formal oral presentation.

[CESE25] – Renewable Energy Technologies

The course focuses on the following points: The energy problem and renewable energy sources. SOLAR ENERGY: thermal solar systems, photovoltaic systems, centralized solar systems. WIND ENERGY: Types of wind motors, wind turbines. GEOTHERMAL: High, medium and low enthalpy. BIOMASS: Categories of biomass (forest biomass, by-products of production and processing of agricultural products, livestock waste, biofuels, energy plantations). MUNICIPAL WASTE: Characteristics, physical and chemical properties, management methods and energy exploitation technologies. HYDROPOWER: Hydro motors. Hydroelectric power plants. SEA ENERGIES: Tides, waves, temperature difference. For all the above sources, the following are developed: Basic characteristics and properties. Methods and technologies of energy exploitation. System dimensioning. Estimation of energy potential. ENERGY STORAGE SYSTEMS: Electricity storage. Heat storage. Mechanical energy storage. HEAT PUMPS: Dimensioning, operating characteristics, correlation of efficiency with the external environment.

[CESE26] – Chemical and Physical Processes for Clean Energy Production

Part I. Introduction to reaction kinetics: fundamental principles and practical guides. Principles of chemical processes, types of chemical reactors, design equations, single and multiple reactions, reactor combinations, non-isothermal reactors, catalytic reactions and reactors. Elements of mixing theory and non-ideal reactors. Part II. Physical processes related to clean energy: basic principles and techniques, such as membrane processes (microfiltration, ultrafiltration), equilibrium processes (distillation, liquid-liquid extraction) and affinity-based separations (adsorption, ion exchange). Particle processes (size reduction, crystallization). Part III. Applications of chemical and physical processes in clean energy production: renewable biofuels, including microalgae biodiesel, bioethanol, biogas and hydrogen. Introduction to the concept of biorefinery, with an emphasis on integrated processes that transform biomass into fuels, chemicals and value-added products, in the context of a circular, low-carbon, energy future.

[CESE27] - Life Cycle Sustainability Assessment (LCSA)

The course introduces the basic knowledge of Environmental Impact Assessment (EIA) and the corresponding compliance with environmental terms in the context of sustainable resource management and relevant environmental legislation. The key points of Environmental Impact Studies and the relevant application of environmental legislation in projects and activities are analysed. After analysing the basic background and knowledge, analyses the key points of Environmental Management Systems (EMS) and environmental performance monitoring (mainly ISO 14001 and 50001 for energy issues). Students of this course will have the opportunity to delve into issues related to the management of construction site pollutants, waste and environmental hazards with the goal of preserving the natural environment and minimizing social impacts. The course also focuses on the interactions between Energy and Environment, highlighting case studies from construction sites, environmental events in projects and techniques for optimal utilization and monitoring of environmental performance.

[CESEPD01] – Industrial Processes Design

The course introduces students to the application of feasibility studies in industrial energy production processes. It is based on the preparation of a comprehensive feasibility study for a selected industrial unit, which varies each academic year, as well as on the preparation of a detailed report that is an important part of the overall grade of the course. The course contains the development and interpretation of methodological flow diagrams and the application of mass and energy balances for process analysis. Students learn the preliminary calculation of dimensions and the selection of basic process equipment, as well as methods of assessing the economic viability and profitability of a project. To support the above, the course includes an extensive laboratory part, in which students They use specialized software tools to design industrial units. In addition, production capacity analysis, bottleneck identification, and process optimization strategies are examined. Finally, they study the optimization of operating conditions based on operational criteria and the principles of process scaling, as well as the identification and quality assessment of output currents, to ensure compliance with quality standards and sustainable operation of the process.

[CESEPD02] – Operations Research and Optimization

This course provides a comprehensive introduction to optimization and mathematical programming, covering model formulation through the definition of variables, objective functions, parameters, and constraints. Students will explore linear programming in depth, including theoretical foundations, technical graphical solutions, the Simplex method, duality theory, and sensitivity analysis. The course also examines classical algorithms such as transfer, assignment, and upload methods, along with hands-on experience in solving linear programming problems using computer software. Further topics include integer programming and nonlinear programming, with attention to classical solving methods for finite and unlimited models, including Karush–Kuhn–Tucker (KKT) conditions and practical applications. The course concludes with linear multi-goal planning, goal planning, and broader decision-making methodologies.

[CESECEA01] – Heating devices and engines

Upon completion of the course, students will be able to understand the energy balance and the ways in which it is applied in technical applications. They will have gained a substantial understanding of the fundamental issues related to energy and to the design/construction of energy utilization systems for heat and power generation.

- Introduction to heating systems and equipment: principles and heating systems. Calculation of heat load. Boilers, radiators, dimensioning and operation of heat pumps. Piping calculations and design of the heating network.
- Introduction to Internal Combustion Engines: classification of engines, components and terminology, engine operation maps. Dimensioning and use of internal combustion engines in conventional and hybrid propulsion systems.
- Engine Cycles: Introduction. Gaseodynamic Cycles (Otto, Diesel, Miller). Combustion Thermodynamics. Fuel-Air Cycles. Calculation of Engine Cycles and Exhaust Gas Composition.
- Measurement Techniques: Analysis of reading diagrams. Friction and lubrication. Fluid mechanics in four-stroke and two-stroke engines. Turbofilling and turbocharging. Fuel injection systems. Heat transfer and engine cooling.
- Combustion in Otto and Diesel engines: Calculation of combustion rate. Pollutant formation and exhaust gas aftertreatment technologies.

[CESECEA02] – Energy systems control

The Control of Energy Systems course provides an integrated approach to the analysis of dynamic behaviour and the design of control systems for energy systems.
The outline of the course is as follows:

- Feedback Control Fundamentals - Controls
- Dynamic Behaviour Analysis (Stability, Dynamic Response)
- Simple feedback loop (PID controller, controller configuration, sequential loop control, proactive control, time-delayed systems)
- Multi-loop feedback systems (dynamic interaction analysis, decoupling)
- Design of control systems in the field of frequency response.
- Design of control systems in the field of state variables.

[CESESS01] – Distributed energy production

- Introduction (Definition, Centralized vs. Decentralized Energy, Microgrids and Producer-Consumer Models, DER Classification)
- Solar Photovoltaic (PV) Systems (PV Cell Physics, Characteristics, Temperature Effects, Maximum Power Point Monitoring, Inverters, Grid Integration)
- Wind Energy Systems (Wind Turbine Power Types and Curves, Induction Generators, DFIG, Synchronous Generators, PMSG, Power Inverters, Electrical Behaviour, Grid Integration)
- Small Hydro & Other Distributed Renewable Energy Sources (Hydro and Micro-Hydroelectric Power Systems, Wind Turbine-Turbine Selection and Control, CHP, Biogas Generators, Electrical Interconnection)
- Power Electronics for Distributed Energy (Inverter Topologies and Modulation Techniques, Harmonic Generation and Filtering, Anti-Insulation and Protection Schemes, Grid-Forming Inverters vs. Grid-Following Inverters)
- Electrical Interconnection of Generation Systems (Diagrams, Topology, Impact on Distribution Feeders, Voltage Regulation and Control Strategies, Reactive Power Management, Protection Issues)
- System Modelling (Load and Production Profiles, Intermittency Time Series Modelling, Power Flow Studies, Dimensioning, DER Placement)
- Microgrids & Smart Grid Integration (Microgrid Architectures, Control Hierarchy, Demand Response and Smart Loads).
- Economics, Policy & Project Development (Cost Analysis, Feed-in Tariffs, Metering Offsetting, Regulatory Frameworks, Project Dimensioning, Feasibility Studies, Reliability Assessment and Risk Management, Environmental Impacts).

[CESESS02] – Hydrogen and Fuel Cells

The course provides a comprehensive introduction to hydrogen as an energy carrier and to fuel cell technologies to produce clean electrical power. Students study the fundamental properties of hydrogen, its production processes (electrolysis, reforming, thermochemical and biological processes), storage methods and safety issues. The course examines the principles of operation, thermodynamics and performance characteristics of basic types of fuel cells, such as proton exchange polymer membrane (PEM) cells, solid oxide cells, and high-temperature systems with proton conductivity. Emphasis is placed on electrode reactions, ion and gas transport, water and heat management, catalysts and degradation mechanisms. The role of hydrogen and fuel cells in energy system integration, transportation, industry decarbonization, and power grid balancing is analysed through real-world application studies. Laboratory exercises introduce basic diagnostic tools, such as polarization curves, performance measurements, and performance evaluation through electrochemical impedance spectroscopy. Upon completion of the course, students will understand the scientific and engineering foundations that enable hydrogen and fuel cell technologies to contribute to a sustainable energy future.

[CESE28] - Semi-annual Technical Report - Senior project

Complete semi-annual technical report in one of the fields of study

[CESEPD03] – Energy Finance

Upon successful completion of the course, students will be able to understand how financial principles are applied in the energy sector, as well as how energy commodities are produced, traded, priced and financed in global and regional markets. The course introduces the operation of the Energy Exchange, including spot markets and markets derivatives (futures), trading mechanisms and the role of market participants such as producers, traders and financial institutions. Students will gain knowledge of energy trading strategies, the price formation process, market volatility and the use of financial tools to manage risk. The content also examines investment decision-making in Renewable Energy projects, the impact of regulation and energy policy on financial performance, as well as the ever-increasing importance of sustainability and markets carbon. Emphasis is placed on linking market dynamics with financial analysis, with the aim of supporting informed decisions in the field of energy investments, trading and risk management.

[CESECEA03] – Applications in Agriculture

The Applications in Agriculture course explores renewable energy and bioenergy technologies for the development of sustainable agricultural systems. It starts with the basics of solar energy, such as the capture and intensity of solar radiation, the use of thermal mass, the optimal orientation of facilities, and their contribution to the overall sustainability of farms. Passive solar heating and cooling are covered through greenhouse and barn design, solar chimneys, natural ventilation, heat storage, and low-cost interventions, as well as solar thermal systems for water heating, livestock installations, crop drying, and post-harvest processes. Agricultural applications of solar energy, such as the use of photovoltaics for irrigation, pumping, electrical fencing, remote sensing, monitoring, and precision agriculture, including off-grid solutions, are being considered. The principles of geothermal energy are presented, with a focus on resource classification, soil thermal properties, shallow low-enthalpy geothermal systems, ground heat pumps, and seasonal storage. Direct geothermal applications in greenhouses, aquaculture, crop processing and drying, as well as in microclimate control are analysed. Finally, the course examines agricultural biomass resources, pretreatment and pellet production processes, anaerobic reactor design, and best practices for farm-level biogas systems.

[CESESS03] – Smart grids

Introduction. The course begins with an introduction to the smart grid, the concept, smart grid drivers, the evolution of the electrical grid, definitions and needs in equipment, functions and opportunities, challenges and benefits, the difference between conventional and smart grid.

Analysis of smart grid technologies, i.e. Smart Energy Resources, Power Supply Automation, Substations and Automation, Transmission Systems (EMS, FACTS, HVDC), Monitoring, Protection and Control, Energy Management, Distribution Systems (Volt/Var Management, Isolation, Fault Detection, Service Remediation), Ancillary Services, Distribution Transformers, Phase Shift Transformers, Electric Vehicles (plug-in and hybrid).

Smart meters and advanced metering infrastructure. Introduction to smart meters, protocols, standards and initiatives, advanced metering infrastructure, energy quality management and electromagnetic compatibility in smart grids, grid-connected renewable energy, regulators and energy quality monitoring, energy quality control.

Computing for smart grid applications. Local area network, home network, IP protocols, cloud computing and cybersecurity for smart grids, broadband over power lines (BPL), energy management and specific applications.

[CESE29] – Diploma thesis - Capstone project

Preparation of a complete technical report, including original work and research in one of the fields of study.

B. ELECTIVE COURSES

[CESE01EL] – Energy Systems in the Built Environment

The course examines buildings in the context of the carbonized economy through the application of renewable energy systems (with an emphasis on solar technologies) and focuses on meeting the needs of heating – cooling and ensuring thermal comfort for users. The design and sizing of energy systems, the energy efficiency of appliances, the health and well-being of users, and the construction of infrastructure that is resilient to climate change are also a key topic of the course. The forecasting of energy demand and consumption, the application of automation, smart systems, cost-effectiveness and environmental impact assessment (with an emphasis on carbon footprint) will also be explored. Finally, in the context of the course, tools will be used for the integrated assessment of buildings in the context of environmental certificates according to LEED and BREEAM, in accordance with energy and climate policy.

[CESE02EL] – Energy and Environment

The course introduces students to the scientific principles underlying the interaction of energy systems with the environment, providing the theoretical background for understanding the environmental challenges and opportunities of the clean energy transition. It examines how different forms of energy production, conversion and use—such as oil, coal, natural gas, nuclear energy, biomass, geothermal, hydroelectric, wind and solar energy, as well as other renewable sources – affect climate change, air quality, natural resources and ecosystems. Students study the environmental impacts of fossil fuels and clean energy technologies, with a focus on greenhouse gas emissions, pollutant formation, biogeochemical cycles, and ecosystem interactions. The course covers life cycle analysis, environmental footprint, and sustainability indicators for the evaluation of energy systems. Emphasis is placed on the local and global consequences of energy efficiency options and related compromises. Through case studies and quantitative analysis, students develop skills in evaluating and designing efficient and environmentally responsible energy solutions, highlighting the critical role of science-informed decision-making for a sustainable energy future.

[CESE03EL] – Turbomachines

Introduction to turbomachinery, general principles, standard layouts. The turbo engine and the operating system. Standard features of turbomachinery, laws of similarity, cooperation of several turbomachinery, operation in series or in parallel. The fluid mechanics and thermodynamics of turbines, the thermodynamic cycles of gas turbines and steam turbines. The relative flow, the velocity triangles, Euler's equation. Aerodynamics of turbomachinery, basic principles of operation, dimensionless numbers, performances, reaction. Axial compressors: design, operation, limiting factors. Blade aerodynamics for axial compressors operating in both sub- and ultrasonic areas. Flow phenomena, 3D effects, edge leakage flows. Radial Turbines: Description, Velocity Triangles, Design and Operation Problems. Axial Turbines: Blade design and manufacturing features, 3-D flows. Blade cooling methodology and manufacturing problems. Pumps: Study of water phase change under extremely low pressures, cavitation. Analysis of 3-D functional characteristics of flow effects, multistage pumps, technical and operational problems. Radial turbines. Design and function theory, study of flow in radial turbine rotors. Water turbines: Fluid mechanics of Pelton, Francis and Caplan turbines. Design and construction, functional characteristics, cavitation.

[CESE04EL] – Modelling and Optimization of Energy Systems

The course introduces students to cutting-edge topics in the modelling and optimization of energy systems, including the modelling of hybrid energy systems with multiple energy feedstocks, energy supply chain networks, multigeneration systems, combined heat and power systems, energy markets, and energy design.

In the first half of the semester, computer-aided modelling and optimization techniques of energy systems will be introduced, such as: mass balances and introduction of variables to describe energy production technology, definition of operating and design constraints. Modelling with 0-1 variables for the selection of power generation technology and the development of energy-related flow charts. Setting goals such as economic or environmental. Efficient modelling of complex decisions and constraints based on mathematical reasoning techniques. Examples that consider multi-energy systems.

They will then describe and quantify the multi-level energy supply chains. In addition, the modelling and optimization of a country's long-term energy planning will be studied, including the introduction of constraints of energy production technologies, energy demand, availability of energy resources, modelling of environmental and energy policies. Development of an integrated model of mixed integer linear programming Finally, there will be an introduction to the basic principles of modelling and optimization of energy markets

Tasks and training in a computing environment:

- Introduction to the GAMS modelling and optimization tool.
- Synthesis and optimization of heat exchange networks (work of 2 people)
- Modelling and optimizing a long-term planning problem (work of 2 people)

[CESE05EL] – Battery Management in Electric Vehicles

The course begins with a comprehensive overview of the powertrain subsystems and configurations of electric vehicles. Specific requirements for traction batteries compared to stationary storage, delving deeper into the modelling of lithium-ion cells. Detailed study of equivalent circuit models used to predict battery behaviour under the intense, dynamic current profiles typical of automobile driving cycles.

Hardware and software design of Battery Management Systems (BMS), Critical safety functions of a BMS (overcurrent/overvoltage, overheating protection, etc.). Topology design for cell monitoring and the various passive and active cell balancing techniques required to maximize the usable capacity and lifespan of a battery.

Algorithmic controls. Application of techniques (Coulomb Measurement and Kalman Extended Filters), Assessment of the state of charge and health status in real time. Thermal management of batteries (air, liquid and phase change cooling systems necessary to maintain optimal operating temperatures).

Application in electric vehicles (onboard/off-vehicle charging topologies, communication protocols, etc.). Emerging role of electric vehicles in grid stability through Vehicle-to-Grid (V2G) technologies. Applications of second-use batteries and recycling challenges, with an effort to return to the circular clean energy economy.

[CESE06EL] – Energy from the Chemical Recycling of Waste Plastics

The course examines the principles and technologies of recycling polymers from plastic waste, emphasizing energy recovery and the production of high value-added fuels and chemicals in the context of the circular economy. Initially, an introduction is made to the science of polymers, the mechanisms of polymerization reactions, the physical and chemical properties of key commercial polymers, such as polyethylene, polypropylene, PET, PVC and polystyrene, in the production and consumption trends of plastics worldwide as well as in the quantities of plastic waste. Various streams of plastic waste and sorting technologies are then analysed. The following is a detailed presentation of engineering and chemical recycling strategies. Emphasis is placed on thermochemical recycling

technologies, such as pyrolysis and gasification, with analysis of reaction mechanisms, product distribution, production of synthesis gas and hydrogen-rich streams, as well as the upgrading of the quality of the fuels produced through catalysis. The kinetics and thermodynamics of polymer degradation are examined. At the same time, environmental issues such as life cycle analysis, greenhouse gas emissions, hazardous ingredients, and microplastics are examined. The laboratory exercises of the course include the identification of polymers, the use of thermal analysis techniques and laser-scale pyrolysis experiments with product characterization. Students will perform a brief techno-economic analysis on realistic scenarios of converting plastic waste into energy.

11 Teaching, Student evaluation, ECTS

Lectures are conducted in person with the physical presence of lecturers and students in the classrooms of the Collaborating Schools. By decision of the Program Committee, a common weekly online teaching zone may be established for all students of the Program. This zone may be used for tutorial and/or seminar courses or, exceptionally, for the rescheduling of courses when classroom availability is limited during the rest of the week. In exceptional cases of force majeure or other extraordinary circumstances that temporarily prevent face-to-face teaching, courses may, by a dully reasoned decision of the Chairs of the Collaborating Schools and the Program Director, be delivered remotely online for a strictly limited period, exclusively for the time necessary to address the circumstances justifying the temporary transition to distance learning.

Examinations are conducted with the physical presence of students and examiners in the classrooms of the Schools, whether in written or oral form. Exceptionally, oral examinations may be conducted remotely, provided that the identity of the examinees is securely verified and the established best practices for online examinations are followed, ensuring academic integrity and fairness. Distance written examinations are not permitted, except in the cases explicitly and mandatorily provided for by the applicable legislation. By decision of the Program Committee, written examinations using electronic devices (tablets, laptops or PCs) may be permitted provide that they are conducted in person under physical supervision of the examinees in the premises of the Schools, and in accordance with a formally approved examination protocol that safeguards transparency, integrity and the equal treatment of all examinees.

Attendance at courses, tutorials and any organised educational activity of the Program is mandatory. Students may be absent up to thirty percent (30%) of the total teaching hours of each course per semester, while deviation from this limit is permitted only in dully justified exceptional cases, and subject to the approval of the Program Committee. Active participation in teaching and assessment activities constitutes a fundamental academic obligation and a prerequisite for the successful completion of studies.

Prior to the commencement of each semester, the Program Secretariat prepares and publishes the detailed semester timetable. The timetable is t=structured to ensure as far as possible, that (a) the compulsory and elective courses are evenly distributed throughout the week, (b) unnecessary time gaps between consecutive courses on the same day are avoided and (c)courses belonging to the same semester of study do not overlap.

Upon completion of the tenth (10th) teaching week of each semester, students are invited to participate in an anonymous electronic evaluation of the courses and the instructors. The evaluation process forms part of the Program's internal quality assurance system and aims to support continuous improvement of teaching and learning.

Student evaluation

Assessment Methods: Students are assessed through written and/or oral examinations held at the end of each semester for the courses taught during that period. Students who do not achieve a passing mark are entitled to one (1) re-sit opportunity during the September examination period. The final grade for each course is determined by the weighting of the final examination and any approved coursework or in-term assessments, as specified in the course outline and communicated at the beginning of the semester.

Adjustments for Students with Disabilities: In accordance with the relevant institutional regulations, lecturers must make appropriate arrangements for the oral examination of students with documented disabilities or specific learning difficulties (e.g., dyslexia, significant mobility impairments, or visual impairments) that substantially limit their ability to participate in written examinations. A student examined orally for a particular course may not also sit the written examination for the same module within the same examination period.

Publication of Examination Timetables and Invigilation: The Program Secretariat publishes the detailed written examination timetable for each examination period prior to each examination period. Academic staff, supported by the Secretariat, ensure that an adequate number of invigilators is appointed, who may include doctoral candidates and postgraduate students. The module convenor must be present at the examination venue, oversee the proper and impartial conduct of the examination, and take any necessary measures to ensure its smooth running.

Eligibility, Conduct and Academic Integrity: Prior to attending an examination, each candidate must ensure that their name appears on the official electronic register confirming eligibility to sit that examination. Cheating, plagiarism, or any other form of academic misconduct is strictly prohibited. The possession or use of unauthorized materials, books, notes, or electronic communication devices during the examination constitutes a serious breach of academic integrity. Candidates may not use personal sheets for draft work; only the final page of the examination script may be used for rough calculations. In cases of suspected malpractice, examination results may be temporarily withheld pending investigation, without prejudice to any disciplinary measures provided for under the applicable institutional regulations.

Duties of Invigilators: Invigilators verify each candidate's student identification, ensure that the candidate's name and registration number are correctly entered on the examination script, initial each script, maintain continuous supervision of the examination environment. They are responsible for overseeing entry to and exit from the examination room and ensure that no candidate leaves the examination room during the first thirty (30) minutes of the examination.

Duration of Written Examinations: The maximum duration of written examinations for all courses is two (2) hours, unless otherwise specified in the official course outline.

Collection and Transfer of Examination Scripts: Upon completion of the examination, invigilators count the total number of submitted scripts, and one invigilator certifies the total. The scripts are then handed to the course lecturer, who verifies and signs to confirm receipt of the correct number of scripts in the presence of the invigilator.

Marking Scale: In all courses of the Program, student performance is assessed on a numerical scale from zero (0) to ten (10). Marks from zero (0) to four (4) indicate failure, while marks from five (5) to ten (10) indicate a pass. These grading conventions apply to all official grade records and transcripts issued by the Program.

Publication of results: Examination results must not be published in any format that reveals the identity of candidates. Results may be displayed exclusively using each student's unique registration number, in accordance with data protection regulations and institutional policies.

Transfer of marks and invalid statements on Scripts: Marks awarded in a given examination period may not be carried forward to a subsequent period. Any statements written by candidates on examination scripts that are unrelated to the examination content, such as requests for conditional marking (e.g., disregarding the script if the mark falls below a specified threshold), or comments regarding the number of courses remaining for degree completion, are not permitted and, where present, are disregarded during the marking process.

Feedback and access to scripts: Following the publication of results, lecturers may discuss the examination questions and indicative answers with interested students at designated times. Candidates have the right to review their examination script from the current examination period and to request clarification regarding marking. Lecturers are required to upload the proposed solutions for their examination papers to the Program's e-learning platform.

Degree classification requirements, ECTS: For the award of the degree and the calculation of the final classification, the following components are required: twenty-seven (27) compulsory courses, amounting to one hundred and eighty (180) ECTS credits; five (5) elective courses and two (2) assignments, amounting to sixty (60) ECTS credits. The successful completion of all required components results in the accumulation of two hundred and forty (240) ECTS credits, which constitutes the total credit requirement for the award of the degree, where 1 ECTS credit, corresponds to 27 work hours.

Final Marks and Scores: The Final Score (FS) for the Program, which forms the basis for the award of the Degree descriptor, is calculated as the credit-weighted average of the marks obtained by the student in all assessed components. The calculation follows the formula:

$$FS = \frac{\sum_{i=1}^{34}(M_i \times ECTS_i)}{240}$$

where I = 1… 34 corresponds to all compulsory and elective modules, including the two assignments. The denominator reflects the total of 240 ECTS credits required for the award of the Degree.

The minimum possible FS is 5.0. The Degree descriptor is then assigned according to the following classification scale.

FS	**Degree Descriptor**
8,5 – 10,0	Excellent
6,5 – 8,49	Very good
5,0 - 6,49	Good

12 Lecturers

The following staff categories may be appointed as lecturers in the Program:

- Any of the faculty members of the Collaborating Schools or other Schools of Aristotle University of or of another Higher Education Institution (HEI). Teaching duties in this Program is considered as an extra to their minimum legal obligations (Article 155 of Law 4957/2022),
- Emeritus Professors or retired faculty members of the Collaborating Schools or other Schools of Aristotle University or other HEI,
- Members of Special Educational Staff (EEP), Laboratory Teaching Staff (EDIP) and Special Technical Laboratory Staff (ETEP) of HEIs, who hold a doctoral degree and have teaching experience, as well as sufficient scientific, publication or research activity,
- Adjunct lecturers,
- Visiting professors and visiting researchers,
- Researchers on contract,
- Researchers and special functional scientists of the Research Centres of article 13A of Law 4310/2014 (A' 258) or other research organisations in Greece and abroad, who hold a doctoral degree and have teaching experience and sufficient scientific, publication or research activity,
- Postdoctoral students and young scientists, holders of a doctoral degree, who have specialized knowledge or relevant experience in the subject of matter,
- Collaborating professors.

The assignment of the teaching duties is carried out by decision of the Program Committee, following the recommendation of the Program Director, who collaborates for this purpose with the Chairs of the Collaborating Schools. The decision of the Program Committee must ensure that participation in the Program does not adversely affect the lecturers' teaching, research and administrative obligations towards their School and the Greek-language undergraduate study program. The decision of the Program Committee regarding the assignment of teaching duties is issued no later than the beginning

of each academic semester. The decision specifies the appointed lecturers, the courses and educational activities, as well as the total number of teaching hours assigned to each lecturer in accordance with the approved curriculum for that semester.

Lecturers are obliged to adhere to the officially approved timetable and to comply with the examination and evaluation regulations, set out in this Study Guide and the Program Regulations.

List of lecturers for the 2026-2027 Academic Year by School of Origin

(EE: Electrical and Computer Engineering, ME: Mechanical Engineering, CE: Chemical Engineering, C: Chemistry, A: Agriculture, E: Economics, P: Professor, AP: Associate Professor, AsP: Assistant Professor)

School	Surname	Name	Rank	Classes Code	e-mail
C	Avranas	Antonios	P	CESE6	avranas@chem.auth.gr
EE	Alexiadis	Minas	P	CESESS01	minalex@auth.gr
EE	Atreas	Nikolaos	AP	CESE02	natreas@auth.gr
C	Achilias	Dimitrios	P	CESEEL02, CESEEL06	axilias@chem.auth.gr
ME	Vlachokostas	Christos	AP	CESE19, CESE27	vlahoco@meng.auth.gr
ME	Vlachos	Dimitrios	P	CESEPD02	vlachos1@meng.auth.gr
ME	Georgiadis	George	AsP	CESEPD02	ggeorgij@meng.auth.gr
CE	Georgiadis	Michalis	P	CESEEL04	mgeorg@auth.gr
ME	Giagopoulos	Dimitrios	AP	CESE14	dgiagopoulos@auth.gr
ME	Giama	Efrosini	AP	CESE25, CESECEA01, CESEEL01	fgiama@meng.auth.gr
CE	Damartzis	Theodoros	AsP	CESE8	damartzis@cheng.auth.gr
C	Eugenides	Sotirios	AsP	CESEEL02	sevgenid@chem.auth.gr
C	Kalogiouri	Natasha	AsP	CESE01	kalogiourin@chem.auth.gr
ME	Kalfas	Anestis	P	CESE11, CESEEL03	akalfas@meng.auth.gr
C	Karapantsios	Theodoros	P	CESEPD01	karapant@chem.auth.gr
ME	Karatzas	Konstantinos	P	CESE10	kkara@auth.gr
A	Karpouzos	Dimitrios	P	CESE27	dimkarp@agro.auth.gr
C	Kartsonakis	Ioannis	AsP	CESE01, CESE6	ikartson@chem.auth.gr
C	Katsogiannis	Ioannis	P	CESEEL02	katsogia@chem.auth.gr
C	Katsounaros	Ioannis	AP	CESE15, CESESS02	katsounaros@chem.auth.gr
E	Kosmidou	Kiriaki	P	CESEPD03	kosmid@econ.auth.gr
C	Koukaras	Manolis	AP	CESE03, CESE23	koukarase@chem.auth.gr
C	Kostoglou	Margaritis	P	CESE26	kostoglu@chem.auth.gr
A	Kotsopoulos	Thomas	P	CESE18, CESE22, CESE24,	mkotsop@agro.auth.gr
C	Lazaridis	Theodoros	AP	CESE01	tlazarides@chem.auth.gr
C	Lykakis	Ioannis	P	CESE01	lykakis@chem.auth.gr
EE	Mademlis	Christos	P	CESE17, CESE20, CESESS03, CESEEL05	mademlis@ece.auth.gr
CE	Marnellos	George	P	CESE8,	gmarnellos@cheng.auth.gr
ME	Michailidis	Nikolaos	P	CESE12	nmichail@meng.auth.gr
C	Balaskas	Andronikos	AsP	CESE6	abalaskas@chem.auth.gr
C	Binas	Vassileios	AsP	CESE01, CESE6, CESE12	vbinas@chem.auth.gr
A	Nastis	Stefanos	P	CESE19	snastis@agro.auth.gr
ME	Ntziachristos	Leonidas	P	CESE21, CESE24, CESECEA01	leon@auth.gr
ME	Panagiotidou	Sophia	AP	CESE9	span@meng.auth.gr
ME	Panaras	George	AP	CESE25, CESEEL01	gpanaras@meng.auth.gr
ME	Papadopoulos	Agis	P	CESE25, CESECEA01, CESEEL01	agis@auth.gr

A	Partalidou	Maria	P	CESE19, CESE27	parmar@agro.auth.gr
ME	Savvaidis	George	P	CESE05, CESE14	gsavaidis@meng.auth.gr
A	Sergaki	Panagiota	P	CESE27	gsergaki@agro.auth.gr
ME	Seferlis	Panagiotis	P	CESE7, CESE13, CESECEA02	seferlis@meng.auth.gr
ME	Stergioudi	Fani	AP	CESE12	fstergio@meng.auth.gr
C	Trogadas	Panagiotis	AsP	CESESS02	trogadas@chem.auth.gr
C	Tsiplakidis	Dimitrios	P	CESE6, CESE15, CESE24, CESESS02	dtsiplak@chem.auth.gr
A	Ypsilantis	Ioannis	P	CESE18	iipsi@agro.auth.gr
C	Fanourgakis	George	AsP	CESE04, CESE16	fanourg@chem.auth.gr
A	Fotidis	Ioannis	AsP	CESE18, CESE22, CESECEA03	ifotidi@agro.auth.gr

13 Tuition Fees

For attendance on the Program, a total tuition fee of thirty-two thousand euros (€32,000) is payable, divided into annual fees of eight thousand euros (€8,000). The level of tuition fees is determined and may be revised by decision of the Senate of Aristotle University, while the method and schedule of payment may be specified or adjusted by decision of the Program Committee.

Tuition fees are paid by the student (or by a third party acting on their behalf) into a bank account managed by the Special Account for Research Funds of Aristotle University (ELKE AUTH). Fees are paid in eight (8) equal instalments of four thousand euros (€4,000): the first instalment is due during the enrolment process, with subsequent instalments payable before the start of each semester.

Payments are made electronically, in accordance with the instructions provided by the Program Secretariat. Upon confirmation of payment by ELKE AUTH, an official receipt is issued and the student is notified electronically. The amount paid to ELKE AUTH is non-refundable in cases of non-acceptance or withdrawal of the application.

Upon acceptance of an offer of a place on the Program, candidates are required to pay a deposit of one thousand euros (€1,000) as an advance towards the tuition fees. This amount is also paid to ELKE AUTH and is non-refundable in the event of withdrawal from the Program.

14 Scholarships and financial support

Limited scholarships and awards may be made granted to students on the basis of academic merit and objective criteria, following a dully reasoned decision of the Program Committee and subject to the Program's available financial resources. Indicative categories include the following:

Entry Scholarships: Up to three (3) scholarships per academic year may be awarded to incoming students who demonstrate outstanding performance during the selection process, based on the overall assessment of their qualifications (including performance in the oral interview). These scholarships provide full exemption from tuition fees for the first academic year.

Excellence Scholarship: A scholarship for academic excellence may be awarded to the student who achieves the highest overall average grade across all years of study, if they have successfully completed all courses within this period. The scholarship exempts the student from tuition fees for the following academic year. In the event of a tie, the Program Committee may decide to award the scholarship to more than one student.

Excellence Awards: The Program Committee may confer awards of academic excellence on students who demonstrate outstanding academic performance during their studies. Such awards may include an honorary distinction and/or a monetary prize. An award may be granted to the student who attains the highest academic performance within a specific academic year.

Support for Underprivileged Students: A full or partial exemption from tuition fees may be granted, following a reasoned decision of the Program Committee, to students originating from war zones or those under international or subsidiary protection, based on documented social and humanitarian criteria.

Scholarships Based on Social Criteria: In exceptional circumstances, a social scholarship may be awarded to applicants or enrolled students experiencing serious financial hardship, health-related difficulties, bereavement, or other substantiated emergency conditions. Applications are evaluated by the Program Committee, together with the relevant supporting documentation.

Compensatory Scholarships: Compensatory scholarships may also be awarded, consisting of a partial exemption from tuition fees in exchange for the provision of specific services in support of the Program. Such services may include assisting library functions, administrative support, contributing to research projects, or undertaking other activities determined by the Program Committee in consultation with the Secretariat and academic staff. The scope, duration, and conditions of each compensatory scholarship are clearly defined at the time of award. Failure to fulfil the agreed obligations may result in the suspension or revocation of the scholarship.

The awarding of scholarships and/or excellence awards, including the specific terms, conditions, and the rights and responsibilities of recipients, is determined by the Program Committee prior to the commencement of each academic year. All scholarships and awards are granted at the discretion of Committee's and are contingent upon the financial capacity and available resources of the Program.

15 Program administration and support

International Students Support Unit (urep-dept@auth.gr): Responsible for providing dedicated assistance to international students enrolled in the Program, in accordance with Article 212 of Law 4957/2022. Its mission is to support international students across all first-, second- and third-cycle study Programs of the University. The Unit's responsibilities include:

- - supporting international students with their enrolment in the foreign-language study Programs of the Aristotle University of Thessaloniki,
- - assisting students with the procedures for obtaining an entry visa and residence permit for study purposes, and liaising with the competent public authorities on these matters,
- - facilitating the conclusion of agreements for the accelerated issuance of residence permits for study purposes, in accordance with Article 37 of Law 4251/2014 (A' 80),
- - providing guidance and practical assistance to students during their initial settlement in Greece,
- - collaborating with the relevant administrative services of the Aristotle University of Thessaloniki to ensure coordinated support for international students,
- - organising, in cooperation with the appropriate University units, courses in Greek or other foreign languages,
- - undertaking any additional responsibilities assigned in the University's organisational framework that relate to the remit of the Foreign Student Support Unit.

Program Secretariat (info@cese.auth.gr): Responsible for student and administrative matters. In particular, student-related responsibilities include:

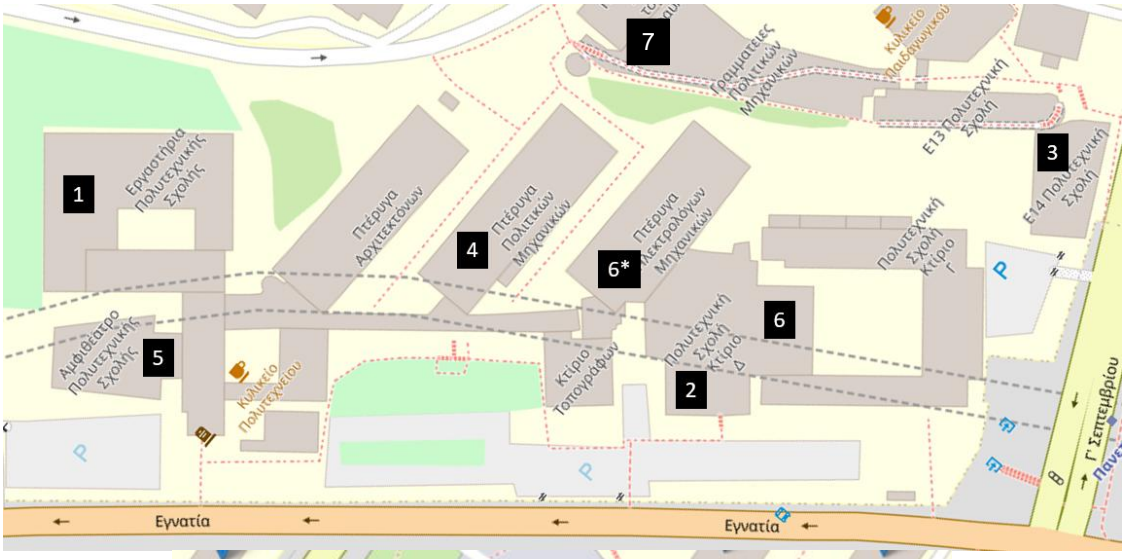
- student registration
- maintaining student records, including marks, information on scholarships, and the issuing of diplomas
- preparing student lists based on the courses each student has declared they wish to attend
- issuing official certificates

Student services are provided on all working days from 12:00 to 13:00 at the Secretariat Office, located on the ground floor of Building D of the Faculty of Engineering.

16 Survival guide at AU

Finding your way

An interactive map of the campus can be found at https://maps.auth.gr/. The main locations of interest can be found in the following picture:



2 Building D Floors 7 – 9: Offices of Mechanical, Electrical, Chemical Engineering Professors
2 Building D, Ground Floor: Program Secretariat
3 Building E14, Offices of Mechanical Engineering Professors
4 Classrooms of the School of Mechanical Engineering
5 Amphitheatres of the Faculty of Engineering
6 Computer Island of the School of Mechanical Engineering
7 Library of Mechanical Engineering
8 Building A (old) of School of Chemistry: Professors' office, Secondary Lecture Hall (Amphitheatre), Classrooms, Teaching laboratories, School library
9 Building B (new) of School of Chemistry: Professors' office, Main Lecture Hall (Amphitheatre), Teaching laboratories, Classrooms

Institutional Account (University ID)

Your institutional account gives you access to:

- University email
- Wi-Fi
- e-learning platforms (**elearning.auth.gr**)
- Software and computing resources

The institutional account will be automatically issued to you upon your enrolment.

Academic Identity Card

Issued after enrolment and institutional account activation. It also functions as a public transport pass for eligible students.

On-campus Libraries

The Library of the School of Mechanical Engineering (https://www.lib.auth.gr/en/library-mechanical-engineering) is located on the ground floor of Building E10, next to the Hydraulics Building (Number 7 on map above).

What you'll find there:

- Books in Greek, English, German, French and Italian
- Journals, manuals, dictionaries, catalogues, maps and electronic material (non-borrowable)
- Access to study spaces and information services
- Staff who can help you locate material and use library resources

Opening hours:
09:00–14:00, Monday to Friday (closed on public holidays)

Becoming a member:
To borrow books, you must register by submitting:

- A completed registration form
- A colour photograph
- Your student ID or police ID

Borrowing basics:

- Regular loan books: **7 days**, renewable if not reserved
- Short-loan books: **3 days**
- Non-loan items: dictionaries, catalogues, journals, electronic material
- Regular members may borrow up to **3 short-loan books**
- Thesis students may borrow **5 books** with extended loan periods (with supervisor certification)

Important:
You must return all books and settle any fines before graduation, as the library must issue a clearance certificate

Reading Rooms

AUTH offers several study spaces:

- **Central Student Reading Room:** Open daily **08:00–02:00**
- **School Libraries:** Many Schools offer additional study areas

Computer Islands & Digital Services

The Mechanical Engineering main Computer Island is on the ground floor of Building D. It includes networked PCs for coursework, thesis preparation and seminars. When places are full, priority is given to students working on diploma theses or doctoral research.

University Student Club (https://pfl.auth.gr/)

Located in the eastern part of campus, the Club offers:

- Student meals at a very reasonable fee
- Health services
- Reading rooms
- Hairdresser
- Cultural and sports activities

Student Unions

Explore updated information at https://www.auth.gr/en/student-unions-en/

Support Services

Social Policy & Health Committee

Ensures accessibility and support for:

- Students with disabilities
- Students needing assistive technologies (e.g., Braille printers, audio textbooks)
- Students requiring transport support

It also organises a voluntary blood donation twice a year.

Email : *socialcom@ad.auth.gr*
fititikiline@ad.auth.gr
Website :/Social Policy & Health Committee – Department of Studies
Tel: *2310 995386*
2310 995360

Support Office for Students from Vulnerable Social Groups

Supports:

- Students with disabilities
- International students
- Minority, expatriate or repatriated students
- Students facing serious academic or personal difficulties

Email: *studentcare@auth.gr*
Website: https://studentaid.auth.gr/
Tel: *2310.999888*

Prayer Room for Students

Beginning in the late 1970s/early 1980s, the School of Theology has maintained a designated prayer facility for the students of the institution, serving as the venue for the Friday Prayer.

Counselling & Psychological Support (KESYPSY)

Provides free, confidential support for issues such as:

- Anxiety and stress
- Adjustment to university life
- Interpersonal and family difficulties
- Psychosomatic symptoms

Located in the Lower Student Club (offices 5 & 8) .

Website : https://kepsysy.auth.gr/
Tel. : *2310 992643 & 2310992621*

Volunteer Committee

Promotes student volunteering and coordinates departmental volunteer networks.

Email : *vrect-ac-secretary@auth.gr*
Tel: *2310 996713, 996708*

Liaison Office (Career Services)

Offers:

- Career counselling
- Workshops and seminars
- Information on postgraduate studies
- Job and internship postings

Website: https://career.auth.gr.
Tel: *2310 997340*

Department of Studies

Offers:

- Complete and updated record of studies legislation
- Legal advice on study matters

Website: https://dps.auth.gr
Tel: 2310 995132

Thessaloniki & Transportation

Thessaloniki is the second largest city in Greece inhabited, in its metropolitan area, by more than 1,500,000 inhabitants. It is the administrative and government centre for all of Northern Greece and a key hub for the Balkan region, hosting the country's second largest port and basic infrastructure for trade and transport to and from the other Balkan countries. Thessaloniki is one of the most vibrant cities in Greece that is home to a very large student community and a multifaceted day and nightlife. Famous for its taverns with many different delicacies, its cafes by the sea and the nightlife, Thessaloniki is a city that never sleeps.

Thessaloniki offers easy and fast ways to get around. No part of the city is more than 30 minutes from the centre by public transport. The Organization of Urban Transport of Thessaloniki (O.A.S.Th.), the second largest in Greece, connects the entire city through a dense network of bus lines, while the recent opening of the Thessaloniki Metro makes travel even easier.

All the necessary information about timetables, real-time bus tracking, route duration, best timetables, etc., are available on the official page of O.A.S.Th. (https://www.oasth.gr/) and in https://www.thessmetro.gr/ one may find the corresponding metro information.