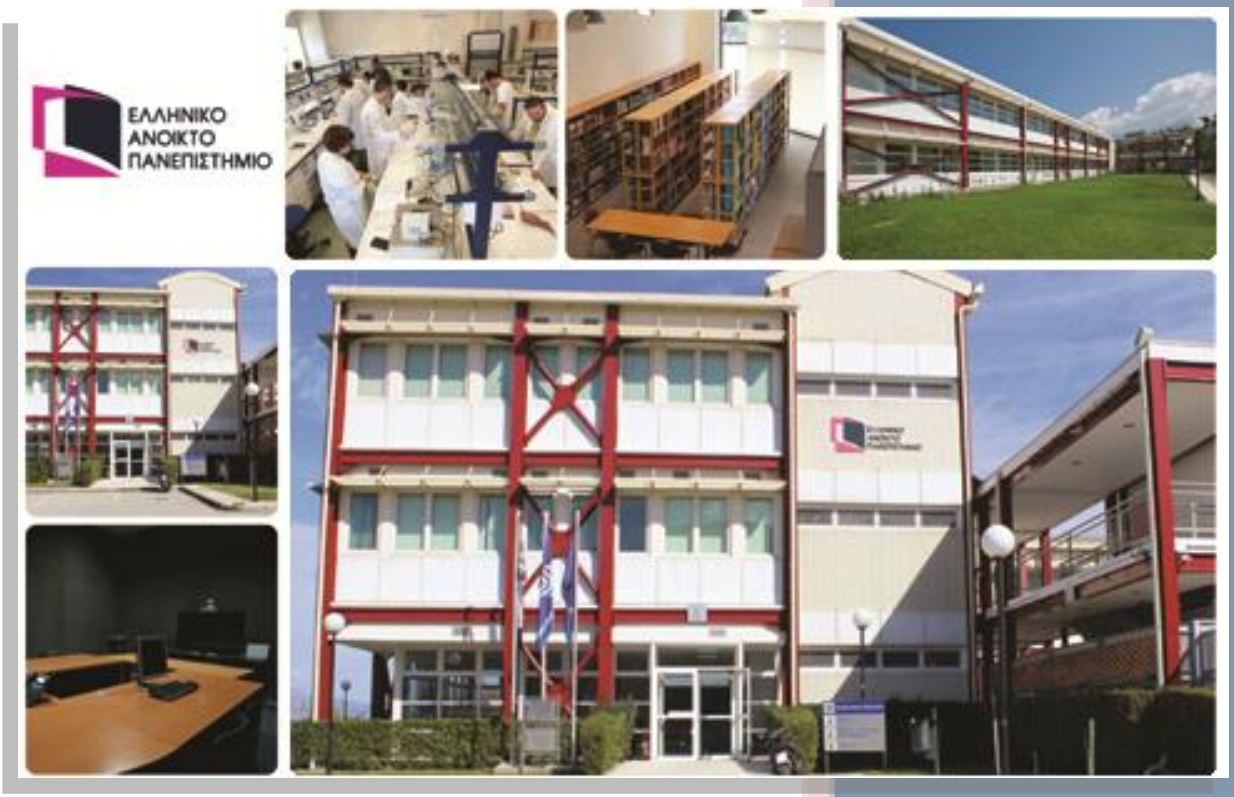
Study Guide
Academic Year
2025-2026

HELLENIC OPEN UNIVERSITY

SCHOOL OF SCIENCE AND TECHNOLOGY



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Legal Framework

The Hellenic Open University (HOU) was legally founded with article 27, par. 1, of Law 2083/1992 (A' 159), provides higher education as a Higher Education Institution (H.E.I.), in accordance with the provisions of Article 3 of Law 4957/2022 (A' 141), is subject to the provisions of 4957/2022 (A' 141) Law for issues that are not regulated by the 5094/2024 (A' 39) Law and bears the international title "Hellenic Open University (H.O.U.)".

The mission of the Hellenic Open University (HOU) is to:

a) provide open and distance undergraduate and postgraduate education and training,
b) provide short-cycle study programmes through the development and use of appropriate educational material and teaching methods,
c) provide pedagogical teaching methods, education, training and expertise, and
d) scientific research

The objectives of the HOU include the promotion of scientific research, as well as the development of technology and methodology in the field of the transmission of knowledge in distance.

Administrative bodies of H.O.U.

Higher Education Institutions have the following administrative bodies, each of which exercises the responsibilities defined in Law 4957/2022 (A' 141):

a) Governing Council, b) Senate, c) Rector, d) Vice-rectors, e) Executive Director

Governing Council

The composition of the Governing Council (G.C.) of the Hellenic Open University (H.O.U.) is as follows:

1. **Emmanouil Koutouzis,** Professor, School of Humanities (internal member).
2. **Ioannis Kalavrouziotis**, Professor, School of Science and Technology (internal member).
3. **Maria Hadjinicolaou**, Professor, School of Science and Technology (internal member).
4. **Augustinos Dimitras**, Professor, School of Social Sciences, (internal member).
5. **Vassilia Hatzinikita**, Professor, School of Humanities (internal member).
6. **Stylianos Zerefos**, Professor, School of Applied Arts and Sustainable Design (internal member).
7. **Iosif Bouzakis**, Emeritus Professor of the first rank of the University of Patras (external member).
8. **Maria Boletsi**, Professor of Modern Green Studies at the University of Amsterdam and Associate Professor in Comparative Literature at Leiden University (external member).
9. **Evgenia Moraitou**, Chief Financial Director at a Commercial Company Group (external member).
10. **Eleni Xoplaki**, Academic Staff member, Justus Liebig University of Giessen (external member).
11. **Loukas Zahilas**, Clerk at CEDEFOP (external member).

Senate

The Senate is formed for the academic year 2025-2026 as follows:

1. Professor **Emmanouil Koutouzis**, Rector.
2. Professor **Antigone Detzortzi Vlavianou,** Dean of the School of Humanities of the Hellenic Open University, with Deputy Dean Associate Professor **Dimitrios Filippis**.
3. Professor **Prokopis Theodoridis**, Dean of the School of Social Sciences of the Hellenic Open University, with Deputy Dean Professor **Dimitrios Stergiou.**
4. Professor **Irini Mavrommati**, Dean of the School of Applied Arts and Sustainable Design of the Hellenic Open University with Deputy Dean Professor **Lampros Doulos**.
5. Professor **Kyriakos Bourikas,** Dean of the School of Science and Technology of the Hellenic Open University with Deputy Dean Professor **Georgios Hatzigeorgiou.**

According to the provisions of par. 2 of Article 16 of Law 4957/2022, the Vice Rectors have the right to participate in the meetings of the Senate without voting rights, as follows:

1. Professor **Athanassios Mihiotis**, Vice Rector for Research and Innovation (*without voting rights*).
2. Professor **Panagiotis Kayalis,** Vice Rector of Academic Affairs and Outreach (*without voting rights*).
3. Professor **Efthimios Zervas,** Vice Rector of Infrastructure and Finance (*without voting rights*).
4. Professor **Vassilios Verykios,** Vice Rector of Student Affairs (*without voting rights*).

Rector

The position of **Rector** of the Hellenic Open University (H.O.U.) is held by **Emmanouil Koutouzis**, Professor of the first rank of the School of Humanities.

The term of office for the Rector of the Hellenic Open University (H.O.U.) is four years, starting on September 1, 2024, and ending on August 31, 2028.

Vice Rectors

According to the Rector's Act No. HOU 21720/02.09.2024 (Government Gazette B' 5030/04.09.2024), the areas of responsibility, the specific duties of the Vice Rectors of the Hellenic Open University (H.O.U.), and the order of substitution for the Rector are defined. The term of office for the four Vice Rectors of the H.O.U. is four years, starting on September 1, 2024, and ending on August 31, 2028.

Vice Rector for Research and Innovation
Athanassios Mihiotis, Professor of the School of Social Sciences with a specialization in "Management"

Vice Rector of Academic Affairs and Outreach
Panagiotis Kayalis, Professor of the School of Humanities with a specialization in "Modern Greek Literature (19th-20th c.)"

Vice Rector of Infrastructure and Finance
Efthimios Zervas, Professor of the School of Applied Arts and Sustainable Design with a specialization in "Environmental Impacts Technology"

Vice Rector of Student Affairs
Vassilios Verykios, Professor of the School of Science and Technology with a specialization in "Data Management"

SCHOOLS OF THE H.O.U.

The basic academic unit of the Hellenic Open University (H.O.U.) is the School.
The H.O.U. consists of the following Schools: a. School of Social Sciences b. School of Humanities c. School of Science and Technology d. School of Applied Arts and Sustainable Design. The Schools of H.O.U. operate as a single Department.

School of Science and Technology

The School of Science and Technology of the Hellenic Open University (H.O.U.) consists of the following bodies:
a) Dean of the School
b) Dean's Deputy of the School
c) School's Assembly which is constituted in accordance with Article 29 and exercises the responsibilities of the Department's Assembly as outlined in Article 30 of Law 4957/2022 (A' 141).
d) Deanery, which is constituted in accordance with Article 22 of Law 4957/2022 (A' 141), exercises the duties of Article 23 of the same Law and those provided by Law 5094/2024 (A' 39).

The School of Science and Technology's Assembly for the academic year 2025-2026 is formed as follows:

1. Professor Kyriakos Bourikas - **Dean of the School.**
2. Professor Georgios Hatzigeorgiou - **Dean's Deputy of the School.**
3. Professor Vassilios Verykios
4. Professor Maria Hadjinicolaou
5. Professor Ioannis Kalavrouziotis
6. Professor Dimitrios Kalles
7. Professor Achilles Kameas
8. Professor Antonios Leisos
9. Professor Sarantis Mitropoulos
10. Professor Georgios Papagiannopoulos
11. Associate Professor Petros Kokkinos
12. Associate Professor Georgios Balomenos
13. Associate Professor Argyro Sgourou

Undergraduate Students' Representative: not defined yet

Postgraduate Students' Representative: not defined yet

PhD Candidates' Representative: not defined yet

The School of Science and Technology's Deanery for the academic year 2025-2026 is formed as follows:

Professor Kyriakos Bourikas –**Dean of the School**

Professor Georgios Hatzigeorgiou - - **Dean's Deputy of the School.**

Members:

1. Professor Dimitrios Kalles
2. Professor Achilles Kameas
3. Professor Antonios Leisos

Studies at the Hellenic Open University

The Hellenic Open University (H.O.U.) awards:
a) Undergraduate Degrees
b) Postgraduate Degrees.
c) Doctoral Degrees.
Also, it issues:
a) Certificates of Module and Laboratory Module Attendance.
b) Training Certificates.

According to Article 18 of Law 5094/2024 (A' 39):
"*Individual academic and operational Units which are part of the Schools of the Hellenic Open University (H.O.U.) include:*
a) The Module (Md.), b) the Laboratory Module (L.Md.) and c) the Practical Training Module (P.T.Md.), each of which covers one (1) distinct subject at undergraduate and postgraduate level.
Each Module (Md.) lasts one (1) academic year or one (1) academic semester and corresponds to the specified number of ECTS credits as defined by the programme's Regulation of Studies.
Each Laboratory Module (L.Md) includes a number of laboratory exercises in addition to the theoretical content of the studies it may encompass. The duration of the L.Md. extends over one (1) academic year or one (1) academic semester and corresponds to the specified number of ECTS credits as defined by the programme's Regulation of Studies".

Obtaining a Bachelor's Degree (first cycle of studies)
To obtain a degree from the Hellenic Open University (H.O.U.), students are required to complete the Programme of Studies as outlined in the Programme' s Structure.
Obtaining a Master's Degree
To obtain a Master's degree, candidates are required to hold a Bachelor's degree or an equivalent higher education diploma, successfully complete and pass the examinations for the required Modules (Md.), Laboratory Modules (L.Md.) or Practical Training Modules (P.T.Md.) as specified by the Programme of Studies.
Obtaining a Doctoral Diploma
To obtain a doctoral degree, candidates are required to hold a relevant Master's degree and to write a doctoral thesis.

Studies are offered within each Module (Md.) through **distance learning** and includes the following:
Students receive and study the educational material (in printed or electronic form), which is in line with the requirements of distance learning. Students who are educated remotely rely much more on the educational material than those in traditional forms of education, due to the limited communication they can have with the instructor and with their fellow students. Therefore, the educational material "teaches" the students, and it needs to be designed in such a way as to compensate, to the greatest extent possible, for the absence of direct educational communication and, in general, fulfills the various teaching functions that are carried out in traditional education. To meet these needs, the educational material must be created in a way (and include the appropriate elements) in order to:

- Guide the students during their studies.

- Promote the essential for the learning procedure interaction of the student with the learning material (through exercises and assignments).
- Explain difficult points and concepts.
- Assess and inform the student about their progress.
- Motivate and encourage the student to continue.

Allow the students to freely choose the place, time, and pace of their studies.

For these reasons, the H.O.U. has developed specialized educational materials for all Modules (Md.), which are tailored to the requirements of distance education.

For each Module (Md.), it is estimated that approximately ten (10) hours of study per week are needed. Each undergraduate Md. consists of approximately 800 pages of examinable material, while each postgraduate Md. consists of approximately 1.000 pages. However, the aforementioned numbers of pages are indicative and vary from programme to programme, depending on its content and requirements. To meet these study demands, students must effectively organize their time and plan their activities.

The material may be accompanied by a "Study Guide" (parts of which can be found in the Digital Learning Spaces, and specifically in the digital area of the Module), which includes the study and written assignment schedule, the syllabus, the examinable material, and more. It is important for students to carefully review this Guide and adhere to the study schedule, especially the deadlines for submitting their assignments to their tutor.

Students are continuously supported by their Professors - Advisors and communicate regularly with them. The communication between Professors - Advisors and their students takes place either by phone, or via email, or through tele-conferencing during designated hours with an open discussion system.

During communication with students, the Tutor is informed about the individual, social, educational, and professional characteristics of the students, as well as about their needs and expectations from the Md., in order to adjust their teaching accordingly. Additionally, the Tutor motivates students during their learning journey, connects them with each other to exchange experiences, form study groups, work on assignments, and more. The Tutor also suggests additional bibliographic sources, informs and prepares students for upcoming assignments, exams, and so forth.

The work of the instructors for each Md. is regulated by the Coordinator of the Md. The Coordinator ensures the consistency of their activities, coordinates their work, and develops the topics for written assignments and final examinations with them. Additionally, the Coordinator evaluates the performance of the instructors. The work of an entire Programme of Studies is coordinated by the Director of the Programme.

Over the period of the distance teaching of a Md., Group Counseling Meetings (G.C.M.) are organized on the basis of a relevant decision of the Deanery. These meetings are held on non-working days and hours, unless not possible for objective reasons and in special and exceptional cases. The number of meetings is at least three (3) for P.S. with semester-long Modules and at least five (5) for P.S. with term-long Modules, and the duration of each meeting is four (4) hours. When the G.C.M. of the Module are conducted remotely via teleconference, the duration of each G.C.M. may be reduced, while their number is increased

correspondingly so that the total duration of the G.C.M. remains unchanged. In the case of Laboratory Module (L.Md) that offer face-to-face or distance laboratory training of more than two (2) days, the number of G.S.M. shall be at least two (2) for semester-long courses and three (3) for annual courses and their duration shall be between two (2) and four (4) hours each. In the case of L.Md. that offer face-to-face or distance online practice for one (1) day, then the same requirements as for Md apply and the day of laboratory practice counts towards the total number of G.S.M..

According to the decision No. 558/ak.th.3.7/27.07.2022 of the Board of Directors, starting from the academic year 2022-2023 and onwards, Group Counseling Meetings (G.C.M.) will be conducted remotely.

In each G.C.M. typically an average of 25 students participate who make up the group, and each G.C.M. is coordinated by the designated instructor. Additionally, students are required to complete Educational Activities (E.A.) which are evaluated by the instructor.

The graded educational activities within a Md. include: written assignments, exercises, tests, laboratory practice, presentations, etc. Educational activities are submitted exclusively through the H.O.U. educational platform, except for laboratory practice, presentations, or other specialized activities.

The deadlines for submitting the educational activities are indicated in the Study Schedule/Calendar of each Md.

Any other optional (non-graded) educational activity (e.g. quiz, etc.) may be posted on the educational platform, if the T.S.G. of the Md. so decides. Each educational activity is graded on a scale with a maximum score of ten (10).

To be eligible to participate in the final examinations, a student must (a) achieve at least 50% of the potential maximum score from the total of graded activities, and (b) submit more than half of the total number of graded educational activities. The graded activities may not account for more than 40% of the total Md. grade, -unless otherwise specified in the Government Gazette establishing the programme- and are only included in the final grade after successful participation (≥5) in the final examinations. The aforementioned restrictions do not apply to L.Md. and the relative grading weight of each activity/examination as well as the total number of activities are defined by the relevant S.P.C./A.S.C. with the approval of the School's Deanery. Any deviations from the above requires a special decision by the Senate/Board of Directors following a justified proposal by the School's Deanery. The number of E.A. is 4-6 for term-long Md. and 3-4 for semester-long Md.

The right to participate in the final exams of a Module is granted to students who have enrolled in it and have also fulfilled their educational obligations (educational activities) as specified above.

The examination periods are defined as follows:

Each academic term has the following academic periods:

a) January-February (**1st period**), for students enrolled in S.P. with semester-long Md.,

b) May-June (**2nd period**) for students enrolled in S.P. with semester-long and term-long Md.,

c) June-July (**repeat**), the repeat examination period for students enrolled in programmes with semester-long and term-long Md.,

d) September (**3rd period**), for final-year students enrolled in undergraduate S.P. with semester-long/term-long Md. and final-year students enrolled in post-graduate S.P. with term-long Md.

Students who do not achieve a passing grade in three (3) consecutive examination attempts for P.P.S. with semester-long structure or four (4) consecutive examination attempts for P.P.S. with annual structure, or fail to attend the exams, must re-enroll in the Md. with full financial and educational obligations.

The details regarding enrollment at the Hellenic Open University (H.O.U.) are specified by the Regulation of Studies.

Method of calculating the degree/diploma grade for Programmes of Studies based on the European Credit Transfer and Accumulation System (ECTS): For the calculation of the degree grade of the Programmes of Studies based on the European Credit Transfer and Accumulation System (ECTS) system, the weight of the Modules/courses is taken into account according to the ECTS credits assigned to them.

Admission/Registration Process

According to the article 22, par. 2 of Law 5094/2024 (A' 39) the enrolment of the students in the Programmes of Studies offered by H.O.U takes place without exams. The candidates should submit their application within the deadlines and according to the procedure the Senate sets for each academic year. The call for expressions of interest from prospective students for the programmes of studies is posted on the Hellenic Open University (H.O.U.) website.

The enrolment of the bachelor students requires an Upper Secondary School Certificate Level 4 of the Hellenic Qualification Framework or equivalent of Foreign Certificate.

By decision of the Senate, the total number of positions available for undergraduate and postgraduate students is determined for each academic year. By a similar decision the number of additional positions available for undergraduate or postgraduate students is established, which cannot exceed fifteen percent (15%) of the annual number of positions provided. By a similar decision the conditions, requirements, methods, bodies, and procedures for selecting candidates for admission to the Hellenic Open University (H.O.U.) are specified, as well as any other details related to the admission of undergraduate and postgraduate students to the H.O.U.

Students with serious health conditions are also admitted to the Hellenic Open University (H.O.U.) at a rate of 5% in addition to the designated number of positions for undergraduate programmes.

Financial Contribution – Scholarships

Students participate in the costs associated with the implementation of the open and distance learning system.

Student scholarships are offered, on the provision that certain economic, social and academic criteria are met. The scholarships awarded by the HOU cover either the full amount or part of the financial participation payable by the students for the academic year they apply for a scholarship and provided that a combination of economic, social and academic criteria are met.

STUDY PROGRAMMES OFFERED

SCHOOL OF SCIENCE AND TECHNOLOGY

UNDERGRADUATE PROGRAMMES (Bachelor Degree)

- Studies in Natural Sciences
- Computer Science

POSTGRADUATE PROGRAMMES (Master Degree)

- Data Science and Machine Learning
- Quality Management and Technology
- Advanced Studies in Physics
- Waste Management
- Engineering Project Management
- Earthquake Engineering and Seismic-Resistant Structures
- Environmental Catalysis for Pollution Abatement and Clean Energy Production
- Master's in Mathematics
- Master's in Information system
- Master's in Teaching Natural Science
- Pervasive and Mobile Computing System
- Chemical and Biomolecular Analysis
- **Joint Degree** "Cultivations under cover-Hydroponics"
- **Joint Degree** "Precision Agriculture"
- M.Sc. in Epidemiology
- **Joint Degree** "Precision Medicine and Novel Therapies"

School of Science and Technology

Undergraduate Courses

Studies in Natural Sciences

Description

The course aims to provide students with an introduction to all fields of Natural Science, including Physics, Chemistry and Biology, understanding of Science principles, notions and theories, and to develop problem solving abilities.

Learning Outcomes

On successful completion, the students will be able to:

- Understand and describe the necessity and concepts of basic scientific directions within the framework of a consolidated scientific world perception
- Describe the basic principles, concepts, scientific theories and laws of Physics, Chemistry and Biology, as well as their evolution, till today.
- Understand basic mathematical concepts and use the theorems of analysis and algebra of calculus and vector calculus in order to solve problems in physical sciences and/or describe physical and biological phenomena by employing mathematical terms and equations
- Apply analytical and approximation techniques and methods for solving problems modelled through differential equations that describe physical phenomena and/or biological and chemical processes.
- Apply the fundamental laws of physics to solve problems in the fields of Mechanics, Electromagnetism, Wave propagation, Thermodynamics, Quantum Mechanics and Atomic Physics.
- Apply the laws of chemistry and successfully deal with general problems in Chemistry disciplines such Physical Chemistry, Inorganic and Organic Chemistry.
- Deeply understand the biological mechanisms regulating cellular function, processes and concepts of metabolism and general physiology of living organisms. They also will be able to describe heredity principles and interpretation of the complex biological relationship between genotype and phenotype, which have influenced the evolution on earth through the process of natural selection.
- Deepen the knowledge of laboratory methods and techniques that are employed for the collection, analysis and process of biological, chemical and physical data, and develop the relevant skills.

Admission Requirements

Graduates of High Schools or holders of corresponding or similar secondary education degrees earned either abroad or in Greece.

Knowledge of a foreign language as well as familiarity with the use of computers, e-mail, and the Internet will significantly facilitate participation in the program.

Minimum study duration

4 academic years

Classification according to ISCED-2011 of UNESCO

Coding of educational attainment: 6
Based on the field of Education: 44 Physical Sciences

Classification according to ISCED-2013 of UNESCO

Based on the field of Education: 0538 Physical Sciences

ECTS credit points

240

Learning Material

Learning material used is mainly printed textbooks but also audiovisual and electronic learning material. The printed material is especially adapted to meet the needs and standards of distance education.
Chapters clearly state aims and objectives. Key concepts and expected learning outcomes. Self-assessment questions and exercise.
Alternative teaching material. To assist the students to a better understanding of the main teaching material. It utilizes, clarifies and enriches, if necessary, the already existing material.

Contact

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General Information:
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Course Structure

1st Year	
FYE10 Mathematics I	(C[1], 20 ECTS)
FYE12 General and Inorganic Chemistry	(C, 20 ECTS)
FYE14 Introduction to Natural Sciences	(C, 20 ECTS)
2nd Year	
FYE20 Mathematics II	(C, 20 ECTS)
FYE22 Physical Chemistry	(C, 14 ECTS)
FYE24 Physics I: classical mechanics, electromagnetics, thermodynamics	(C, 14 ECTS)
Physics Laboratory Course I	(C, 6 ECTS)
Chemistry Laboratory Course I	(C, 6 ECTS)
3rd Year	

FYE30 Organic Chemistry	(C, 16 ECTS)
FYE31 Cell structure and function	(C, 16 ECTS)
FYE34 Physics II: vibrations and waves, relativity, modern physics	(C, 16 ECTS)
Chemistry Laboratory Course II	(C, 6 ECTS)
Biology Laboratory Course I	(C, 6 ECTS)
4th Year	
FYE40 Quantum Physics	(C, 14 ECTS)
FYE43 Genetics	(C, 14 ECTS)
Physics Laboratory Course II	(C, 6 ECTS)
Biology Laboratory Course II	(C, 6 ECTS)
Choose one (1) module:	
FYE41 Evolution of Ideas in Natural Sciences	(E^2, 20 ECTS)
FYE42 Planet Earth	(E, 20 ECTS)
PLI10 Introduction to Computer Science	(E, 20 ECTS)
PLI11 Principles of Software Technology	(E, 20 ECTS)
PLI23 Telematics, Internets and Society	(E, 20 ECTS)
PLI35 Computer Systems Security	(E, 20 ECTS)
PLI37 Informatics and Education	(E, 20 ECTS)
PLI44 Signals and Image Processing	(E, 20 ECTS)
EKP63 Science Education	(E, 20 ECTS)
LTU_MATH Introduction to Mathematical Modeling and Applications in Natural Sciences	(E, 20 ECTS)
FYE UT Undergraduate Thesis	(E, 20 ECTS)

Notes:

[1]C = Compulsory

[2]E = Elective

The Physics, Chemistry and Biology Laboratory Courses, lasting two laboratory cycles each, are mandatory and are held exclusively in Patras.

The Laboratory Thematic Unit Introduction to Mathematical Modeling and Applications in Natural Sciences, lasting one laboratory cycle, is elective and held remotely.

Guidelines on Module selection

The modules of the first three academic years are compulsory.

- In order to enroll in the module FYE24, students must have successfully completed the module FYE14.
- In order to enroll in the module FYE22, students must have successfully completed the module FYE12.
- In order to enroll in the module FYE20, students must have successfully completed the module FYE10.
- In order to enroll in the module FYE34, students must have successfully completed the module FYE24.

- In order to enroll in the module FYE40, students must have successfully completed the module FYE34.
- In order to enroll in the module FYE43, students must have successfully completed the module FYE31.
- In order to enroll in the Laboratory Thematic Unit Introduction to Mathematical Modeling and Applications in Natural Sciences" (LTU_MATH), students must have successfully completed the Modules FYE10, FYE14, FYE20, and FYE24.
- In order to enroll in the Undergraduate Thesis (FYE UT), students must have successfully completed all Modules of the third year.

In order to practice in the laboratory circles, students must meet the following requirements:

Physics Laboratory Course

Laboratory cycle I: students must be enrolled and should be attending the module FYE24, Physics I, during the current academic year, or if students have successfully completed their studies or have earned the right to take exams in the specific module in the previous academic year.

Laboratory cycle II: (1) students must be enrolled and should be attending the module FYE40, Quantum Physics, during the current academic year, or if students have successfully completed their studies or have earned the right to take exams in the specific module in the previous academic year and (2) have successfully completed the Physics Laboratory Course I in the previous academic year, or have enrolled and attended the Physics Laboratory Course I in the current academic year. In the latter case, their face to face exercise in the Physics Laboratory Course II requires a previous successful face to face exercise in the Physics Laboratory Course I.

Chemistry Laboratory Course

Laboratory cycle I: students must be enrolled and should be attending the module FYE22, Physical Chemistry, during the current academic year, or if students have successfully completed their studies or have earned the right to take exams in the specific module in the previous academic year.

Laboratory cycle II: (1) students must be enrolled and should be attending the module FYE30, Organic Chemistry, during the current academic year, or if students have successfully completed their studies or have earned the right to take exams in the specific module in the previous academic year and (2) have successfully completed the Chemistry Laboratory Course I in the previous academic year, or have enrolled and attended the Chemistry Laboratory Course I in the current academic year. In the latter case, their face to face exercise in the Chemistry Laboratory Course II requires a previous successful face to face exercise in the Chemistry Laboratory Course I.

Biology Laboratory Course

Laboratory cycle I: students must be enrolled and should be attending the module FYE31, Cell structure and function, during the current academic year, or if students have successfully completed their studies or have earned the right to take exams in the specific module in the previous academic year.

Laboratory cycle II: (1) students must be enrolled and should be attending the module FYE43, Genetics, during the current academic year, or if students have successfully completed their studies or have earned the right to take exams in the specific module in the previous academic

year and (2) have successfully completed the Biology Laboratory Course I in the previous academic year, or have enrolled and attended the Biology Laboratory Course I in the current academic year. In the latter case, their face to face exercise in the Biology Laboratory Course II requires a previous successful face to face exercise in the Biology Laboratory Course I.
It is strongly recommended that students should attend the module FYE30 before or in parallel with the module FYE31, otherwise they will face difficulty in the Biochemistry module (FYE31/2).
Of the fourth year modules, students must attend compulsorily the modules FYE43 and FYE40 and choose one more of the fourth year modules.
From the academic year 2019-2020, it is allowed for students of the programme studies FYE who have only two (2) modules remaining, even if one (1) is a prerequisite for the other, to declare them simultaneously.
Also, for those students who have only three (3) modules remaining to complete their studies, they may declare all three (3) modules simultaneously, even if one module is a prerequisite for another.
During the module selection, all modules from previous academic years must be selected and consequently the selection of the modules of the next academic year can begin.
After graduation, students may continue their studies in the Postgraduate Programmes of the School of Science and Technology.

Information regarding the written exams of Program Studies "Studies in Natural Sciences":
Following the decision to separate the taught and examined syllabus of the Course Modules of the Program Studies "Studies in Natural Sciences" into two parts: a' and b', students are given the opportunity **to optionally participate in an intermediate exam, after completing the first (a') part of the syllabus**. The second (b') part of the syllabus will be examined after its completion, as a continuation of the examination period, while the repeat examination will be offered for both parts, independently, and will be conducted in accordance with the applicable regulations.
The intermediate exam is offered as optional and in case of failure, students who do not secure a passable grade in the intermediate exam retain the right to participate in the final and repeat examinations at the end of the academic year.
The grade of the examination of the first (a') part will be counted as a percentage of:

- 40% of the total grade of the module FYE22,
- 30% of the total grade of the module FYE34 from the academic year 2019-20. The registered students to the module FYE34 during the academic year 2018-2019 that will fail, will be re-examined the next academic year (2019-2020) according to the apportionment of the A' part applicable in the year 2018-2019, i.e. 35% of the total grade,
- 35% of the total grade in the remaining Course Modules in which intermediate examination is conducted.

with a corresponding safeguard of the grade for the following academic year as well. This is applicable as long as the student has obtained the necessary grade in all written assignments, according to the requirements of each Course Module or Laboratory Module, and with regard to the Study Regulations.

In case the students do not succeed in the examination of the first (a') part (minimum score of 5), their studies at the Course Module or Laboratory Module continue normally. Those who fail this exam, will be able to participate in the final and repeat examinations of the first (a') part, which are held at the end of the academic year.
Those students who do not attend the intermediate exam of the first (a') part, will participate normally in the final exam of the first (a') part which is held in the June-July period.
The examination for the second (b') part of the syllabus is conducted in the May-July period after the completion of the second part of the syllabus.
The grade of the second (b') part examination will be counted as a percentage of:

- 30% of the total grade of the module FYE22,
- 40% of the total grade of the module FYE34 from the academic year 2019-20. The registered students to the module FYE34 during the academic year 2018-2019 that will fail, will be re-examined the next academic year (2019-2020) according to the apportionment of the (b') part applicable in the year 2018-2019, i.e. 35% of the total grade,
- 35% of the total grade in the remaining Course Modules in which intermediate examination is conducted.

with a corresponding safeguard of the grade for the following academic year as well. This is applicable as long as the student has obtained the necessary grade in all written assignments, according to the requirements of each Course Module or Laboratory Module, and with regard to the Study Regulations.
Those who fail either the first (a') or second (b') part of the final exams participate in the corresponding repeat exam.
For the successful completion of the course module it is required to successfully complete each part of the exam and a score greater than or equal to five (5).
The intermediate examination is applicable for the following course modules: **FYE10, FYE12, FYE14, FYE20, FYE22, FYE24, FYE30, FYE31, FYE34, FYE40, FYE41, FYE42 and FYE43.**
Also, the intermediate examination is also applied to module PLI21 (for students who have been admitted to the study program until the academic year 2017-2018) in accordance with the provisions in force in the said Course Module and in the Program Studies "Computer Science".

Course Modules

FYE10 Mathematics I

Module code: FYE10
ECTS Credit Points: 20
Module Type: Compulsory
Year: 1st
Language: Greek
Learning Outcomes: On successful completion of the Module FYE10 Mathematics I the students will have the opportunity to develop the following skills:

- apply the converge criteria for real number sequences and series

- apply the basic theorems (Darboux, Existence of Minimum & Maximum Value, Mean Value, Rolle) to the solution of various problems, such as the description of the behaviour of real valued functions of a single real variable, approximation of roots of equations, optimization, etc
- use polynomial approximations (Taylor & Maclauren Series) for algebraic and transcendental functions, determine approximation errors and intervals of validity
- use integration techniques for the determination of antiderivatives, the evaluation of areas of plane regions, areas and volumes of solids of revolution, etc
- determine the Fourier Series expansion of periodic functions
- apply the basic theorems (Continuity, Differentiability, Mean Value, Existence of Local Minima & Maxima, Implicit and Inverse Function) to the solution of various problems, such as the description of the behaviour of real multivalued real functions, optimization, Taylor Series approximation, etc
- use Vector Algebra techniques to the solution of geometrical problems
- apply vector functions techniques to the description curves and surfaces, in three dimensions
- use Vector Calculus techniques and the Theorems of Green, Gauss, Stokes and Helmholtz for the description of Vector Fields

General outcomes:

On successful completion of the module the student will be able to

- to organize and use the knowledge acquired for solving a specific problem
- to be able to understand and present up to date scientific briefs in related areas of Mathematics

Subjects covered:

- Calculus of one variable
- Calculus of many variables
- Introductory Mathematics

Teaching Method: Distance education with six Contact Sessions held at weekends during the academic year.

Evaluation: Students are assigned to submit six (6) written assignments during the academic year. The average grade of the six (6) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the six (6) assignments and (b) at least four (4) of the six (6) written assignments have been submitted.

FYE12 General and Inorganic Chemistry

Module code: FYE12

ECTS Credit Points: 20

Module Type: Compulsory

Year: 1st

Language: Greek

Learning Outcomes: After successful completing the module «General and Inorganic Chemistry» (FYE 12), students will be expected to be able to:

- Describe the properties of electrons, protons, and neutrons (the atomic structure) Describe isotopes and their composition
- Calculate atomic weights from isotopic abundance and isotopic masses
- Name and write formulas for common binary and ternary inorganic compounds
- Use chemical formulas to solve various kinds of chemical problems
- Relate names to formulas and charges of simple ion
- Combine simple ions to write formulas and names of some ionic compounds
- Recognize and use formula weights and mole relationships
- Interconvert masses, moles, and formulas
- Determine percent compositions in compounds
- Determine formulas from composition
- Write balanced chemical equations to describe chemical reactions
- Interpret balanced chemical equations to calculate the moles or masses of reactants and products involved in each of the reactions
- Determine the percent yield of a reaction
- Calculate concentrations of solutions when they are diluted
- Carry out calculations related to the use of solutions in chemical reactions
- Describe the wave properties of light and how wavelength, frequency, and speed are related
- Use the particle description of light, and explain how it is related to the wave description
- Relate atomic emission and absorption spectra to important advances in atomic theory
- Describe the main features of the quantum mechanical picture of the atom
- Describe the four quantum numbers, and give possible combinations of their values for specific atomic orbitals
- Describe the shapes of orbitals and recall the usual order of their relative energies
- Write the electron configurations of atoms
- Relate the electron configuration of an atom to its position in the periodic table
- Describe the periodic table and some of the relationships that it summarizes
- Discuss chemical periodicity of the following physical properties: Atomic radii, Ionization energy, Electron affinity, Ionic radii, Electronegativity
- Write Lewis dot representations of atoms
- Predict whether bonding between specified elements will be primarily ionic, covalent, or polar covalent
- Compare and contrast characteristics of ionic and covalent compounds
- Describe how the elements bond by electron transfer (ionic bonding)
- Describe energy relationships in ionic compounds
- Predict the formulas of ionic compounds
- Describe how elements bond by sharing electrons (covalent bonding)
- Write Lewis dot and dash formulas for molecules and polyatomic ions

- Recognize exceptions to the octet rule
- Write formal charges for atoms in covalent structures
- Describe resonance, and know when to write resonance structures and how to do so
- Describe the basic ideas of the valence shell electron pair repulsion (VSEPR) theory
- Use the VSEPR theory to predict the molecular geometry of polyatomic molecules and ions
- Describe the relationships between molecular shapes and molecular polarities
- Predict whether a molecule is polar or nonpolar
- Describe the basic ideas of the valence bond (VB) theory
- Analyze the hybrid orbitals used in bonding in polyatomic molecules and ions
- Use hybrid orbitals to describe the bonding in double and triple bonds
- Describe the basic concepts of molecular orbital theory
- Draw a molecular orbital diagram of a diatomic molecule from the relating atomic orbitals
- Distinguish among bonding, antibonding, and nonbonding orbitals
- Find the bond order in diatomic molecules and ions
- Relate bond order to bond stability
- Use the MO concept of delocalization for molecules in which valence bond theory would postulate resonance
- Recognize and describe nonelectrolytes, strong electrolytes, and weak electrolytes
- Describe the Arrhenius theory of acids and bases
- Describe the Bronsted-Lowry theory of acids and base
- List properties of aqueous solutions of acids and bases
- Arrange binary acids in order of increasing strength
- Arrange ternary acids in order of increasing strength
- Describe the Lewis theory of acids and bases
- Complete and balance equations for acid base reaction
- Define acidic and basic oxides and salts
- Explain amphoterism
- Balance oxidation-reduction equations
- Explain the common ion effect and give illustrations of its operation- Recognize buffer solutions and describe their chemistry
- Describe how to prepare a buffer solution of a specified pH- Explain what acid-base indicators are and how they function
- Describe what species are present at various stages of titration curves for (a) strong acids and strong bases, (b) weak acids and strong bases, and (c) polyprotic acids and strong bases- Carry out calculations based on titration curves for (a) strong acids and strong bases and (b) polyprotic acids and strong bases- Write solubility product constant expressions
- Use Ksps in chemical calculations
- Recognize some common, slightly soluble compounds
- Describe fractional precipitation and how it can be used to separate ions
- Describe the occurrence and use of the main-group elements - Describe compounds of the main-group elements, their reactions, properties, and uses

- Describe major sources of metals
- Describe some pretreatment techniques for ores
- Describe some reduction processes that produce free metals
- Describe some techniques for refining (purifying) metals
- Identify the d-transition metals and describe some of their important properties Describe typical oxidation states of the transition metals
- Describe the specific metallurgies of three metals: titanium, iron, and copper Recognize coordination compounds
- Use the terminology that describes coordination compounds
- Apply the rules for naming coordination compounds
- Recognize common structures of coordination compounds
- Describe various kinds of structural (constitutional) isomerism and distinguish among structural isomers
- Recognize stereoisomers
- Describe the valence bond theory and the crystal field theory of bonding in coordination compounds
- Explain the origin of color in complex species
- Use the spectrochemical series to explain colors of a series of complexes
- Give some examples of applications of complexes in our daily life

Subjects covered:

- Atomic structure - The periodic system - Properties of the atoms
- Chemistry of Coordination and Organometallic Compounds
- Current Trends and Applications in Inorganic Chemistry

Teaching Method: Distance education with six Contact Sessions held at weekends during the academic year

Evaluation: Students are assigned to submit six (6) written assignments during the academic year. The average grade of the six (6) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.
The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.
Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the six (6) assignments and (b) at least four (4) of the six (6) written assignments have been submitted.

FYE14 Introduction to Natural Sciences

Module code: FYE14
ECTS Credit Points: 20
Module Type: Compulsory
Year: 1st
Language: Greek
Learning Outcomes: By the end of this course, students will be able to:

- Describe using the kinematical equations the motion of a body in 1,2 and 3 dimensions, the Newton's laws and the laws for rotation, as well as the conservation

laws of momentum, angular momentum and mechanical energy. To explain the pseudo forces in non-inertial frames of reference, and to perceive the concept of conservative forces and potential energy. To examine the motion in the gravitational field, the static equilibrium of a body, the two-body collision, the kinematics of variable-mass systems, the precession and the general motion of a rigid body. To solve complex problems using the free body diagram, to analyze the body's motion in independent coordinates, to combine the Newton laws to describe the general motion of a rigid body.

- Describe the simple harmonic motion, the general solution and the physical meaning of the parameters and constants of this solution, the functional form of the position, velocity and acceleration as well as the kinetic and potential energy of a simple harmonic oscillator system. To examine the harmonic motion of the simple, physical and torsional pendulum as well as of the double pendulum, to describe the oscillation motion with dumping and the forced oscillations with dumping.
- Describe the quantities of pressure and density of a fluid, the variation of pressure in a static fluid, the Pascal's and Archimedes' principles, the effects of surface tension of a fluid, to apply the continuity equation and the Bernoulli equation.
- Determine the electric potential and the electric field from a static charge distribution, to formulate the Gauss's law, the Ohm's law, the Kirchhoff rules, the Ampere's law, the Biot-Savart law, the Faraday law and the Lenz rule. To explain the motion of charges in electric and magnetic fields and the sources of the magnetic field. To solve circuit problems with resistors and capacitors, to explain the functionality of: the capacitor, the solenoid, the transformer and the electric generator, and to describe the main devices that are used in electrical measurements. To infer the completeness of Maxwell's equations for electromagnetism problems solving.

Subjects covered:

- Introduction to mathematics
- Introductory physics

Teaching Method: Distance education with six Contact Sessions held at weekends during the academic year.

Evaluation: Students are assigned to submit six (6) written assignments during the academic year. The average grade of the six (6) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the six (6) assignments and (b) at least four (4) of the six (6) written assignments have been submitted.

FYE20 Mathematics II

Module code: FYE20

ECTS Credit Points: 20

Module Type: Compulsory

Year: 2nd

Language: Greek

Learning Outcomes: After completing this module, students will be expected to be able to:

- Understand the basic theory of Linear Algebra and Ordinary Differential Equations.
- Combine basic mathematical notions with those of Linear Algebra and Differential Equations.
- Solve problems of Linear Algebra using Matrices, Determinants, Linear Systems, Linear Transformations and Eigenvalues-Eigenvectors.
- Solve Ordinary Differential Equations of first and higher order, as well as Linear Systems of Ordinary Differential Equations.
- Apply Linear Algebra and Ordinary Differential Equations to describe and model the behavior of some physical systems or phenomena in mathematical terms.

Subjects covered:

- Linear algebra
- Differential equations I

Teaching Method: Distance education with six Contact Sessions held at weekends during the academic year.

Evaluation: Students are assigned to submit six (6) written assignments during the academic year. The average grade of the six (6) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.
The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.
Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the six (6) assignments and (b) at least four (4) of the six (6) written assignments have been submitted.

FYE22 Physical Chemistry

Module code: FYE22

ECTS Credit Points: 14

Module Type: Compulsory

Year: 2nd

Language: Greek

Learning Outcomes: After successful completing the module «Physical Chemistry» (FYE 22), students will be expected to be able to:

- describe the definitions and fundamental concepts and develop the three basic laws of thermodynamics
- define the basic thermodynamic functions, the concept of chemical potential and the perfect (ideal) gas
- derive the equation of state of the perfect gases
- describe the ideal mixture of gases
- describe the deviation of the behavior of gases from the ideal behavior and give examples of equation of the state for real gases

- define the reaction stoichiometry and describe the meaning of the progress of a reaction
- write and understand the general chemical reaction equilibrium condition
- define the chemical equilibrium constant, the standard Gibbs free energy of reaction and the standard thermodynamic formation functions
- describe the temperature dependence of the chemical equilibrium constant and the effect of the pressure and temperature conditions to the yield of a chemical reaction
- formulate the phases equilibrium condition through the chemical potentials and to describe qualitatively the dependence of the chemical potential of the three phases of a substance on the temperature and pressure
- derive and write the Clausius–Clapeyron equation
- draw the boundary lines between the three phases in the diagram (p, T) and describe the equilibrium between two or three phases
- define the ideal solution based on the chemical potential
- write the Raoult and Henry laws
- describe the possible configurations of a system of molecules
- define the partition function and the canonical partition function
- calculate the statistical weight of a possible configuration of a system of molecules, the canonical partition function and the thermal de Broglie wavelength
- calculate the thermodynamic functions of a system from the canonical partition function
- mention and calculate the four contributions to the partition function of a substance due to the four different modes of its molecules motion
- describe the kinetic model of gases and calculate, on the basis of this model, thermodynamic and transport properties of a perfect gas
- describe the main characteristics and quantities of electromagnetic radiation
- describe the basic principles of rotational or microwave spectroscopy, infrared or vibration of diatomic molecules, spectroscopy and Raman spectroscopy
- describe the magnetic properties of nuclei of atoms that make up molecules and the basic principles and concepts of nuclear magnetic resonance spectroscopy (NMR)
- describe the modern technique for taking NMR spectra of high resolution and interpret the two-dimensional NMR spectra
- define basic concepts of chemical kinetics, such as the chemical reaction rate, the kinetic equation and the order of reaction
- apply the following methods for determining the kinetic equation of a reaction: the differential method, the method of initial rates, the isolation technique, the integral method and the half-life method
- write and apply the Arrhenius equation
- describe the search path of the mechanism of a chemical reaction
- describe the basic mechanisms of reversible reactions, consecutive reactions, parallel reactions and of chain reactions, as well as the main kinetic study methods of them
- describe the two main theories of chemical reactions: the collision theory and the transition state theory

- explain the following terms: electrochemical cell, electrode, electrolyte, anode, cathode, half-cell, half-reaction, electrolysis
- describe the function of an electrochemical cell and write the overall reaction taking place at this
- mention the various types of ionic conductors (electrolytes)
- describe how the ions behave in the presence of other ions due to their interaction
- explain the way of the ions movement within the ionic conductors
- describe the structure of the electrode-electrolyte interface
- explain the way of the representation of electrochemical cells and the sign of the electromotive force
- provide for the spontaneous direction of a redox system from measurements of electrode potentials
- describe the electrochemical equilibrium for an interface and an electrochemical reaction
- explain the dependence of the equilibrium potential on the activities of the electroactive species
- write and apply the Nernst equation
- explain the relationship between the rate of an electrochemical reaction and the potential difference in the electrical interface

Subjects covered:

- Chemical thermodynamics
- Chemical kinetics
- Electrochemistry
- Statistical thermodynamics
- Spectroscopy

Teaching Method: Distance education with five Contact Sessions held at weekends during the academic year.

Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

FYE24 Physics I: classical mechanics, electromagnetics, thermodynamics

Module code: FYE24

ECTS Credit Points: 14

Module Type: Compulsory

Year: 2nd

Language: Greek

Module general description: The module FYE 24 includes three courses: Classical Mechanics, Thermodynamics, and Electromagnetism. Knowledge of derivative and integral calculus is required for all three courses. Knowledge of ordinary differential equations or concurrent registration in FYE 20 is desirable. Especially for Electromagnetism, the knowledge and use of vectors is required. Knowledge of line and surface integrals is desirable.

Learning Outcomes: With the successful completion of the module the students:

- Will know the beauty of Classical Mechanics, namely that all its results can be derived from Newton's laws.
- Will be in a position to study one-dimensional and three-dimensional motions of point masses either through the solution of the differential equation of motion or with the use of the energy method, when it is appropriate.
- Will be in a position to study the rotation of solid bodies around a fixed axis.
- Will be in a position to write the equations of motion of point masses in coupled harmonic oscillators independent of their number or their configuration.
- Will know the fundamental concepts of Thermodynamics (such as heat, work, internal energy, entropy) and will be able to use the laws of Thermodynamics to solve simple problems.
- Will know the four laws of Electromagnetism.
- Will be able to compute the electric field that is produced by a distribution of stationary electric charges and the magnetic field that is produced by a constant electric current.
- Will be able to compute the electric field produced by a variable magnetic flux.9) Will be able to compute the magnetic field produced by a variable electric flux.

Subjects covered:

- Classical mechanics
- Thermodynamics
- Electromagnetism

Teaching Method: Distance education with six Contact Sessions held at weekends during the academic year.

Evaluation: Students are assigned to submit six (6) written assignments during the academic year. The average grade of the six (6) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the six (6) assignments and (b) at least four (4) of the six (6) written assignments have been submitted.

Physics Laboratory Course I

ECTS Credit Points: 6

Module Type: Compulsory

Year: 2nd

Language: Greek

Subjects covered:

- Classical Physics
- Modern Physics

Laboratory Module general description: The purpose of ETHEF is the laboratory training of the program students in the principles, the experimental methods, the scientific instruments and the applications of Classical and Modern Physics.

It aims at the significant hands on familiarity with the laboratory and experimental equipment related to the above covered subjects, at its correct and effective use, as well as at the application of experimental data processing and analysis methods. Also, it aims at understanding the basic principles, concepts and phenomena of Physics through the experimental process, as well as to highlight the experimental methodology as the means to verify or reject theories and hypotheses.

Learning Outcomes: Upon successful completion of the ETHEF, students will be able to:

- conduct experiments related to knowledge subjects of Physics, namely: Mechanics, Electromagnetism, Thermodynamics, Optics, Fluid Mechanics, Wave, Quantum Physics, Atomic and Nuclear Physics
- operate laboratory equipment, such as voltage and current power supplies, digital oscilloscopes, laser devices, photosensors and photomultipliers, microscopes, etc.
- operate modern data collection systems and apply statistical data analysis and signal processing methods
- evaluate the effect of statistical and systematic errors in the measurement of natural quantities
- evaluate experimental results and compare with theoretical predictions and corresponding experimental measurements.

Evaluation: Students are assigned to submit five (5) educational activities during the academic year. The average grade of the five (5) educational activities, weighted at 30%, is taken into consideration for the calculation of the final grade. Students' grade in each of the laboratory exercises should be ≥5.0 (five), in order to successfully complete their experimental exercise in the laboratory cycle.

The grade of the second phase (laboratory examination) will be taken into account to the extent of 70% for the final grade. Students should practice all the exercises of the laboratory cycle.

Chemistry Laboratory Course I

ECTS Credit Points: 6

Module Type: Compulsory

Year: 2nd

Language: Greek

Subjects covered:

- General and Inorganic Chemistry
- Analytical Chemistry
- Physical Chemistry
- Organic Chemistry

Laboratory Module general description: The purpose of ETHEX is the laboratory training of the program students in the principles, methods, scientific instruments and applications of General and Inorganic Chemistry, Analytical Chemistry, Physical Chemistry and Organic Chemistry. It aims at the significant hands on familiarization of the student with the laboratory and experimental equipment related to the above covered subjects and at its proper and effective use. It also aims to understand the basic principles, concepts and phenomena of Chemistry through the application of the theoretical knowledge acquired in the implementation of specific experimental protocols.

Learning Outcomes: Upon successful completion of the ETHEX, students will be able to:

- report and apply laboratory safety regulations
- evaluate and statistically process the experimental results
- handle laboratory equipment, such as glassware, scientific instruments and other laboratory devices related to Chemistry
- handle chemical substances and chemical reagents
- conduct experiments related to knowledge subjects of Chemistry, specifically Inorganic Chemistry, Organic Chemistry, Physical Chemistry and Analytical Chemistry
- identify various experimental sizes in the above covered subjects.

Evaluation: Students are assigned to submit five (5) educational activities during the academic year. The average grade of the five (5) educational activities, weighted at 30%, is taken into consideration for the calculation of the final grade. Students' grade in each of the laboratory exercises should be ≥5.0 (five), in order to successfully complete their experimental exercise in the laboratory cycle.

The grade of the second phase (laboratory examination) will be taken into account to the extent of 70% for the final grade. Students should practice all the exercises of the laboratory cycle.

FYE30 Organic Chemistry

Module code: FYE30

ECTS Credit Points: 16

Module Type: Compulsory

Year: 3rd

Language: Greek

Learning Outcomes: Upon completion of the course the student will be able to

- Recognize the structures of molecules and the basic reactions of organic chemistry.
- Knowledge of main spectroscopic techniques. - Understand the basic principles and rules of stereochemistry.
- Distinguish the major classes of organic compounds & biomolecules, understand their properties and mechanisms of basic reactions.
- Apply and combine the main spectroscopic techniques for the structure elucidation of simple molecules.
- Analyze retro-synthetically the structures of simple organic molecules.
- Suggest reaction sequences for the synthesis of simple organic molecules, designing the most efficient sequence of chemical reactions.

Subjects covered:

- Homologous series

- Stereochemistry and organic reactions mechanisms
- Spectroscopy of organic compounds
- Bio-Molecules

Teaching Method: Distance education with six Contact Sessions held at weekends during the academic year.

Evaluation: Students are assigned to submit six (6) written assignments during the academic year. The average grade of the six (6) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.
The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.
Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the six (6) assignments and (b) at least four (4) of the six (6) written assignments have been submitted.

FYE31 Cell structure and function

Module code: FYE31
ECTS Credit Points: 16
Module Type: Compulsory
Year: 3rd
Language: Greek

Module general description: The concepts presented during this module are based, in part, on knowledge acquired in FYE12 (General and Inorganic Chemistry) and FYE22 (Physical Chemistry), also supplemented by knowledge acquired during in FYE30 (Organic Chemistry). FYE31 includes three fundamental subjects of Biology (Cellular/Molecular Biology, Biochemistry and Animal Physiology), which facilitates the holistic understanding of these distinct subjects and highlights their interconnection.
The main topics presented in the framework of this module are:
1. Subject: "Cell molecular approach":
   - Chemical composition of living cells
   - Organization of eukaryotic and prokaryotic organisms, as well as viruses
   - Cell signaling and cell communication
   - The main steps of cellular respiration
   - Nucleus and chromosomes
   - Replication of the genome, transcription and translation, regulation of gene expression
   - Cell Proliferation, Mitosis, Apoptosis
2. Subject: "Biochemistry-Metabolism":
   - Structure and function of proteins, enzymes, enzyme kinetics
   - Structure, function, metabolism of carbohydrates, lipids, glycogen
   - Cell membrane, transport of substances through membranes and compartmentalization within cell
   - Glycolysis, gluconeogenesis, pentose phosphate pathway
   - Recycling of proteins and nucleic acids

- Metabolism regulatory mechanisms

3. Subject: "Animal Physiology":
   - Basic principles of animal form and function and animal nutrition
   - Circulation and gas exchange in mammals
   - Osmoregulation and excretion in mammals
   - Hormones, the endocrine and reproductive systems in mammals
   - Immune system and immune responses
   - Neurons, nerve signal transmission, types of synapses

Learning outcomes: Upon completion of this course the student should be able to:
- Classify the cell macromolecular complexes and relate cell structures to cell functions
- Distinguish unique structures and functions of prokaryotic and eukaryotic cells
- Explain the genetic information flow in cells and describe the pre- and post-transcriptional regulatory mechanisms
- Correspond cellular functions and biochemical reactions with specific subcellular compartments
- Describe the basic catabolism and anabolism biochemical pathways
- Describe the basic mechanisms of cellular communication and signaling
- Explain concepts on animal physiology
- Describe cellular and tissue organization of mammals
- Describe tissue-specific functions

Subjects covered:
- Cell molecular approach
- Biochemistry-Metabolism
- Animal Physiology

Teaching Method: Distance education with six Contact Sessions held at weekends during the academic year.

Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

FYE34 Physics II: vibrations and waves, relativity, modern physics

Module code: FYE34

ECTS Credit Points: 16

Module Type: Compulsory

Year: 3rd

Language: Greek

Description: This module provides basic knowledge on (a) coupled oscillations and waves (b) Special Relativity and the principles of General Relativity (c) the principles of Quantum

Mechanics and Nuclear Physics, and their application in the interpretation of natural phenomena.

Learning Outcomes: The module aims to introduce in (a) Vibrations and Waves (b) Theory of Relativity and (c) Modern Physics. On successful completion of this module the student should be able to:

- Demonstrate understanding of coupled oscillations, utilize the mathematical formalism to compute frequencies and relative amplitudes of normal modes of mechanical systems in related problems.
- Demonstrate understanding of the basic principles and phenomena related to mechanical and electromagnetic waves as interference, diffraction and geometric optics, and solve related problems.
- Demonstrate understanding of the principles of the Special Theory of Relativity, its consequences such as time dilation, length contraction and Doppler shift, and state the Lorentz transformation and the relativistic definitions of quantities such as momentum and energy, and apply them in solving related problems. Outline the principles of general relativity.
- Demonstrate understanding of the experimental results which led to the introduction of quantum mechanics and the basic concepts and principles of quantum formalism such as the wave function and its probability density interpretation, the Schrödinger equation, uncertainty principle, particle-wave duality. Identify and understand the solutions of the Schrodinger equation for both one-dimensional potentials as the infinite well, the step function, the harmonic oscillator, or the three-dimensional Coulomb potential and their consequences such as the quantization of energy and angular momentum, the tunneling and demonstrate ability to interpret relevant phenomena, and solve related simple problems.
- Describe the statistical laws that govern the behavior of the different particle species (fermions, bosons) and utilize them in interpreting relevant phenomena, and solve related simple problems.
- Describe the predictions of quantum theory for atoms, molecules and solids, as the periodic table of elements, the emission and absorption spectra and the band theory and the quantum mechanical applications such as the laser and the transistor.
- Demonstrate understanding the basic concepts and applications of nuclear physics as the nucleus model, α, β and γ decays, radioactivity, radiocarbon dating, nuclear reactions, nuclear fission, fusion and identify the fundamental interactions of nature and elementary particles as fundamental blocks of matter.

Subjects covered:

- Relativity
- Vibrations & Waves
- Modern Physics

Evaluation: Students are assigned to submit six (6) written assignments during the academic year. The average grade of the six (6) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the six (6) assignments and (b) at least four (4) of the six (6) written assignments have been submitted.

Chemistry Laboratory Course II

ECTS Credit Points: 6

Module Type: Compulsory

Year: 3rd

Language: Greek

Subjects covered:

- General and Inorganic Chemistry
- Analytical Chemistry
- Physical Chemistry
- Organic Chemistry

Laboratory Module general description: The purpose of ETHEX is the laboratory training of the program students in the principles, methods, scientific instruments and applications of General and Inorganic Chemistry, Analytical Chemistry, Physical Chemistry and Organic Chemistry. It aims at the significant hands on familiarization of the student with the laboratory and experimental equipment related to the above covered subjects and at its proper and effective use. It also aims to understand the basic principles, concepts and phenomena of Chemistry through the application of the theoretical knowledge acquired in the implementation of specific experimental protocols.

Learning Outcomes: Upon successful completion of the ETHEX, students will be able to:

- report and apply laboratory safety regulations
- evaluate and statistically process the experimental results
- handle laboratory equipment, such as glassware, scientific instruments and other laboratory devices related to Chemistry
- handle chemical substances and chemical reagents
- conduct experiments related to knowledge subjects of Chemistry, specifically Inorganic Chemistry, Organic Chemistry, Physical Chemistry and Analytical Chemistry
- identify various experimental sizes in the above covered subjects.

Evaluation: Students are assigned to submit five (5) educational activities during the academic year. The average grade of the five (5) educational activities, weighted at 30%, is taken into consideration for the calculation of the final grade. Students' grade in each of the laboratory exercises should be ≥5.0 (five), in order to successfully complete their experimental exercise in the laboratory cycle.

The grade of the second phase (laboratory examination) will be taken into account to the extent of 70% for the final grade. Students should practice all the exercises of the laboratory cycle.

Biology Laboratory Course I

ECTS Credit Points: 6

Module Type: Compulsory
Year: 3rd
Language: Greek
Subjects covered:

- Cell Biology
- Molecular Biology
- Genetics
- Biochemistry
- Bioinformatics
- Physiology

Laboratory Module general description: ETHEB aims at the laboratory training of program students in the principles, methods, scientific instruments and applications of Cell Biology, Molecular Biology, Genetics, Biochemistry, Bioinformatics and Animal Physiology. It aims at the significant hands on familiarization of the student with the laboratory and experimental equipment related to the above covered subjects and at its proper and effective use. It also aims to understand the basic principles, concepts and phenomena of Biology through the application of the theoretical knowledge it has acquired in the implementation of specific experimental protocols.

Learning Outcomes: Upon successful completion of the ETHEB, students will be able to:

- state and apply laboratory safety regulations regarding the use of biological samples and corresponding laboratory equipment
- operate laboratory equipment, such as centrifuges, incubation chambers, photometer, micropipettes, thermal cycler, photonic microscopes, etc.
- handle microbial cultures, analyze biological samples, perform enzymic reactions, etc
- conduct experiments related to subjects of biology, namely Cell Biology, Molecular Biology, Genetics, Biochemistry, Bioinformatics and Animal Physiology
- browse databases of biological interest
- retrieve and process nucleotide and amino acid sequences from databases
- evaluate and process experimental results.

Evaluation: Students are assigned to submit five (5) educational activities during the academic year. The average grade of the five (5) educational activities, weighted at 30%, is taken into consideration for the calculation of the final grade. Students' grade in each of the laboratory exercises should be ≥5.0 (five), in order to successfully complete their experimental exercise in the laboratory cycle.

The grade of the second phase (laboratory examination) will be taken into account to the extent of 70% for the final grade. Students should practice all the exercises of the laboratory cycle.

FYE40 Quantum Physics

Module code: FYE40
ECTS Credit Points: 14
Module Type: Compulsory
Year: 4th
Language: Greek

Learning Outcomes: Upon completion of the course the student is able to:

- Understand the fundamental principles of quantum physics.
- Apply the general theory to a variety of problems involving bound states and simple scattering processes.3. Characterize and analyze the behavior of nuclei.
- Compare the theoretical results to the experimental data.
- Comprehend the basic principles of elementary particles (physical properties, classification and interactions).
- Understand and evaluate modern results published in some scientific journals.

Subjects covered:

- Quantum mechanics
- Introduction to nuclear physics
- Introduction to elementary particle physics

Evaluation: Students are assigned to submit six (6) written assignments during the academic year. The average grade of the six (6) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.
The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.
Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the six (6) assignments and (b) at least four (4) of the six (6) written assignments have been submitted.

FYE43 Genetics

Module code: FYE43
ECTS Credit Points: 14
Module Type: Compulsory
Year: 4th
Language: Greek
Module general description: The aim of this module is to deliver knowledge on the basic principles of Genetics, and Evolution, as well as the relationships in between. During this module, general patterns of how genetic traits are passed through generations are discussed, as well as the creation of diversity among living organisms and the evolutionary mechanisms.
The main topics presented in this module are:
1. Subject: "Mendelian inheritance patterns":

- Genetic analysis according to Mendel
- Extensions to monogenic and multifactorial inheritance
- Linking, mapping and genetic recombination mechanisms
- Gene expression and regulation in eukaryotes
- Genetics of prokaryotic organisms and regulation of gene expression
- Population diversity

2. Subject: "Chromosomal rearrangements and mutations":

- Chromosomal rearrangements
- Genome sequence rearrangements and transposable elements

- Mutations and effects on gene structure and function
- Mutations as tools of genetic analysis
- Genetic diversity of genomes
- Short length polymorphisms (SNPs, deletions, duplications)

3. Subject: "Evolution":
   - Population evolution
   - The origin of species
   - The history of life on earth
   - Phylogeny trees

Learning Outcomes: Upon successful completion of this module, students will be able to:

- Describe the Mendelian hereditary rules
- Distinguish the complex molecular interactions that contribute to the inheritance of characters in daughter cells
- Explain the flow of genetic information in cells and describe the relevance of inheritance patterns in all organisms
- Describe the relationship between phenotype and genotype
- Describe the fundamental concepts of gene linkage and mapping
- Explain the basic principles of mutagenesis
- Describe the basic principles of developmental genetics
- Discuss the basic principles of genetic engineering
- Describe the basic principles and theories of evolution
- Explain the processes and mechanisms of evolution

Subjects covered:

- Mendelian Inheritance Patterns
- Chromosomal Rearrangements and Mutations
- Evolution

Teaching Method: Distance education with six Contact Sessions held at weekends during the academic year.

Evaluation: Students are assigned to submit six (6) written assignments during the academic year. The average grade of the six (6) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the six (6) assignments and (b) at least four (4) of the six (6) written assignments have been submitted.

Physics Laboratory Course II

ECTS Credit Points: 6

Module Type: Compulsory

Year: 4rd

Language: Greek

Subjects covered:

- Classical Physics
- Modern Physics

Laboratory Module general description: The purpose of ETHEF is the laboratory training of the program students in the principles, the experimental methods, the scientific instruments and the applications of Classical and Modern Physics.

It aims at the significant hands on familiarity with the laboratory and experimental equipment related to the above covered subjects, at its correct and effective use, as well as at the application of experimental data processing and analysis methods. Also, it aims at understanding the basic principles, concepts and phenomena of Physics through the experimental process, as well as to highlight the experimental methodology as the means to verify or reject theories and hypotheses.

Learning Outcomes: Upon successful completion of the ETHEF, students will be able to:

- conduct experiments related to knowledge subjects of Physics, namely: Mechanics, Electromagnetism, Thermodynamics, Optics, Fluid Mechanics, Wave, Quantum Physics, Atomic and Nuclear Physics
- operate laboratory equipment, such as voltage and current power supplies, digital oscilloscopes, laser devices, photosensors and photomultipliers, microscopes, etc.
- operate modern data collection systems and apply statistical data analysis and signal processing methods
- evaluate the effect of statistical and systematic errors in the measurement of natural quantities
- evaluate experimental results and compare with theoretical predictions and corresponding experimental measurements.

Evaluation: Students are assigned to submit five (5) educational activities during the academic year. The average grade of the five (5) educational activities, weighted at 30%, is taken into consideration for the calculation of the final grade. Students' grade in each of the laboratory exercises should be ≥5.0 (five), in order to successfully complete their experimental exercise in the laboratory cycle.

The grade of the second phase (laboratory examination) will be taken into account to the extent of 70% for the final grade. Students should practice all the exercises of the laboratory cycle.

Biology Laboratory Course II

ECTS Credit Points: 6

Module Type: Compulsory

Year: 4rd

Language: Greek

Subjects covered:

- Cell Biology
- Molecular Biology
- Genetics
- Biochemistry
- Bioinformatics
- Physiology

Laboratory Module general description: ETHEB aims at the laboratory training of program students in the principles, methods, scientific instruments and applications of Cell Biology, Molecular Biology, Genetics, Biochemistry, Bioinformatics and Animal Physiology. It aims at the significant hands on familiarization of the student with the laboratory and experimental equipment related to the above covered subjects and at its proper and effective use. It also aims to understand the basic principles, concepts and phenomena of Biology through the application of the theoretical knowledge it has acquired in the implementation of specific experimental protocols.

Learning Outcomes: Upon successful completion of the ETHEB, students will be able to:

- state and apply laboratory safety regulations regarding the use of biological samples and corresponding laboratory equipment
- operate laboratory equipment, such as centrifuges, incubation chambers, photometer, micropipettes, thermal cycler, photonic microscopes, etc.
- handle microbial cultures, analyze biological samples, perform enzymic reactions, etc
- conduct experiments related to subjects of biology, namely Cell Biology, Molecular Biology, Genetics, Biochemistry, Bioinformatics and Animal Physiology
- browse databases of biological interest
- retrieve and process nucleotide and amino acid sequences from databases
- evaluate and process experimental results.

Evaluation: Students are assigned to submit five (5) educational activities during the academic year. The average grade of the five (5) educational activities, weighted at 30%, is taken into consideration for the calculation of the final grade. Students' grade in each of the laboratory exercises should be ≥5.0 (five), in order to successfully complete their experimental exercise in the laboratory cycle.

The grade of the second phase (laboratory examination) will be taken into account to the extent of 70% for the final grade. Students should practice all the exercises of the laboratory cycle.

FYE41 Evolution of Ideas in Natural Sciences

Module code: FYE41

ECTS Credit Points: 20

Module Type: Optional

Year: 4th

Language: Greek

Learning Outcomes

After successful completion of this thematic module, the student will be aware of the general evolution of ideas in science. He should have realized that, while physical phenomena remain the same, the human approach and interpretation of them vary through the centuries!

In particular, the student will approach the history of physics, chemistry, biology, characteristic "adventures" and the degree of acceptance of the proposed interpretations of natural phenomena, by the scientific community and structured society.

The students have to realize that the field of scientific research is open to further research which would lead to new concepts, models, theories, surprises!

Competences

Generic Competences:

- General knowledge of the field of natural sciences.
- Learning ability, creativity.
- Criticism and self-criticism capacity. Interdisciplinarity.
- Written and oral communication. Ethics in science. Use of second language.

Subject specific competences:

- Knowledge and understanding of theories for interpreting natural phenomena. Science culture acquisition (Physics culture)
- Acquiring skills useful for the teaching of physics.
- Appreciation of the temporal evolution of theories, models, standards.
- Familiarity with searching and evaluating information.
- Comprehensive knowledge of science - conceptual approach.

Course contents

- History of Physics and Chemistry (with emphasis in ancient times, the Arabs (10th-12th century), the Scientific Revolution (16th & 17th century modern physics).
- History of Biology (perceptions of the phenomena of life in antiquity and the Middle Ages, Renaissance, modern times).
- Philosophy of Science (Philosophical currents historical dimension in philosophy of science, modern trends in philosophy of science, Conceptual approach.

Subjects covered:

- History of physics and chemistry
- History of biology
- Philosophy of science

Teaching Method: Distance education with five Contact Sessions held at weekends during the academic year.

Evaluation: Students are assigned to submit six (6) written assignments during the academic year. The average grade of the six (6) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the six (6) assignments and (b) at least four (4) of the six (6) written assignments have been submitted.

FYE42 Planet Earth

Module code: FYE42

ECTS Credit Points: 20

Module Type: Optional

Year: 4th

Language: Greek

Learning outcomes: Upon completion of the thematic unit, the student will have acquired the following knowledge:

- The basic elements of Earth's crust, the types of rocks, their formation, the formation and classification of volcanoes. He will have learned the mechanisms of earthquakes and their characteristics and a simplified method for estimating their magnitude and their epicenter.
- The structure and compositions of the oceans and the sea bed, the interactions between oceans - atmosphere and land, the equations describing the ocean dynamics, the types of waves and the mechanisms of their formation and the tides.
- The general description of the biosphere, the characteristics of the ecosystems, the energy flow and material cycles in the ecosystems and the basic spatial and temporal characteristics of the biocenoses.
- The structure and chemical composition of Earth's atmosphere, the greenhouse effect, the mechanisms of production and depletion of the stratospheric ozone, the atmosphere dynamics. Also the basic characteristics and the causes of atmospheric pollution and the simple gaussian dispersion model for estimating air pollution as a function of the weather conditions.
- The basic principles of magnetohydrodynamics and plasma physics, the characteristics of the Sun, the solar wind, the magnetosphere of the Earth and the basic celestial mechanics equations.

Subjects covered:

- Lithosphere
- Hydrosphere
- Biosphere
- Atmosphere
- Space physics

Teaching Method: Distance education with five Contact Sessions held at weekends during the academic year.

Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

PLI10 Introduction to Informatics

Module code: PLI10

ECTS Credit Points: 20

Module Type: Optional

Year: 4th

Language: Greek

General Description: The main objective of the module is to acquaint the student with the basic principles of Computer Science and information management, to gain basic knowledge

of problem solving, techniques, tools and structured programming languages, as well as program development principles. Also, the aim is to acquaint knowledge in the use of simple and complex data structures and in the management of information systems, in order to be able to follow the evolutionary course of technology, informatics and their application, now and in the future.

Learning Outcomes:

VOLUME 1: INTRODUCTION TO COMPUTER SCIENCE

a) Knowledge

Upon successful completion of the study of the first volume, students will know:

- the historic evolution of computers and informatics
- the basic subjects of Informatics and its applications
- the computer structure as well as the functionality of its subsystems
- how to store and represent data and information on a computer
- the basic numbering systems used in informatics and their arithmetic operations
- the description of the basic logic gates and circuits
- the concepts of programming, algorithms and programming languages

b) Understanding

Upon successful completion of the study of the first volume, students will understand:

- the ways of storing, transmitting and processing data
- operations in various arithmetic systems
- the process of representing logical - digital circuits
- algorithmic concepts as well as the concepts of application software and systems

c) Application

Upon successful completion of the study of the first volume, students will be able to:

- perform value conversions and arithmetic operations on different arithmetic systems
- design logical (digital) sequential circuits

d) Analysis

Upon successful completion of the study of the first volume, students will be able to:

- describe the various computer subsystems and their functionality
- to categorize the basic subjects of Informatics and its applications

e) Synthesis

Upon successful completion of the study of the first volume, students will be able to:

- compose logical circuits from gates

f) Evaluation

Upon successful completion of the study of the first volume, students will be able to:

- evaluate the impact of Informatics in respect to technology evolution and its implications in society

VOLUME 2: PROGRAMMING TECHNIQUES

a) Knowledge

Upon successful completion of the study of the second volume, students will know:

- the concept of algorithms, programming practices, program design principles, the criteria of programs' suitability, as well as structured programming principles and programming structures
- advanced programming techniques, such as subroutines, recursion and regression

- software documentation issues and debugging

b) Understanding

Upon successful completion of the study of the second volume, students will understand:

- how to solve problems, how to design and develop programs
- the concepts of variable, data type, data structure, operator, parameter and expression
- the communication between the main program and its sub-programs
- how sorting and search algorithms work
- the range of variable declaration

c) Application

Upon successful completion of the study of the second volume, students will be able to:

- describe an algorithm through pseudocode
- design algorithms using basic programming practices and program design methodologies
- apply defensive programming

d) Analysis

Upon successful completion of the study of the second volume, students will be able to:

- recognize and categorize the main programming languages

e) Synthesis

- implement sorting and search algorithms
- design algorithms using arrays

f) Evaluation

Upon successful completion of the study of the second volume, students will be able to:

- select the proper programming structures for algorithmic implementations
- evaluate the efficiency of an algorithm

VOLUME 3: DATA STRUCTURES

a) Knowledge

- Upon successful completion of the study of the third volume, students will know:
- The concept of basic data structures, their implementation and its difference from an individual data type
- One-dimensional and two-dimensional arrays (concept, definition, memory representation, import, print, search-sort using various algorithms) have been already described in previous volumes
- The concept of "Dynamic Data Structure", and more specifically:
- Single Linked Lists, Double Linked Lists, Circular Linked Lists, with several operations such as:
- (Enter-Delete values, Search-Sort by various algorithms)
- The concepts of Stack and Queue. Static vs Dynamic implementation. Import (enqueue) Export (dequeue)
- The concept of Tree as dynamic data structure
- In more detail: The concepts Binary Tree, Complete Binary Tree, Binary Search Tree, Heap Tree

Static vs Dynamic representation. Techniques for accessing a binary tree

NOTE:

- The concept of structure (struct) has been described in Volume 4 (Programming languages)
- The concept of simply linked list and its representation in memory has been described in Volume 4 (Programming languages)

b) Understanding

Upon successful completion of the study of the third volume, students will understand:

- The different ways in which a data structure can be represented in the main memory of the computer
- How important Data Structures are for the development effective algorithms and programs
- The appropriate way of selecting Data Structures in solving algorithmic problems
- Several sorting algorithms and the different ways of data searching using data structures
- Bubble Sort, Merge Sort, Selection Sort algorithms
- Linear Search, Binary Search

c) Application

Upon successful completion of the study of the third volume, students will be able to:

- Develop the above data structures in C programming language and implement them into C programs
- APPLICATIONS: To solve real-world problems-applications by adopting appropriate Data Structures (Dynamic or Static)
- Develop algorithmic applications with search and sorting techniques using appropriate data structures for each application
- Design variations and/or combinations of different sorting and search algorithms.
- Design modifications, extensions, or combinations of basic algorithms of operations in lists, stacks, queues, binary search trees, and heap tree

d) Analysis

Upon successful completion of the study of the third volume, students will be able to:

- Categorize data structures and their various applications
- Adopt an analytical way of thinking, meaning that:
- Will be able to analyze real-world problems and select the appropriate data structures for dealing with it
- Implement programs per use case that require the adoption of the proper data structures (table, list, stack, queue, trees)

e) Synthesis

Upon successful completion of the study of the third volume, students will be able to:

- Implement programs per use case that require the adoption of the proper data structures (table, list, stack, queue, trees)

f) Evaluation

- Upon successful completion of the study of the third volume, students will be able to:
- Design and implement efficient algorithms in parallel with the ability of selecting the appropriate data structures for real-world problem solving
- Be able to experiment with a data structure

VOLUME 4: PROGRAMMING LANGUAGES

a) Knowledge

Upon successful completion of the study of the fourth volume, students will know:

- The concept and basic principles of Structured Programming
- The basic types of C programming language variables, their use for data representation, as well as their declaration commands
- The need to enter comments into a C program
- The basic libraries of C Programming language
- The declaration of constants in C Programming language
- The structure of a C program, (as a case of a structured programming language)
- The concept “compiler”
- The concepts of logical and syntactic error
- The process of identifying logical and syntactic errors (debugging) using debugging or tracing methods
- The logical operators and logical operations of the C programming language
- Input and output commands scanf, printf and their use
- The implementation of all Algorithmic Selection Structures, in C programming language
- The implementation of all Algorithmic Repetition Structures, in C
- Static data structures. The concept of One/ Two Dimensional Table data stricture in C programming language
- The declaration, input and display of a Table’s elements in C
- The string concept
- Searching and Sorting Algorithms in C (Divide and conquer methods)
- Implementation of sorting and searching algorithms on Tables in C
- Working with memory - The concept of Pointer in C Language
- The concept of Function in C
- Developing C programs using functions.
- The concepts of formal and actual parameters
- Passing parameters’ values (pass by value)
- Pass by reference using pointers
- Development of relative examples-cases in C
- Use of recursive functions in C
- The “Struct”
- Using arrays of structures
- Understanding how to use structures and pointers to design and develop a simply linked list and to insert values (Conceptual – Theoretic discussion)
- Design og proper structures (struct) for various cases

b) Understanding

Upon successful completion of the study of the fourth volume, students will be able to understand:

- The differences between the three Algorithmic Repetition Structures in C programming language (for, while, do - while) as well as the selection criteria of each in the development of C programs.
- How to declare and develop functions in C programming language
- How to pass variables into functions and return their value in the main program

- Functions of void type in C
- The choice between using Static Data Structures (Tables) or Dynamic Data Structures (Simply Linked Lists)
- Dynamic memory management in C programming language
- The concept of the recursive functions, as well as the advantages / disadvantages over typical functions performing iterations (with loop execution)

c) Application

Upon successful completion of the study of the fourth volume, students will be able to:

- Develop solutions to real world or computational problems by developing programs in C
- Describe the operation as well as the results of a simple program in Cprogramming language
- Use a simple programming environment IDE (the Dev-C++ Integrated Development Environment – in Thematic Unit PLH-10
- Debug programs with logical and syntactic errors using traces or debuggers (especially in the cases of pointers).
- Take advantage of dynamic memory capabilities in C programming language to store dynamically changing data structures
- Pass parameters to functions using pointers

d) Analysis

Upon successful completion of the study of the fourth volume, students will be able to:

- Analyze a complex problem in small structural components, each of which will perform a specific function, based on the principles of structured programming
- Design and develop functions of appropriate type, based on the previous analysis
- Select the appropriate algorithmic - programming structures, as well as variables (static or dynamic memory) for the basic functions of their programs

e) Synthesis

Upon successful completion of the study of the fourth volume, students will be able to perform:

- Design a program in C programming language that will implement the solution of a real problem, using structured programming techniques

f) Evaluation

Upon successful completion of the study of the fourth volume, students will be able to perform:

- Provide an estimate of memory and runtime requirements for the functions they implement (either using a recursive or an iterative approach)
- Optimize their programming skills and techniques

Subjects covered:

- Introduction to Computer Science
- Programming Techniques
- Data Structures
- Programming Languages

Teaching Method: Distance education with five Group Counseling Meetings (OSS) during the academic year on weekends.

Evaluation: Students are assigned to submit four (4) written assignments during the academic year. The average grade of the four (4) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.
The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.
Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the four (4) assignments and (b) at least three (3) of the four (4) written assignments have been submitted.

PLI11 Principles of Software Technology

Module code: PLI11
ECTS Credit Points: 20
Module Type: Optional
Year: 4th
Language: Greek
General Description: The main objective of the module is to introduce students to Informatics as an applied engineering science, that provides a set of documented principles, methodologies and techniques, with the help of which one can develop quality software products. Students will first be trained in the basic principles and concepts of Software Engineering, and then they will study specific issues and application areas of the methodologies it includes. Two very important and widespread application areas of Informatics are Operating Systems and Databases. Furthermore, students will study techniques for assessing the complexity and practical application of computer-based problem-solving algorithms. In addition to the transfer of knowledge and the acquisition of skills for the application of Software Engineering methodologies, the module aims at the adoption by students of a positive attitude towards the application of widespread principles and methodologies in software development. The ultimate goal is to improve the quality of software, develop a spirit of collaboration and meet the needs for which the software system was developed.
Learning Outcomes:
SOFTWARE ENGINEERING I
On successful completion of the study of this volume, students will be able to:

- Describe and explain the basic concepts of software engineering (software, tools, procedures, methodologies, life cycle etc.)
- Recognize the fundamental role of the basic principles of software engineering in the development of qualitative software and applications
- Describe the different phases in the development of a software application as well as the basic features of the most significant software life-cycle models.
- Identify the requirements of a software application and use the principles of structured analysis for their detailed specification.
- Use effectively the most known diagrammatic software representation models (data-flow diagrams, state transition diagrams etc.) for the requirements analysis of a software application.

- Design a software application following the principles of structured design (architectural design, interface design, detailed design of modules etc.).
- Explain and apply suitable fault avoidance techniques during the implementation of a software application in order to produce qualitative code without bugs.
- Describe the different stages and explain the different strategies followed during the testing process of a software module or system.

DATABASES

On successful completion of the study of this volume, students will be able to:

- Describe the basic concepts and models of databases as well as the main differences between a database and a database management system.
- Recognize the fundamental need of using database technology in any application that demands efficient organization and management of large-scale data.
- Explain the different methods for data organization and data access (records, indexes, b-trees etc.) in modern database systems.
- Distinguish between the different levels of database analysis and design (conceptual, logical and physical level).
- Use effectively the entity-relationship model for the conceptual design of a database.
- Perform the design of a database in the logical level with use of the relational model.
- Use effectively a theoretical query language (i.e. relational algebra) for data retrieval out of a relational database.
- Implement a database over a modern relational database management system and practically use a standard query language (i.e. SQL) for efficient data organization, management and retrieval.

OPERATING SYSTEMS I

On successful completion of the study of this volume, students will be able to:

- Describe the basic functions of an operating system.
- Recognize the fundamental role of operating systems in the efficiency of modern systems and applications due to their advanced multi-tasking and multi-user capabilities.
- Describe the different methods used for process scheduling in modern operating systems and explain their differences, advantages and disadvantages. .
- Explain the mutual exclusion problem and use effectively the basic mechanisms offered by a multitasking operating system for process synchronization and communication (semaphores etc.).
- Describe the different main-memory organization methods followed in modern computer systems and identify their advantages and disadvantages.
- Generalize the use of basic memory organization methods (i.e. paging, segmentation) to more complex hybrid memory schemes, which are mainly used in modern computer systems.
- Explain the function of virtual memory organization and distinguish between the different page replacement algorithms used in modern operating systems.
- Solve practical problems and exercises with regard to the above concepts and mechanisms of a modern operating system (process management, CPU scheduling, process synchronization and communication, memory management, virtual memory organization).

Subjects covered:

- Software engineering I

- Operating systems I
- Databases

Teaching Method: Distance education with five Group Counseling Meetings (OSS) during the academic year on weekends.

Evaluation: Students are assigned to submit four (4) written assignments during the academic year. The average grade of the four (4) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the four (4) assignments and (b) at least three (3) of the four (4) written assignments have been submitted.

PLI23 Telematics, Internets and Society

Module code: PLI23

ECTS Credit Points: 20

Module Type: Optional

Year: 4th

Language: Greek

General description: The main purpose of Module is to acquaint students with the basic conceptual and technological versions of telematics services and internet technologies, to become familiar with the programming languages and to get acquainted with the programming techniques of web applications, as well as to study the social impact of Information and Communications Technology (ICT). The main purpose of the module is to understand the basic concepts of telematics networks, and the estimation of transmitted information, to become familiar with the concepts of data transmission / packets transmission in broadband networks, telematics networks' performance, with the concepts of information management taking into account the technical characteristics of telematics networks, the IP Addressing, to become familiar with the basic concepts of mobile telecommunication systems, the concepts of the offered traffic and the grade of service (GoS), the frequencies reuse etc. It also aims to become familiar with Internet technologies, HTTP protocol and understand the basics of user interaction with Internet pages, to become familiar with the performance of the HTTP protocol, as well as with Internet protocol analysis tools. Also, the module's main goal is the development of simple and advanced websites and portals, to be familiar with the programming languages and the programming techniques of web applications: HTML, CSS, Javascript, PHP, MySQL; to acquire the ability to judge and select the appropriate language / technology of web programming, to recognize the importance of authentication and authorized user access to a web application. Understanding and applying World Wide Web programming techniques using XML, DTD, DOM, XSL.

Learning Outcomes: On successful completion of the module, students will be able to,

- Explain and present the basic concepts of modern telematics networks and services.
- Analyze and design wireless and mobile (GSM, UMTSetc) networks.
- Explain the addressing schemes of the Internet.

- Distinguish the routing algorithms and protocols of the Internet.
- Associate telematics services with distributed object-oriented technology and service-oriented architecture.
- Utilize various web programming technologies and develop a web application.
- Gain the ability to judge and choose the appropriate language / technology of web programming.
- Recognize the importance of authenticating and authorizing users to access a World Wide Web application.
- Discuss the architecture of the World Wide Web (WWW).
- Compose methods of the HTTP protocol.
- Create simple WWW pages using HTML and CSS.
- Construct dynamic WWW applications by inserting client-side JavaScript) and server-side (PHP) scripts in HTML code.
- Integrate server-side scripting (PHP) with Data Bases (MySQL).
- Design data descriptions in the WWW with XML.
- Transform XML descriptions by using XSL.
- Measure and evaluate the performance of Internet and WWW.
- Analyze caching and proxy techniques in the WWW.
- Apply web application programming techniques using XML, DTD, DOM, XSL.
- Explain searching and security mechanisms of the WWW.
- Discuss the increasing and diversifying social impact of Information and Communication Technologies.

Subjects covered:

- Telematics
- Internet – Web
- Computers and information society

Teaching Method: Distance education with five Group Counseling Meetings (OSS) during the academic year on weekends.

Evaluation: Students are assigned to submit four (4) written assignments during the academic year. The average grade of the four (4) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the four (4) assignments and (b) at least three (3) of the four (4) written assignments have been submitted.

PLI35 Computer Systems Security

Module code: PLI35

ECTS Credit Points: 20

Module Type: Optional

Year: 4th

Language: Greek

Learning Outcomes:

Computer Security

Upon completion of this course, students will be able to:

- Understand the terminology of this area
- Understand operating system security issues
- Develop and manage access control methods
- Protect an information system from malware attacks
- Understand and utilize risk assessment methods
- Develop an information system Security Plan
- Understand the legal aspects of personal data protection

Network Security

Upon completion of this course, students will be able to:

- Understand the terminology of this area
- Understand the OSI network security architecture
- Manage Internet security issues
- Develop security methods at the application level
- Manage selected application security systems
- Understand the legal aspects of protection of data communications

Cryptography

Upon completion of this course, students will be able to:

- Understand the terminology of this area
- Understand the essential mathematical background
- To understand the pros and cons of modern cryptosystems
- Manage a cryptosystem
- Utilize digital signatures
- Understand the legal aspects of using cryptosystems

Subjects covered:

- Computer security
- Network security
- Cryptography

Teaching Method: Distance education with five Group Counseling Meetings (OSS) during the academic year on weekends.

Evaluation: Students are assigned to submit four (4) written assignments during the academic year. The average grade of the four (4) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the four (4) assignments and (b) at least three (3) of the four (4) written assignments have been submitted.

PLI37 Informatics and Education

Module code: PLI37

ECTS Credit Points: 20
Module Type: Optional
Year: 4th
Language: Greek
Module general description: The purpose of this thematic area is to explore the issue of the integration of Information Communication Technologies in education. The main topics which analyze and discuss this thematic area consist of: computer-assisted learning, learning theories, educational software, open learning environments, computer science in education, teaching computer science, programming as a learning tool in education, educational software, tools for developing educational models, evaluation of educational software, prototyping, and quality control.

Learning Outcomes:

PLI-37–I Didactics of Informatics

a) On successful completion of the study of the first volume students will know:

- the role of Informatics in Education
- the role of Informatics in Greek Education
- advanced concepts of Didactics of Informatics (learning structural and object oriented programming, psychology of programming)
- the role informatics a sa subject matter in education
- specific issues relative to the Didactics of Information focused on structural and object oriented programming

b) On successful completion of the study of the first volume students will know:

- the role of Informatics as a cognitive discipline in alignment with the principles of pedagogy
- the pedagogical and didactical approaches and principles of Informatics and ICT at all levels of an education system

c) On successful completion of the study of the first volume students will know:

- design learning activities and educational scenarios in order to teach informatics as a subject matter
- use appropriate educational software in the teaching of informatics
- apply and evaluate learning activities and educational scenarios into teach informatics as a subject matter

PLI-37–II Informatics in Education

a) On successful completion of the study of the second volume students will know:

- the pedagogical models and approaches concerning the introduction of Information and Communication Technologies in Education
- the evolution of Informatics in Education as different phases
- the Learning Theories (behaviorism, constructivism, socio-cultural theories activity theory) and Information and Communication Technologies (ICT)
- the role of Information and Communication Technologies in teaching and learning (teaching machines, computer assisted learning, microworlds, multimedia and hypermedia learning, virtual reality, e-learning, simulations, modelling, Logo, educational robotics, edutainment).

- the learning theories and instructional strategies integrated with Information and Communication Technologies(ICT)
- the basic principles of communication and interaction between the humans and the computer
- the basic principles of design and evaluation of the education software

b) On successful completion of the study of the second volume students will know:

- the concept of educational software and its usefulness in the educational process
- the concept of open-ended computing environment and its usefulness in the teaching and learning process
- theoretical issues and principles of educational software: principles of instructional design and evaluation of educational software

c) On successful completion of the study of the second volume students will know:

- use appropriate educational software in teaching subjects in various learning areas in primary and secondary education
- use e-learning and distance learning environments in teaching and learning
- consider on the educational applications of the Information and Communications Technologies (ICT)
- design learning activities and educational scenarios for teaching and learning in the curricula of primary and secondary education
- design learning activities with e–learning environments

PLI-37–III Design of Educational Software

a) On successful completion of the study of the third volume students will know:

- the principles of design educational software
- the principles of design interfaces and navigation, content and interaction
- the models for the development of education software
- the tools for the development of education software
- issues related to digitalization of sound, image and video
- issue related to documentation of software
- the principles applied for the evaluation of software
- the principles applied for the pedagogical use of the software
- the issue related to the technological evaluation of the software
- the basic principles related to the qualitative assurance of the educational software

b) On successful completion of the study of the third volume students will know:

- the purpose of designing educational software
- the purpose of evaluating educational software
- the purpose of quality control and assurance of educational software

c) On successful completion of the study of the third volume students will know:

- design multimedia materials for educational use
- design simple educational applications e–learning
- use e-learning tools to design distance learning applications
- develop distance and e-learning applications to teach informatics
- evaluate educational software
- evaluate e–learning environments
- evaluate distance learning applications

- apply quantitative and qualitative methods, technics and tools for the evaluation of educational software

Subjects covered:

- Didactics of ICT
- ICT and Education
- Design of Educational Software

Teaching Method: Distance education with five Contact Sessions held at weekends during the academic year.

Evaluation: Students are assigned to submit four (4) written assignments during the academic year. The average grade of the four (4) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the four (4) assignments and (b) at least three (3) of the four (4) written assignments have been submitted.

PLI44 Signals and Image Processing

Module code: PLI44

ECTS Credit Points: 20

Module Type: Optional

Year: 4th

Language: Greek

General Description: The main objective of the module is to introduce the students in the fields of signals and their processing, which are fundamental for a large number of areas involving acquisition, processing, storage and transmission of information. In volume A, the notions of signals and systems and the related fundamental mathematical tools are presented (Fourier and Laplace transforms). Volume B focuses on digital signal and image processing, the discrete Fourier transform and the z transform in order to conclude with the design of digital filters. Also, an introduction to digital images is presented. In volume C, the processing of digital images is further described by highlighting image enhancement, segmentation through an introduction to pattern recognition with Bayesian classification.

Learning Outcomes:

On successful completion of this module, students will be able to:

- Understand basic principles of signals and systems; of fundamental transforms (Fourier, Laplace and Z); of convolution, sampling, frequency response and of the basic principles of digital filters in one-dimensional signals and images.
- Interpret one- or multi-dimensional signals (speech, seismic, heart rate, etc), correctly implement the digitization of continuous-time signals, calculate the frequency content of signals and design basic filters for their processing.
- Apply simple digital image processing techniques, like image enhancement, image segmentation and image description
- Analyze and design continuous-time and discrete-time signal processing systems.

Subjects covered:

- Signals and systems
- Digital signal and image processing
- Image analysis and pattern recognition

Teaching Method: Distance education with five Group Counseling Meetings (OSS) during the academic year on weekends.

Evaluation: Students are assigned to submit four (4) written assignments during the academic year. The average grade of the four (4) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the four (4) assignments and (b) at least three (3) of the four (4) written assignments have been submitted.

EKP63 Science Education

Module code: EKP63

ECTS Credit Points: 20

Module Type: Optional

Year: 4th

Language: Greek

Aim: The module "Science Education" aims to familiarize the students of the Hellenic Open University with:

- the systematic examination of problems related to the understanding of natural science concepts,
- the use of existing research data - especially those related to students' misconceptions - in teaching,
- corrective intervention in the transformation of the content to be taught,
- the exploitation of existing learning tools so that they can be effectively integrated into teaching.

In particular, the module addresses the following **central questions**:

- What are the factors that determine and define School Science as an autonomous field of knowledge?
- What are the necessary skills, knowledge, attitudes and values that are deemed necessary for students to develop through the teaching of Science?
- What are the pupils' initial ideas regarding concepts and phenomena in science and how can these form the starting point for the construction of school science knowledge?

Learning Outcomes:

Upon completion of the module the student will be able to:

- identify the main problems that pupils face in understanding basic concepts and phenomena in science,
- understand and justify the necessity of teaching science,

- explains how knowledge of pupils' practical-experiential perceptions of science can help to improve the organisation of teaching,
- briefly describes the general characteristics of pupils' perceptions,
- indicates the main changes introduced in the role of the teacher by the new model of teaching in science,
- recognises and uses teaching tools such as cognitive conflict, analogical thinking and goal-obstacles,
- recognises the main features and differences between the different epistemological positions on the nature of scientific knowledge,
- describe and distinguish the different concepts that students use in order to understand and explain concepts and phenomena in science,
- recognises the role and character of informal and non-formal forms of science education,
- recognise the changes that science knowledge undergoes when it is transformed into school knowledge and compare their characteristics,
- analyse and describe the constitution and organisation of the school version of science in different types of teaching material.

Cognitive Objects of the subject:

- Necessity of systematic examination of the teaching of science.
- Basic conceptual framework of science teaching.
- Modern methods of teaching science such as: general characteristics of teaching, criteria for selection of content, learning processes, pacing and assessment methods, design and development of teaching materials.

Teaching Method: Distance education with five Contact Sessions held at weekends during the academic year.

Evaluation: Students are assigned to submit four (4) written assignments during the academic year. The average grade of the four (4) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the four (4) assignments and (b) at least three (3) of the four (4) written assignments have been submitted.

LTU_MATH Introduction to Mathematical Modeling and Applications in Natural Sciences

Module code: LTU_MATH

ECTS Credit Points: 20

Module Type: Optional

Year: 4th

Language: Greek

Module general description: The aim of the LTU is to educate the undergraduate students of the program in the contemporary technologies that support the theoretical and laboratory training. In particular, the content of the LTU includes:

- basic programming knowledge with languages such as Octave, WolframAlpha, Sagemath
- designing algorithmic procedures for solving mathematical problems
- basic modeling principles
- study of mathematical models, study of physical, chemical and biological processes and phenomena
- methods of solving Partial Differential Equations of the first and second order and Initial Value Problems and Boundary Conditions
- learning basic elements of the R statistical programming language for data analysis, the representation of data, and how to draw conclusions

For the purposes of the LTU_MATH the laboratory equipment of the Applied Mathematics Laboratory of the HOU will be utilized.

The education of the undergraduate students in this LTU uses and expands the theoretical knowledge acquired in the framework of the FYE program and provides additional theoretical and computational Mathematical and Statistical tools and computational skills to deal with the modern problems of Science and Technology.

Learning Outcomes: Upon successful completion of LTU_MATH, the students will be able to:

- design algorithmic procedures for solving mathematical problems
- know and apply basic commands in programming languages such as Octave, WolframAlpha, Sagemath and R
- write code to solve problems
- model science problems using Ordinary and Partial Differential Equations
- study and solve Initial and Boundary Value problems with analytical and numerical methods
- experiment in developing mathematical models for natural sciences
- process results with graphical representations and simulations
- know basic commands of the statistical programming language R
- perform statistical analysis on data using the R language.

Subjects covered:

- Basic programming knowledge
- Mathematical models of Partial Differential Equations
- Data analysis

Prerequisites: FYE10, FYE14, FYE20, FYE24

Evaluation: Elaboration of six (6) laboratory exercises and potential final presentation of a project during the academic year. The average grade of them, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of the laboratory exercises is activated only with a score equal to or above the pass level (≥5) in the final or resit exams. The grade of the final or resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 30 points have been obtained from the laboratory exercises and any other activities and (b) at least five (5) of the six (6) laboratory exercises have been submitted.

FYE UT Undergraduate Thesis

Module code: FYE UT
ECTS Credit Points: 20
Module Type: Optional
Year: 4th
Language: Greek/ English
Content:
Subjects pertaining to basic scientific directions of Natural Sciences with either an area-focused or interdisciplinary approach
Learning Outcomes:
Knowledges:
Upon successful completion of the Undergraduate Thesis, students are expected to:

- comprehend and describe subjects pertaining to basic scientific directions of Natural Sciences
- show deep comprehension of basic principles, concepts, scientific theories and laws of Physics, Chemistry and Biology as well as of their respective hitherto evolution hitherto
- comprehend the basic mathematic concepts and usage of algebraic, calculus and vector calculus theorems for solving problems of natural sciences and describe the behavior of physical and biological systems and phenomena in terms of mathematical equations
- apply analytic as well as approximation techniques for solving differential equations describing phenomena in physics as well as biological and chemical procedures and processes
- apply the basic laws of physics for solving problems in Mechanics, Electromagnetism, Wave mechanics, Thermodynamics, Quantum Mechanics and Atomic Physics
- apply the laws of Chemistry for solving problems of General & Inorganic Chemistry, Physical Chemistry and Organic Chemistry
- demonstrate deep knowledge in the principles and mechanisms of Biochemistry and Molecular Biology, Cell Operation, Genetics, Physiology and Evolution of living organisms
- Use experimental procedures and methods for collecting, elaborating and analysing experimental data and laboratory measurements

Skills:
Upon successful completion of the Undergraduate Thesis, students are expected to:

- Undertake a theoretical or experimental essay by following appropriate methodologies
- Write up scientific essays
- Perform oral presentations of scientific work
- Public defense and discussion on scientific issues

Competences:
Upon successful completion of the Undergraduate Thesis, students are expected to:

- delve into issues of Mathematics and Natural Sciences
- organize and make use of the acquired knowledge for solving problems in Natural Sciences

- make systematic and synthetic use of the knowledge acquired during the studies in FYE
- undertake Scientific (theoretical or experimental) thesis within the respective disciplines of Natural Sciences by following appropriate methodologies
- write up scientific test-essay pertaining to Natural Science subjects
- present and publicly defend his/her thesis in Natural Science subjects

Prerequisites: 3rd year Modules

Informatics

Description

This course aims at preparing students to become computing scientists. By choosing the necessary course modules, students may develop their knowledge and skills in specialised fields related to applied Computer Science.

Learning Outcomes

Upon successful completion of the program, students will be able to:

- Understand the needs of an enterprise infrastructure and services in ICT
- Understand the techniques and methods of organization and management of information systems
- Understand the fundamental concepts and techniques of software design and development
- Understand the information management technologies
- Evaluate the theoretical concepts and systems in ICT
- Evaluate the features and capabilities of information systems
- Design and implement software systems that meet specific design and performance requirements
- Apply their knowledge and skills to solve problems in ICT systems.
- Apply the compositional principles and analysis of computer systems
- Apply networking and communication technologies in information systems.
- Apply critical thinking in the field of knowledge management

Admission Requirements

Graduates of High Schools or holders of corresponding or similar secondary education degrees earned either abroad or in Greece.
Knowledge of a foreign language as well as familiarity with the use of computers, e-mail, and the Internet will significantly facilitate participation in the program.

Classification according to ISCED-2011 of UNESCO

Coding of educational attainment: 6
Based on the field of Education: 48 Computing

Classification according to ISCED-2013 of UNESCO

Based on the field of Education: 0610 Information Communication Technologies (ICTs)

Minimum study duration

4 academic years

ECTS credit points

240

Learning Material

Learning material used is mainly printed textbooks but also audiovisual and electronic learning material. The printed material is especially adapted to meet the needs and standards of distance education.
Chapters clearly state aims and objectives. Key concepts and expected learning outcomes. Self-assessment questions and exercise.
Alternative teaching material. To assist the students to a better understanding of the main teaching material. It utilizes, clarifies and enriches, if necessary, the already existing material.

Contact

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Course Structure

1st Year	
PLI PRO Programming	(C[1], 6 ECTS)
PLI10 Introduction to Informatics	(C, 18 ECTS)
PLI11 Principles of Software Technology	(C, 18 ECTS)
PLI12 Mathematics for Informatics I	(C, 18 ECTS)
2nd Year	
PLI20 Discrete Mathematics and Mathematical Logic	(C, 18 ECTS)
PLI21 Digital Systems	(C, 18 ECTS)
PLI22 Computer Network Fundamentals	(C, 18 ECTS)
PLI LAB I Digital Systems Laboratory Course	(C, 6 ECTS)
3rd Year	
PLI24 Software Design	(C, 18 ECTS)
PLI30 Foundations of Computer Science	(C, 18 ECTS)
PLI31 Artificial Intelligence - Applications	(C, 18 ECTS)
PLI LAB IIDigital Systems Laboratory Course	(C, 6 ECTS)
4th Year	
PLI23 Telematics, Internets and Society	(OM[2], 20 ECTS)
PLI32 Linear Programming and Modeling	(O[3], 20 ECTS)
PLI35 Computer Systems Security	(O, 20 ECTS)
PLI36 Advanced Networks and Services	(O, 20 ECTS)

PLI37 Informatics and Education	(O, 20 ECTS)
PLI40 Project in Software	(OM², 20 ECTS)
PLI42 Special Issues in Software Engineering	(OM², 20 ECTS)
PLI44 Signals and Image Processing	(O, 20 ECTS)
PLI47 Distributed Systems	(OM², 20 ECTS)
FYE14 Introduction to Natural Sciences	(O, 20 ECTS)
DEO10 Law and Administration	(O, 20 ECTS)

Notes:

C[1]: Compulsory

OM[2]: Optional Mandatory

O[3] : Optional

In order to obtain the degree, it is necessary to complete 12 modules, the two-cycle Digital Systems Laboratory courses and the PLIPRO Laboratory course.

Guidelines on Module selection

During the first year of studies you can choose from one (1) up to four (4) first-year's modules/laboratory courses. If the student chooses one, it is mandatory to choose the Laboratory Module PLIPRO: Programming, while if he/she wishes to choose a second one, it must be the Module PLI10: Introduction to Informatics. Due to the fact that PLIPRO is considered as not very demanding (6 ECTS), it is highly recommended students to choose this module in combination with PLI10. If he/she chooses three, it is recommended to choose in addition to PLI10 also PLI12: Mathematics for Informatics I, while if he/she has the required time and wishes to choose four, he/she can choose PLI11: Principles of Software Technology.

In the second year of studies it is compulsory to attend the following modules: PLI20, PLI21, PLI22 as well as the Laboratory Thematic Unit (LTU) PLI LAB I according to the instructions below.

In the third year of studies it is compulsory to attend the following modules: PLI24, PLI30, PLI31 as well as the Laboratory Thematic Unit (LTU) PLI LAB II according to the instructions below.

During the module selection, all modules from previous academic years must be selected and consequently the selection of the modules of the next academic year can begin.

The maximum number of ECTS declared for modules/laboratory courses with full obligations cannot exceed 60 each academic year.

The Laboratory Thematic Unit (LTU) "Digital Systems Laboratory Course" (PLI LAB I, PLI LAB II) is a compulsory LTU of two study cycles, each one lasting one academic year. The first study cycle is offered in the 2nd academic year and the second study cycle in the 3rd academic year. It is not permitted to attend the PLI LAB I and PLI LAB II laboratory courses at the same time. Students who have completed or are studying in parallel the module PLI21 are entitled to attend the laboratory course. In order to enroll in the second study cycle, students must either have completed PLI LAB I or have acquired the right to take part in the PLI LAB I examination.

In the fourth year of studies it is compulsory to attend at least one of the following modules: PLI23, PLI40, PLI42 and PLI47.

It is possible to include the Modules "Introduction to Natural Sciences" (FYE14) from the

School of Science and Technology and "Law and Administration" (DEO10) from the School of Social Sciences as optional in the fourth (4th) year of the undergraduate program "Informatics" (PLH). Students may choose only one of the two proposed Modules.

Module Sequence:
The following sequence of prerequisite modules is defined.

- PLI12 Mathematics for Informatics I
- PLI20 Discrete Mathematics and Mathematical Logic
- PLI30 Foundations of Computer Science

Students may declare together PLI12 and PLI20 or PLI20 and PLI30, if they have declared during the previous academic year PLI12 or PLI20 respectively and repeat it only to take part in the final examinations.
Students are permitted to choose the module PLI40 only if they have completed in previous academic years or will complete in the current academic year (simultaneously with it) at least 11 other modules.

Course Modules

PLIPRO Programming

Module code: PLIPRO
ECTS Credit Points: 6
Module Type: Compulsory
Unit characterization: Labotatory
Year: 1st
Language: Greek
Module General description: The course aims to give students a detailed and practical introduction to basic concepts of programming and software development through a modern high-level programming language (Python). Specifically, it aims to introduce concepts such as variables, expressions, control flow, complex data structures and file processing, permanent data storage.
The laboratory consists of mandatory laboratory exercises, which are an important part of the course. In the framework of laboratory exercises, there will be guided analysis and solution of real life problems from various fields of human activity that include data management and storage, development of appropriate interaction with the user and data extraction from the internet.
Learning Outcomes:
a) Upon successful completion of the laboratory, the students will know:

- the structure of a program in Python programming language
- the concepts of logical and syntactic errors, as well as debugging process
- the operation of decision commands in the Python programming language
- the logical operators and logical operations of the Python programming language
- the basic data types of the Python programming language
- the functionality of data structures: list, stack, queue, dictionary and tuples
- the basic concepts of object-oriented programming

- the basic concepts of event driven programming

b) Upon successful completion of the laboratory, students will know:

- the differences between iteration loops in python programming language (for, while)
- how to declare functions in the python programming language, and how to return a value (or not)
- the concept of the recursive functions, as well as the advantages / disadvantages over the iterative functions (with loop)
- the concept of modular programming
- the difference between mandatory and optional function parameters
- string management
- the concept of object-oriented programming using classes and objects
- the concept of inheritance and polymorphism
- the methodology of event driven programming

c) After the successful completion of the laboratory, the students will be able to:

- describe their solutions in computational steps in the Python programming language
- use modern data structures such as tuples, sets, sequences, dictionaries and lists.
- use and modify existing programs in Python (scripts and functions).
- use Python programming environments.
- use Python csv, json, pickle libraries for file management
- use Python's os, os.path libraries that allow interaction with operating system, the creation and deletion of folders, and display their contents.
- use the Python tkinter library for graphical interface design
- use the Python pandas library for data management and analysis
- use Python's NumPy library for scientific calculations with the available implementations of N-dimensional arrays and functions for linear algebra problems
- use the python matplotlib library to create high quality graphical representations
- debug programs that display syntax or logical errors

d) After the successful completion of the laboratory, the students will be able to:

- select the appropriate data structures and variables for the basic functions of their programs
- implement programs that use the appropriate data structures (lists, stacks, queues, dictionaries, tuples)
- implement programs using object-oriented programming
- optimize parts of their programs so as to increase their programs' efficiency
- be able to draw useful conclusions using data analysis
- have a good background to attend more advanced courses in programming.

Upon completion of the course the student should have the following learning outcomes as knowledge and skills:

- To know the principles of programming, to understand how a problem can be solved with computer programming.
- Using multiple levels of abstraction and selecting appropriate data structures to develop a program for solving a real problem and highlighting the usefulness of information technology in dealing with social problems.
- To understand the different programming styles (procedural, object-oriented,

functional) and to be able to choose an appropriate programming style, to produce the desired outputs to specific inputs, to check the correctness of individual program parts and to produce documentation of the program .

- Gain experience with the event driven programming.
- Be able to use available libraries for data analysis and scientific calculations.

Teaching Method: Distance education with five Group Counseling Meetings during the academic year on weekends.

Final and Repeat Exams: TU PLIPRO does not have written Final and Repeat Exams. The students are examined orally in a Group Assignment (GA) in the form of a programming project that they are asked to conduct. The topic of the GA is announced at the end of the 18th week. In order to participate in the GA and in its oral examination students must have enrolled in the TU PLIPRO and have fulfilled their contractual obligations regarding the Written Assignments (WAs) as described previously. In the event that a student enrolls in the TU but does not fulfill his/her contractual obligations, he/she has the right to re-enroll in TU (in the following academic year) but with the same financial and educational obligations. The student who re-enrolls in the TU having fulfilled his/her contractual obligations regarding the WAs, does not redo the WAs, but joins a group for a new GA.

During the oral examination, the Advisor-Professor grades the student's performance in the GA, taking into account the final report and the student's acquired general knowledge from the TU. Indicatively, the following are evaluated:

- Completeness of the solution
- Quality and completeness of the report
- Code quality
- Answering questions during the oral exam

The GA is graded by the Advisor-Professor in the range 0-10, separately for each member of the group. It is not necessary that all members of the same group get the same grade. The grade is registered as "Final Examination Grade" in the "Electronic Spaces for the Educational Process" Service of the HOU (http://study.eap.gr/) and contributes by 70% to the final grade of the TU, as long as it is passable (i.e. ≥5). If the student participates in the GA but does not manage to secure a passable grade (≥5) during the oral examination, then he/she has the opportunity to be re-examined in the same way (orally), in the same academic year. This grade is registered as "Repeat Exam Grade" in the HOU "Electronic Spaces for the Educational Process" Service (http://study.eap.gr/).

Final Marking: The average of the grades of the four (4) written assignments contributes by 30% to the final TU grade, as long as the grade of the final and/or repeat oral examination of the GA is passable (≥5). The grade of the final and/or repeat oral exam of the GA contributes by 70% to the final grade of the TU, as long as it is passable (≥5). If the grade of the final oral examination is not passable, then the student has the opportunity to be re-examined once more (again orally) during the same academic year. If the re-examination grade is not passable either, then the student does not successfully complete the TU but has the right to re-enroll in the following academic year.

PLI10 Introduction to Informatics

Module code: PLI10

ECTS Credit Points: 18
Module Type: Compulsory
Year: 1st
Language: Greek
General Description: The main objective of the module is to acquaint the student with the basic principles of Computer Science and information management, to gain basic knowledge of problem solving, techniques, tools and structured programming languages, as well as program development principles. Also, the aim is to acquaint knowledge in the use of simple and complex data structures and in the management of information systems, in order to be able to follow the evolutionary course of technology, informatics and their application, now and in the future.
Learning Outcomes:
VOLUME 1: INTRODUCTION TO COMPUTER SCIENCE
a) Knowledge
Upon successful completion of the study of the first volume, students will know:
- the historic evolution of computers and informatics
- the basic subjects of Informatics and its applications
- the computer structure as well as the functionality of its subsystems
- how to store and represent data and information on a computer
- the basic numbering systems used in informatics and their arithmetic operations
- the description of the basic logic gates and circuits
- the concepts of programming, algorithms and programming languages

b) Understanding
Upon successful completion of the study of the first volume, students will understand:
- the ways of storing, transmitting and processing data
- operations in various arithmetic systems
- the process of representing logical - digital circuits
- algorithmic concepts as well as the concepts of application software and systems

c) Application
Upon successful completion of the study of the first volume, students will be able to:
- perform value conversions and arithmetic operations on different arithmetic systems
- design logical (digital) sequential circuits

d) Analysis
Upon successful completion of the study of the first volume, students will be able to:
- describe the various computer subsystems and their functionality
- to categorize the basic subjects of Informatics and its applications

e) Synthesis
Upon successful completion of the study of the first volume, students will be able to:
- compose logical circuits from gates

f) Evaluation
Upon successful completion of the study of the first volume, students will be able to:
- evaluate the impact of Informatics in respect to technology evolution and its implications in society

VOLUME 2: PROGRAMMING TECHNIQUES

a) Knowledge

Upon successful completion of the study of the second volume, students will know:

- the concept of algorithms, programming practices, program design principles, the criteria of programs' suitability, as well as structured programming principles and programming structures
- advanced programming techniques, such as subroutines, recursion and regression
- software documentation issues and debugging

b) Understanding

Upon successful completion of the study of the second volume, students will understand:

- how to solve problems, how to design and develop programs
- the concepts of variable, data type, data structure, operator, parameter and expression
- the communication between the main program and its sub-programs
- how sorting and search algorithms work
- the range of variable declaration

c) Application

Upon successful completion of the study of the second volume, students will be able to:

- describe an algorithm through pseudocode
- design algorithms using basic programming practices and program design methodologies
- apply defensive programming

d) Analysis

Upon successful completion of the study of the second volume, students will be able to:

- recognize and categorize the main programming languages

e) Synthesis

- implement sorting and search algorithms
- design algorithms using arrays

f) Evaluation

Upon successful completion of the study of the second volume, students will be able to:

- select the proper programming structures for algorithmic implementations
- evaluate the efficiency of an algorithm

VOLUME 3: DATA STRUCTURES

g) Knowledge

- Upon successful completion of the study of the third volume, students will know:
- The concept of basic data structures, their implementation and its difference from an individual data type
- One-dimensional and two-dimensional arrays (concept, definition, memory representation, import, print, search-sort using various algorithms) have been already described in previous volumes
- The concept of "Dynamic Data Structure", and more specifically:
- Single Linked Lists, Double Linked Lists, Circular Linked Lists, with several operations such as:
- (Enter-Delete values, Search-Sort by various algorithms)

- The concepts of Stack and Queue. Static vs Dynamic implementation. Import (enqueue) Export (dequeue)
- The concept of Tree as dynamic data structure
- In more detail: The concepts Binary Tree, Complete Binary Tree, Binary Search Tree, Heap Tree

Static vs Dynamic representation. Techniques for accessing a binary tree

NOTE:

- The concept of structure (struct) has been described in Volume 4 (Programming languages)
- The concept of simply linked list and its representation in memory has been described in Volume 4 (Programming languages)

h) Understanding

Upon successful completion of the study of the third volume, students will understand:

- The different ways in which a data structure can be represented in the main memory of the computer
- How important Data Structures are for the development effective algorithms and programs
- The appropriate way of selecting Data Structures in solving algorithmic problems
- Several sorting algorithms and the different ways of data searching using data structures
- Bubble Sort, Merge Sort, Selection Sort algorithms
- Linear Search, Binary Search

i) Application

Upon successful completion of the study of the third volume, students will be able to:

- Develop the above data structures in C programming language and implement them into C programs
- APPLICATIONS: To solve real-world problems-applications by adopting appropriate Data Structures (Dynamic or Static)
- Develop algorithmic applications with search and sorting techniques using appropriate data structures for each application
- Design variations and/or combinations of different sorting and search algorithms.
- Design modifications, extensions, or combinations of basic algorithms of operations in lists, stacks, queues, binary search trees, and heap tree

j) Analysis

Upon successful completion of the study of the third volume, students will be able to:

- Categorize data structures and their various applications
- Adopt an analytical way of thinking, meaning that:
- Will be able to analyze real-world problems and select the appropriate data structures for dealing with it
- Implement programs per use case that require the adoption of the proper data structures (table, list, stack, queue, trees)

k) Synthesis

Upon successful completion of the study of the third volume, students will be able to:

- Implement programs per use case that require the adoption of the proper data structures (table, list, stack, queue, trees)

l) Evaluation

- Upon successful completion of the study of the third volume, students will be able to:
- Design and implement efficient algorithms in parallel with the ability of selecting the appropriate data structures for real-world problem solving
- Be able to experiment with a data structure

VOLUME 4: PROGRAMMING LANGUAGES

g) Knowledge

Upon successful completion of the study of the fourth volume, students will know:

- The concept and basic principles of Structured Programming
- The basic types of C programming language variables, their use for data representation, as well as their declaration commands
- The need to enter comments into a C program
- The basic libraries of C Programming language
- The declaration of constants in C Programming language
- The structure of a C program, (as a case of a structured programming language)
- The concept “compiler”
- The concepts of logical and syntactic error
- The process of identifying logical and syntactic errors (debugging) using debugging or tracing methods
- The logical operators and logical operations of the C programming language
- Input and output commands scanf, printf and their use
- The implementation of all Algorithmic Selection Structures, in C programming language
- The implementation of all Algorithmic Repetition Structures, in C
- Static data structures. The concept of One/ Two Dimensional Table data stricture in C programming language
- The declaration, input and display of a Table’s elements in C
- The string concept
- Searching and Sorting Algorithms in C (Divide and conquer methods)
- Implementation of sorting and searching algorithms on Tables in C
- Working with memory - The concept of Pointer in C Language
- The concept of Function in C
- Developing C programs using functions.
- The concepts of formal and actual parameters
- Passing parameters’ values (pass by value)
- Pass by reference using pointers
- Development of relative examples-cases in C
- Use of recursive functions in C
- The “Struct”
- Using arrays of structures
- Understanding how to use structures and pointers to design and develop a simply linked list and to insert values (Conceptual – Theoretic discussion)
- Design og proper structures (struct) for various cases

h) Understanding

Upon successful completion of the study of the fourth volume, students will be able to understand:

- The differences between the three Algorithmic Repetition Structures in C programming language (for, while, do - while) as well as the selection criteria of each in the development of C programs.
- How to declare and develop functions in C programming language
- How to pass variables into functions and return their value in the main program
- Functions of void type in C
- The choice between using Static Data Structures (Tables) or Dynamic Data Structures (Simply Linked Lists)
- Dynamic memory management in C programming language
- The concept of the recursive functions, as well as the advantages / disadvantages over typical functions performing iterations (with loop execution)

i) Application

Upon successful completion of the study of the fourth volume, students will be able to:

- Develop solutions to real world or computational problems by developing programs in C
- Describe the operation as well as the results of a simple program in Cprogramming language
- Use a simple programming environment IDE (the Dev-C++ Integrated Development Environment – in Thematic Unit PLH-10
- Debug programs with logical and syntactic errors using traces or debuggers (especially in the cases of pointers).
- Take advantage of dynamic memory capabilities in C programming language to store dynamically changing data structures
- Pass parameters to functions using pointers

j) Analysis

Upon successful completion of the study of the fourth volume, students will be able to:

- Analyze a complex problem in small structural components, each of which will perform a specific function, based on the principles of structured programming
- Design and develop functions of appropriate type, based on the previous analysis
- Select the appropriate algorithmic - programming structures, as well as variables (static or dynamic memory) for the basic functions of their programs

k) Synthesis

Upon successful completion of the study of the fourth volume, students will be able to perform:

- Design a program in C programming language that will implement the solution of a real problem, using structured programming techniques

l) Evaluation

Upon successful completion of the study of the fourth volume, students will be able to perform:

- Provide an estimate of memory and runtime requirements for the functions they implement (either using a recursive or an iterative approach)
- Optimize their programming skills and techniques

Subjects covered:

- Introduction to Computer Science
- Programming Techniques
- Data Structures
- Programming Languages

Teaching Method: Distance education with five Group Counseling Meetings (OSS) during the academic year on weekends.

Evaluation: Students are assigned to submit four (4) written assignments during the academic year. The average grade of the four (4) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the four (4) assignments and (b) at least three (3) of the four (4) written assignments have been submitted.

PLI11 Principles of Software Technology

Module code: PLI11

ECTS Credit Points: 18

Module Type: Compulsory

Year: 1st

Language: Greek

Prerequisite Module: The choose of PLI11 requires the simultaneous choose or completion of PLI10.

General Description: The main objective of the module is to introduce students to Informatics as an applied engineering science, that provides a set of documented principles, methodologies and techniques, with the help of which one can develop quality software products. Students will first be trained in the basic principles and concepts of Software Engineering, and then they will study specific issues and application areas of the methodologies it includes. Two very important and widespread application areas of Informatics are Operating Systems and Databases. Furthermore, students will study techniques for assessing the complexity and practical application of computer-based problem-solving algorithms. In addition to the transfer of knowledge and the acquisition of skills for the application of Software Engineering methodologies, the module aims at the adoption by students of a positive attitude towards the application of widespread principles and methodologies in software development. The ultimate goal is to improve the quality of software, develop a spirit of collaboration and meet the needs for which the software system was developed.

Learning Outcomes:

SOFTWARE ENGINEERING I

On successful completion of the study of this volume, students will be able to:

- Describe and explain the basic concepts of software engineering (software, tools, procedures, methodologies, life cycle etc.)
- Recognize the fundamental role of the basic principles of software engineering in the development of qualitative software and applications

- Describe the different phases in the development of a software application as well as the basic features of the most significant software life-cycle models.
- Identify the requirements of a software application and use the principles of structured analysis for their detailed specification.
- Use effectively the most known diagrammatic software representation models (data-flow diagrams, state transition diagrams etc.) for the requirements analysis of a software application.
- Design a software application following the principles of structured design (architectural design, interface design, detailed design of modules etc.).
- Explain and apply suitable fault avoidance techniques during the implementation of a software application in order to produce qualitative code without bugs.
- Describe the different stages and explain the different strategies followed during the testing process of a software module or system.

DATABASES

On successful completion of the study of this volume, students will be able to:

- Describe the basic concepts and models of databases as well as the main differences between a database and a database management system.
- Recognize the fundamental need of using database technology in any application that demands efficient organization and management of large-scale data.
- Explain the different methods for data organization and data access (records, indexes, b-trees etc.) in modern database systems.
- Distinguish between the different levels of database analysis and design (conceptual, logical and physical level).
- Use effectively the entity-relationship model for the conceptual design of a database.
- Perform the design of a database in the logical level with use of the relational model.
- Use effectively a theoretical query language (i.e. relational algebra) for data retrieval out of a relational database.
- Implement a database over a modern relational database management system and practically use a standard query language (i.e. SQL) for efficient data organization, management and retrieval.

OPERATING SYSTEMS I

On successful completion of the study of this volume, students will be able to:

- Describe the basic functions of an operating system.
- Recognize the fundamental role of operating systems in the efficiency of modern systems and applications due to their advanced multi-tasking and multi-user capabilities.
- Describe the different methods used for process scheduling in modern operating systems and explain their differences, advantages and disadvantages. .
- Explain the mutual exclusion problem and use effectively the basic mechanisms offered by a multitasking operating system for process synchronization and communication (semaphores etc.).
- Describe the different main-memory organization methods followed in modern computer systems and identify their advantages and disadvantages.
- Generalize the use of basic memory organization methods (i.e. paging, segmentation) to more complex hybrid memory schemes, which are mainly used in modern computer systems.

- Explain the function of virtual memory organization and distinguish between the different page replacement algorithms used in modern operating systems.
- Solve practical problems and exercises with regard to the above concepts and mechanisms of a modern operating system (process management, CPU scheduling, process synchronization and communication, memory management, virtual memory organization).

Subjects covered:

- Software engineering I
- Operating systems I
- Databases

Teaching Method: Distance education with five Group Counseling Meetings (OSS) during the academic year on weekends.

Evaluation: Students are assigned to submit four (4) written assignments during the academic year. The average grade of the four (4) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the four (4) assignments and (b) at least three (3) of the four (4) written assignments have been submitted.

PLI12 Mathematics for Informatics I

Module code: PLI12

ECTS Credit Points: 18

Module Type: Compulsory

Year: 1st

Language: Greek

General Description: With the completion of this course, the students will be able to understand, interpret and describe fundamentals, while they will be able to solve various problems arising from other sciences, such as Physics, Chemistry, Biology etc. The mathematical instruction is necessary for two reasons: (a) students are familiarized with mathematics as the common language for all exact sciences, (b) students are trained on applying computer science methods for solving practical problems, as described in the syllabus, and (c) enables the students to acquire mathematical thinking which is based on demonstration of scientific results that is very important in informatics.

Learning Outcomes: On successful completion of the study:

- Students will expand their knowledge of the three areas of advanced mathematics which compose the syllabus of this course .They will be able to understand basic principles and theorems of Linear Algebra, Calculus of single variable and Probability Theory.
- They will acquire the necessary skills for applying advanced mathematics in order to develop critical thinking and analytical problem solving ability.

- Moreover, students will comprehend and evaluate the logical sequence of advanced mathematics, in particular to the role and construction of mathematical proofs and solutions in various problems.

Finally, the students will be able to compose and apply the methods described in the syllabus in order to efficiently solve interdisciplinary problems and expand their knowledge in mathematical applications, especially on those relevant with computer science.

Subjects covered:

- Linear Algebra
- Calculus of single variable
- Computational Platforms (Matlab, Mathematica, Octave etc.) and Probability Theory/Statistics

Teaching Method: Distance education with five Group Counseling Meetings (OSS) during the academic year on weekends.

Evaluation: Students are assigned to submit four (4) written assignments during the academic year. The average grade of the four (4) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the four (4) assignments and (b) at least three (3) of the four (4) written assignments have been submitted.

PLI20 Discrete Mathematics and Mathematical Logic

Module code: PLI20

ECTS Credit Points: 18

Module Type: Compulsory

Year: 2nd

Language: Greek

General Description: The main objective of the module is to familiarize the students with the branches of Mathematics that are absolutely necessary for the foundations of Computer Science. The module includes Mathematical Logic, which is the main tool for formal inference and for the foundations of Computer Science. Moreover, the module includes some classic branches of Discrete Mathematics, which, in contrast to Continuous Mathematics, promote a particular way of thinking, very close to the way of thinking typically applied in Computer Science. The main proof technique in Discrete Mathematics is the Mathematical Induction, while the solution of discrete mathematical problems often requires problem-specific approaches. The structures and the objects of Discrete Mathematics are directly applied to the foundations of Computer Science, such as the fields of Theory of Algorithms and Data Structures. Finally, the module focuses (with its second textbook) on Graph Theory, which is the branch of Discrete Mathematics with most applications to Computer Science, since graphs provide very natural and meaningful models of many problems from different subject areas of Computer Science.

Learning Outcomes: Upon successful completion of the module, students will be able to:

- Understand the basic techniques of combinatorial enumeration and counting, the basic notions of propositional and first-order logic and the basic notions of graph theory.
- Understand the form of counting problems, the expressing potential and limitations of propositional and first-order types and some interesting graph properties.
- Solve counting problems of different forms, verify and prove properties of propositional and first-order types and solve graph theoretic problems, with emphasis on the use of mathematical induction.
- Model various problems as counting and/or graph problems.
- Use and apply basic algorithms and techniques in logic and graph theory.

Subjects covered:

- Discrete mathematics
- Graph theory
- Mathematical logic

Teaching Method: Distance education with six Group Counseling Meetings (OSS) during the academic year on weekends.

Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.
The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.
Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

PLI21 Digital Systems

Module code: PLI21
ECTS Credit Points: 18
Module Type: Compulsory
Year: 2nd
Language: Greek
General description: The aim of this module is to introduce students to the hardware of computing systems. Specifically, starting from basic concepts of digital logic and logic circuits, the students study the fundamental building blocks of digital systems. They learn how to analyze and design combinational and sequential circuits. These circuits are the basic building elements of any computational system, the architecture of which is subsequently studied. The subjects that follow are the structure of the Central Processing Unit, the memory and that various ways of performing data Input/Output. Finally, the module deals with microprocessors, the structure and operation of two basic microprocessor families (Intel & Motorola) and the programming at the Assembly language level.

Learning Outcomes:

VOLUME 1: DIGITAL DESIGN

On successful completion of the study of the first volume, students will know:

- The difference between analog and digital signals.

- The advantages of digital against analog systems
- Binary representation of numbers (BCD, sign magnitude, 1's complement, 2' s complement) and the arithmetic operations between them
- The fundamentals of error detecting and correcting codes and as examples parity based codes Hamming code.
- To differentiate between combinational and sequential circuits.
- Booleanalgebra.
- Various ways to specify logic functions (truth table, logic expression) and simplify them (e.g. using theorems of Boolean algebra, using Karnaugh map).
- Correspondence of simple logic functions to logic gates and the schematic representation of logic functions with logic gates (logic circuits).
- The functionality and the design of complex logic functions which are common in digital systems (comparators, adders, decoders, multiplexers).
- To design large combinational units using as building blocks less complex logical circuits.
- Several elementary sequential circuits (flip-flops) and their function.
- To analyze sequential circuits.
- To design sequential circuits.
- To design registers of different functionality (parallel input, shift register, multifunctional register)

VOLUME 2: COMPUTER ARCITECTURE

On successful completion of the study of the second volume, students will know:

- The components of a computer system and their operation.
- The meaning of architecture, structure, organization and implementation of a computer system.
- Methods of performance evaluation.
- The representation of information.
- The encoding of machine language instructions and the memory addressing modes.
- Central Processing Unit subunits (register file, shifters, arithmetic/logic unit, multiplier, divider) structure, organization and function.
- Memory units which are used for the implementation of the memory system and their features.
- Memory hierarchy.
- Cache memory (fetch policies, organization, placement and replacement policies and policies for updating higher levels of the memory hierarchy).
- Main memory organization and features (size, word length, bandwidth).
- Busses and their classification (dedicated, shared, CPU-memory busses, system busses, input/output busses, synchronous and asynchronous busses).
- Arbitration and arbitration types
- Input/output organization (programmed Input/Output, interrupts, direct memory access)

VOLUME 3: MICROPROCESSORS

On successful completion of the study of the third volume, students will know:

- The meaning of microprocessor, microcomputer and microcontroller.
- The evolution of the microprocessors.
- Features of several commercial microprocessors.
- Interfacing peripherals and main memory to microprocessors.

- Programming in assembly language (Intel,8085)

Subjects covered:

- Digital design I
- Computer architecture I
- Microprocessors

Teaching Method: Distance education with five Group Counseling Meetings (OSS) during the academic year on weekends.

Evaluation: Students are assigned to submit four (4) written assignments during the academic year. The average grade of the four (4) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the four (4) assignments and (b) at least three (3) of the four (4) written assignments have been submitted.

PLI22 Computer Network Fundamentals

Module code: PLI22

ECTS Credit Points: 18

Module Type: Compulsory

Year: 2nd

Language: Greek

General description: The purpose of the PLI22 course is to familiarize the student with the different computer networking techniques, as well as the means and ways of communication and transmission of information. The student will first get acquainted with the communication system and the operations that are taking place for the transmission of information. These include signal representation, modulation techniques and digitalization of analog signals (Volume B: Digital Communications). It will then introduce the student to the concepts of computer networks, protocols and their architectures (Volume C: Computer Networks I). Finally, the student will be introduced to Information Theory, Data Compression, Channel Capacity and Error-Correcting Codes, concepts and techniques necessary for reliable and secure data transmission (Volume A: Theory of Information and Coding).

Learning Outcomes:

A) Information Theory & Error Control Coding

- Introduction to the concept of information as a quantitative measure and its formulation as Shannon entropy.
- Calculate the entropy and amount of information of random events
- Create instantaneous source codes
- Model various discrete sources of information and apply various source coding algorithms in order to calculate the entropy and the redundancy of a source (with or without memory)
- Measure the capacity of various communication (noiseless or noisy) channels
- Measure the capacity of various communication (noiseless or noisy) channels
- Introduction to discrete channels and calculating their capacity.

- Understanding the mechanisms of detecting and correcting errors during the transmission of symbols over the channels.
- Introduction to linear codes for coding and decoding information
- Calculation of the performance of error-correcting codes.

B) Digital Communications

- Understand the concepts of discrete signals, Fourier transforms, analogue and digital modulation, and sampling
- Examine periodicity of a signal and calculate its period and frequency.
- Use Fourier transforms in order to find the frequencies of a signal.
- Apply various modulation schemes in order to shift the a signal from its baseband frequencies to a high frequency band.
- Calculate the required bandwidth of signals after modulation.
- Apply filters in order to manipulate a signal.
- Apply Nyqvist's theorem in order to calculate the minimum sampling frequency.
- Explain how to convert analogue signals into digital signals.

C) Computer Networks

- Understanding layering principle in IP and OSI models and the role of each layer.
- Understanding the differences between packet-switching and circuit-switching and estimating their performance.
- Distinguish between different types of networks e.g Local area networks, Wide area networks and their corresponding technologies used e.g. Ethernet, Token–TokenRing802.11
- Apply CRC for coding and decoding bits
- Explain the use of framing in physical and link layers and how synchronisation is achieved between sender and receiver
- Explain how key retransmission protocols like, ABP, Go–Back–N, και Selective Repeat.
- Calculate the throughput of these retransmission protocols and compare their performance
- Explain the architecture and protocol operations of 4 major Local area networks Ethernet 802.3, 802.5, FDDI και 802.11)
- Estimate and compare the performance of these four networks
- Identify three medium access mechanisms.

Subjects covered:

- Information theory and coding
- Digital communications
- Computer networks I

Teaching Method: Distance education with five Group Counseling Meetings (OSS) during the academic year on weekends.

Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

PLI LAB I Digital Systems Laboratory Course

ECTS Credit Points: 6
Module Type: Compulsory
Year: 2nd
Language: Greek
Prerequisite Module: The first cycle of studies is offered in the second year. The choice of PLI Lab I is allowed only, if the student has completed in previous years or will complete in the current year (simultaneously with it) at least the PLI21 module.
General description: The purpose of the PLI LAB I module, is the introduction of students in the hardware of the computer systems. Specifically, starting from the basic logic circuits we demonstrate the fundamental building blocks of digital systems. Students learn to design and implement both combinational and sequential circuits. These circuits are the basic building blocks of any computer system, the architecture and programming of which will be studied by students during the subsequent PLI LAB II module. The design will be based on the use of digital circuit design tools using schematic diagrams as well as the use of VHDL (VHSIC Hardware Description Language). Their implementation and experimentation with elementary systems will be done using a development card equipped with integrated FPGAs (Field Programmable Gate Array) and the appropriate flow of programming tools.
Learning Outcomes
Upon successful completion of the course, the student will be able to:

- To understand the basic technologies involved in the design, development and testing of digital circuits
- Use effectively modern digital circuit design and simulation software tools
- To design digital circuits using schematic diagrams
- Design digital circuits using the VHDL hardware description language (VHSIC Hardware Description Language).
- Design basic units of a processor using the VHDL language
- To distinguish the basic building blocks of FPGA components and their application for designing and implementing digital circuits
- Use modern FPGA programming tools and design flows for the design and development of digital circuits
- To implement digital circuits on development boards equipped with integrated FPGAs by using appropriate computer programming tools
- Implement, integrate and validate complex digital systems by interconnecting peripherals on development boards
- To use modern laboratory equipment (oscilloscopes, signal generators, multimeters, signal analyzers, etc.) for the analysis and functional control of digital systems.

Subjects covered:

- Digital design
- Computer architecture

- Microprocessors

Evaluation: The average of the grades of the two laboratory assignments is taken into account at 30% for the final grade. The grade of the second phase (laboratory examination) will be taken into account to the extent of 70% for the final grade.
The Laboratory Exercise takes place exclusively at the Digital Systems Laboratory in Patras and is completed within two (2) consecutive days.

PLI24 Software Design

Module code: PLI24
ECTS Credit Points: 18
Module Type: Compulsory
Year: 3rd
Language: Greek
General description: The purpose of the module is to introduce to students with the concepts, tools, and processes related to "Software Design". The main objectives of the module are, students:

- to get acquainted with concepts related to compilers and interpreters,
- to be able to build basic parts of a compiler,
- to learn with object-oriented technology and software analysis,
- to familiarise to the basic concepts of software development tools,
- to be introduced to basic software and software quality assurance and, finally
- to learn object-oriented programming through Java programming language.

Learning Outcomes:
Part A: Compilers
Upon successful completion of the course, the student will be able:

- To explain what a compiler and what an interpreter is and describe the translation stages.
- To use regular expressions and automata for lexical analysis.
- To use context-free grammars and parse trees for syntactic analysis.
- To apply top-down and bottom-up techniques for syntactic analysis.
- To apply grammar transformation techniques to make a grammar suitable for recursive-descend parsing and LL (1) detection.
- To implement a lexical and syntax analyzer using the Java programming language.
- To design and use a symbol table.
- To explain and construct syntactically directed translation schemes.
- To describe intermediate code representations and optimization mechanisms.
- To describe principles of target code generation.

Part B: Software Engineering II Object Oriented Analysis and Design
Upon successful completion of the course, the student will be able:

- To describe and explain the basic concepts of object-oriented software technology (software, tools, processes, methodologies, life cycle, etc.).
- To know ICONIX object-oriented development methodology and, secondarily, Unified Process, as well as the phases, iterations, and activities it involves.

- To use ICONIX methodology for the development of an object-oriented software system.
- To develop analysis models by using UML.
- To develop the use case model and the corresponding diagrams.
- To develop the problem domain model.
- To design a software system
- To develop various UML diagrams such as: robustness diagrams, sequence diagrams, class diagrams, state diagrams, software components diagrams, software packages diagrams, and deployment diagrams.
- To develop the software using an object-oriented programming language.
- To conduct quality control (coupling, cohesion, etc.) of the software system.
- To prepare the necessary documentation artifacts.

Part C: Programming Languages II – Object Oriented Programming

Upon successful completion of the course, the student will be able:

- To outline and describe the basic object-oriented programming concepts such as class, object, instance, inheritance relationship, aggregation relationship, etc.
- To describe the proper syntax of java data structures, types and operators.
- To implement classes, instances, methods and class relationships.
- To implement the principles data hiding, overriding and polymorphism.
- To write small and medium scale object-oriented applications.
- To read data files and use data bases for data storage.
- To implement exception handling mechanisms.
- To write multi-threaded applications exception handling mechanisms
- To create graphical user interfaces for applications using java libraries.

Additional material: Software Project Panning -Object oriented methodologies

Upon successful completion of the course, the student will be able:

- To describe and explain key concepts of project management (project, project management phases, organizational structures, project scope, scheduling, etc.).
- To understand the different structures used for organizing projects and teams.
- To create project plans including Gantt charts.
- To perform project network analysis using CPM and PERT project management techniques.
- To estimate the required project effort using the use case points.
- To manage resources and perform resource leveling for a project.
- To describe and apply cost estimation techniques for a project.
- To describe and explain the basic principles of software quality assurance and use quality metrics to measure software quality.
- To describe the concept of software risk in software development projects, and predict-manage risks that are likely to occur in a project.

Subjects covered:

- Compilers
- Software engineering II
- Programming languages II - Object oriented programming

Teaching Method: Distance education with five Group Counseling Meetings (OSS) during the academic year on weekends.
Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.
The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.
Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

PLI30 Foundations of Computer Science

Module code: PLI30
ECTS Credit Points: 18
Module Type: Compulsory
Year: 3rd
Language: Greek
General description: The main objective of the module is to introduce students to the foundational principles of computation in Computer Science and to computational thinking. The goal is to learn fundamental algorithmic techniques for problem solving as well as the limits of computation. In particular, the module studies fundamental issues of computability that include the solvability or unsolvability of problems by computers, the estimation of computational resources that are required to solve a particular problem, the concept of algorithm, as well as the process of designing, analyzing, and implementing algorithms to the point that they can be useful in practice.
Learning Outcomes:
The PLI30 module consists of three distinct parts: 1) Algorithms and Complexity, 2) Theory of Computation, and 3) Automata and Formal Languages. The learning outcomes are distinguished into A) Knowledge and Understanding, B) Intellectual (Thinking) Skills, C) Analysis & Synthesis Skills.

A) Knowledge and Understanding.

On successful completion of the module, the students will be able to:

1. Describe simple algorithms in pseudocode, explain its functionality, use asymptotic notation, determine the worst-case running time, formulate and solve recursive equations, describe the generic algorithmic methods of Divide-and-Conquer, Greediness and Dynamic Programming, as well as the graph searching techniques of Depth-First Search (DFS) and Breadth-First Search (BFS).

2. Describe and define formally a Turing machine and its related concepts (Computation, Function, Grammar without limitations, M-recursive function), record the sequential steps of computation, define intuitively and formally the concept of an algorithm, define the halting problem, describe the universal machine Turing, refer some well-known intractable problems,

describe the dove-tailing technique, define the DTIME and NTIME complexity classes as well as the classes P, NP, and EXP, describe the class NP via a polynomial verifier and a short certificate, describe the meaning of complete, tractable and hard problems, describe the role and use of reductions, define the classes of polynomial and exponential space complexity PSPACE and EXPSPACE, describe the space and time constructed functions, define and prove theorems of space and time hierarchy, define an approximation algorithm, describe the probabilistic Turing machine, and distinguish between the features of Monte Carlo and Las Vegas algorithms.

3. Describe the concept of a language, its fundamental operations and what is a regular expression, state the characteristics of a finite state machine, describe the process of accepting an input string, define a finite automaton and explain what is the transition function, describe the language acceptable by a deterministic and a non-deterministic finite automaton, state the pumping lemma for regular languages and its use, define a context-free grammar and its variables, terminal symbols and derivations, state the basic features of a push down automaton (PA), describe the recognition process of an input string and explain its transition function, state the two types of string recognition and the corresponding languages that are acceptable by PAs, define a deterministic push down automaton, describe how a grammar can be transformed into an equivalent one that does not contain unitary rules ass well as state and explain how the pumping lemma is used for context-free grammars.

B) Intellectual (Thinking) Skills.

On successful completion of the module, the students will be able to:

1. Use the asymptotic analysis in determining the complexity of iterative and recursive algorithms, determine exact asymptotic estimations for solving recursive equations, apply the "divide and conquer" method for solving problems of intermediate difficulty, use the method of dynamic programming and the greedy method to solve computational problems of mix difficulty, store a graph using the adjacency list and the adjacency matrix representation, apply the techniques of Depth-First Search (DFS) and Breadth-First Search (BFS for exploring a graph.

2. Prove that the halting problem is undecidable using the diagonalization method, prove the important properties of Turing decidable and Turing recognizable languages, prove that the satisfiability (SAT) problem is NP-complete, prove that a problem is Turing decidable or undecidable, decide whether a given problem belongs to the class P, or NP, or NP-complete, prove the existence of PSPACE-complete problems through polynomial time reductions (problem QSAT), classify problems to the classes of polylogarithmic complexity.

3. Prove the closure properties of regular languages under the operations of union, intersection, concatenation and Kleene star, prove that two expressions belong to the same language, explain why every finite language is regular, prove whether a given language is regular or not, transform a non-deterministic finite automaton to a finite one, prove whether a given language is context-free, design pushdown automata, apply the pumping Lemma for context-free languages.

C) Analysis & Synthesis Skills.

On successful completion of the module, the students will be able to:

1. Select the most suitable algorithm for a given set of input instances, compare the exponent of two functions using asymptotic notation, prove that a greedy algorithm computes the optimal solution, use effectively the methods of Divide-and-Conquer, Greediness and Dynamic Programming to design new algorithms, reason about complicated algorithms and compute their complexity, synthesize or modify existing algorithms for problem solving.

2. Design simple Turing machines that execute requested computations or recognize or decide a given language, distinguish between decidable and undecidable problems, relate the time complexity between variants of the Turing machine, synthesize effectively basic Turing machines in order to create more complex ones, identify the usefulness of the dove-tailing technique, reduce a given problem of known complexity to another and thus determining the complexity of the second problem, relate the two space complexity classes and the way they are correlated via the Savitch theorem.

3. Identify the regular expression that corresponds to a language, justify why regular languages are closed under the operations of intersection, union, concatenation and Kleene star, construct a finite automaton for a given regular expression, construct the regular expression corresponding to the language of a given finite automaton, transform a non-deterministic finite automaton to a deterministic one that accepts the same language, explain when a certain context-free grammar is ambiguous, transform an automaton to a regular language and vice versa, justify the recognition of a context-free language by a pushdown automaton, develop algorithms for solving decision problems for regular and context free languages.

Subjects covered:

- Algorithms and complexity
- Theory of Computation
- Automata and formal languages

Teaching Method: Distance education with five Group Counseling Meetings (OSS) during the academic year on weekends.

Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

PLI31 Artificial Intelligence - Applications

Module code: PLI31

ECTS Credit Points: 18

Module Type: Compulsory

Year: 3rd

Language: Greek

General description: The main objective of the module is to impress upon students that computer science is an applied science that attempts to bridge the gap between man and machines. The module includes both foundations and applications of AI.

The tremendous advances of computing have not yet fully materialized into seamless communication with humans in natural language or into generic learning, though a wide array of applications has been fielded with success. Since Artificial Intelligence does aim to empower machines with traits or features of human intelligence, there is a strong incentive to study the techniques and the processes that allow a computer to display behaviour that resembles that of human beings, in a variety of contexts.

The module starts by covering fundamental concepts in state space representations and search for problem solving, constraints handling and adversarial search. It then moves on to aspects of knowledge representation and reasoning with first-order logic and complements the treatment with an introduction to logic programming (with Prolog). It then moves on to deal with learning, placing an emphasis on neural networks (but, also, covering decision trees and clustering), and then moves on to genetic/evolutionary algorithms and genetic programming, presenting them as a stochastic search technique that can be used for a variety of optimization problems. Finally, hybrid algorithms are presented that combine the last two technologies in order to alleviate their disadvantages and enforce their advantages.

Considering combinations of the above mentioned learning outcomes, after completing PLI31, a student will be able:

- to streamline problem solving by selecting a suitable representation for the state space and by applying fundamental search algorithms (exhaustive search, heuristic search)
- to represent knowledge in predicate logic and to convert it to a form that can be submitted to reasoning via resolution
- to solve a search/optimization problem using genetic algorithms, by suitably selecting a representation and some genetic operators
- to experimentally decide on the suitable architecture of a neural network to solve a classification/prediction problem
- to use the proper programming tools/environments for implementing all techniques mentioned above
- to combine representation, search, prediction and reasoning techniques towards developing systems that implement hybrid approaches

Besides the theoretical treatment, students are also introduced to a variety of systems and problems that can be used for a hands-on approach to the subject, ultimately aiming to show that any problem should be viewed as being suitable to be attacked from a variety of angles, and sometimes by a combination of techniques.

Learning Outcomes: After completing PLI31/INF31 a student will be able:

Knowledge

- Decide if a problem can be cast as a search problem.
- Describe the terminology of the machine learning domain.

- Identify artificial neural networks and decision trees as fundamental machine learning techniques.

Comprehension

- Understand simple Prolog programs and simple Prolog constructs.
- Be able to use recursion and lists in logic programming.
- Understand the differences between blind and informed search algorithms.

Application

- Write a Prolog program, submit queries and understand the results.
- Use natural language to explain sentences in propositional or predicate logic.
- Apply a search algorithm to a given search space.
- Apply machine learning algorithms to various data sets using the WEKA software.
- Apply the k-means algorithm to any data set.

Analysis

- Explain how a simple Prolog program works.
- Formulate search problems by defining state spaces, start and goal states, and state transition operators.
- Analyze a data set identifying features/attributes and classes, towards applying a machine learning algorithm.

Synthesis

- Describe a world using propositional and/or predicate logic and apply inferences.
- Use Prolog for logic programming tasks.
- Construct a heuristic function for a search problem.
- Construct an evaluation function for a two-player game.
- Construct a fitness function for a genetic algorithm.

Evaluation

- Judge whether a simple Prolog program is fit for purpose for a specific problem and be able to suggest simple corrective measures.
- Compare search algorithms in a set of problems.
- Evaluate a machine learning algorithm or a machine learning model on a data set by using suitable metrics.

Subjects covered:

- Artificial intelligence and expert systems
- Neural networks and applications
- Genetic algorithms and applications

Teaching Method: Distance education with five Group Counseling Meetings (OSS) during the academic year on weekends.

Evaluation: Students are assigned to submit four (4) written assignments during the academic year. The average grade of the four (4) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.
The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the four (4) assignments and (b) at least three (3) of the four (4) written assignments have been submitted.

PLI LABII Digital Systems Laboratory Course

ECTS Credit Points: 6

Module Type: Compulsory

Year: 3rd

Language: Greek

Prerequisite Module: The second cycle of studies is offered in the third year. The choice of PLI Lab II is allowed only, if the student has completed in previous years or will complete in the current year (simultaneously with it) at least the PLI21 module. To enroll in the second cycle, prior enrollment in the first cycle of studies is mandatory.

General description: The purpose of the PLI Lab II module, which is a continuation of PLI Lab I, is to introduce the student to computer architecture by designing computer hardware using the VHDL hardware description language. The structure of the Central Processing Unit, the input and the input-output modes of data are the topics discussed in the first part of the section. In the second part, students deal with Microprocessors and their programming in assembly language and higher level C language.

Learning Outcomes

Upon successful completion of the course, the student will be able to:

- Understand the basic microprocessor design technologies
- Design simplified microprocessors using the high level VHDL hardware description language (VHSIC Hardware Description Language)
- Use effectively system design and simulation software tools to integrate and impement microprocessor systems on FPGAs
- Understand the basic principles of microprocessor programming
- Use effectively programming and simulation software tools of commercially available microprocessors
- Distinguish the basic building blocks of complex integrated microprocessor systems (System-on-Chip) using FPGA technology
- Use modern FPGA programming tools and design flows for microprocessor implementation and programming
- Use modern programming tools and flows of commercially available microcontrollers
- Implement microprocessor circuits on development boards equipped with integrated FPGAs by applying the appropriate computer programming tools

Subjects covered:

- Digital design
- Computer architecture
- Microprocessors

Teaching Method: Distance education with four Group Counseling Meetings (OSS) during the academic year on weekends.

Evaluation: The average of the grades of the two laboratory assignments is taken into account at 30% for the final grade. The grade of the second phase (laboratory examination) will be taken into account to the extent of 70% for the final grade.

The Laboratory Exercise takes place exclusively at the Digital Systems Laboratory in Patras and is completed within two (2) consecutive days.

PLI23 Telematics, Internets and Society

Module code: PLI23
ECTS Credit Points: 20
Module Type: Optional mandatory instead of PLI40, PLI42or PLI47
Year: 4th
Language: Greek
General description: The main purpose of Module is to acquaint students with the basic conceptual and technological versions of telematics services and internet technologies, to become familiar with the programming languages and to get acquainted with the programming techniques of web applications, as well as to study the social impact of Information and Communications Technology (ICT). The main purpose of the module is to understand the basic concepts of telematics networks, and the estimation of transmitted information, to become familiar with the concepts of data transmission / packets transmission in broadband networks, telematics networks' performance, with the concepts of information management taking into account the technical characteristics of telematics networks, the IP Addressing, to become familiar with the basic concepts of mobile telecommunication systems, the concepts of the offered traffic and the grade of service (GoS), the frequencies reuse etc. It also aims to become familiar with Internet technologies, HTTP protocol and understand the basics of user interaction with Internet pages, to become familiar with the performance of the HTTP protocol, as well as with Internet protocol analysis tools. Also, the module's main goal is the development of simple and advanced websites and portals, to be familiar with the programming languages and the programming techniques of web applications: HTML, CSS, Javascript, PHP, MySQL; to acquire the ability to judge and select the appropriate language / technology of web programming, to recognize the importance of authentication and authorized user access to a web application. Understanding and applying World Wide Web programming techniques using XML, DTD, DOM, XSL.
Learning Outcomes: On successful completion of the module, students will be able to,

- Explain and present the basic concepts of modern telematics networks and services.
- Analyze and design wireless and mobile (GSM, UMTSetc) networks.
- Explain the addressing schemes of the Internet.
- Distinguish the routing algorithms and protocols of the Internet.
- Associate telematics services with distributed object-oriented technology and service-oriented architecture.
- Utilize various web programming technologies and develop a web application.
- Gain the ability to judge and choose the appropriate language / technology of web programming.
- Recognize the importance of authenticating and authorizing users to access a World Wide Web application.
- Discuss the architecture of the World Wide Web (WWW).
- Compose methods of the HTTP protocol.
- Create simple WWW pages using HTML and CSS.

- Construct dynamic WWW applications by inserting client-side JavaScript) and server-side (PHP) scripts in HTML code.
- Integrate server-side scripting (PHP) with Data Bases (MySQL).
- Design data descriptions in the WWW with XML.
- Transform XML descriptions by using XSL.
- Measure and evaluate the performance of Internet and WWW.
- Analyze caching and proxy techniques in the WWW.
- Apply web application programming techniques using XML, DTD, DOM, XSL.
- Explain searching and security mechanisms of the WWW.
- Discuss the increasing and diversifying social impact of Information and Communication Technologies.

Subjects covered:

- Telematics
- Internet – Web
- Computers and information society

Teaching Method: Distance education with five Group Counseling Meetings (OSS) during the academic year on weekends.

Evaluation: Students are assigned to submit four (4) written assignments during the academic year. The average grade of the four (4) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.
The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.
Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the four (4) assignments and (b) at least three (3) of the four (4) written assignments have been submitted.

PLI32 Linear Programming and Modeling

Module code: PLI32
ECTS Credit Points: 20
Module Type: Optional
Year: 4th
Language: Greek

Module general description: The purpose of this module is to provide knowledge and techniques for decision making. It focuses on Modeling Continuous and Discrete Systemsand Simulation, on developing mathematical models and designing algorithmic techniques to resolve them, like the simplex method and the method of ellipsoids.

Learning Outcomes: The module consists of three distinct subdivisions: 1) Modeling and Simulation, 2) Foundations of Linear Programming 3) Algorithms for Linear Programming and Game Theory. The learning outcomes include A) Knowledge and Understanding, B) Skills Application, C) Skills Analysis and Synthesis.

A) Knowledge and Understanding. Upon completion of this module, students will be able to:
Distinguish between simulation and emulation, detect whether an activity is deterministic or stochastic, determine the equations that describe a physical system knowing the laws that

govern it, construct a mathematical model, analyze a system through the model by changing the system parameters and identify the equilibrium points of a system.
Discern the difference between dependent and independent events, indicate the components of a Petri network, model a system with a Petri network, discriminate among simulation languages and choose a simulation language, distinguish methods of generating random and pseudorandom numbers, be aware of analysis methods of the simulation results, discern the difference between a collection of independent and dependent data.
Be aware of the simplex method and its theoretical foundations, recognize the existence of links between the variables of a linear programming problem, exploit the possibilities and results of the duality theory, determine the optimal solution of a problem from the optimal solution of the dual, know basic techniques of sensitivity analysis, the method of ellipsoids, and the interior point methods. Be able to describe the competition between two people with a game table and know basic elements of game theory.
B) Skills Application. Upon completion of the module, students will be able to:
Explain how the Time verification mechanisms are functioning during the simulation, correlate Flow Time Mechanisms with simulation methods, apply a method of generating random samples in order to produce samples that follow a particular distribution.
Formulate mathematical models for everyday life problems, apply the simplex method for solving general linear programming problems and identify the best alternatives when available.
-Build a linear programming model, implement advanced techniques for the identification and analysis of the solution of linear programming problems, apply techniques that prevent the possibility of cycling of the simplex method and use the ellipsoid method for solving linear programming problems.
C) Skills Analysis and Synthesis. Upon completion of the module, students will be able to:
Model a system with a petri network, analyze a system through the model by changing system parameters, and write simulation programs in GPSS.

- Use sensitivity analysis techniques and parameterized programming models by examining the behavior of the optimal solution of a problem.
- Use driving rules for variables estimation, which are incorporated as alternatives to commercial codes increasing in this way the computational speed of the simplex method, develop games by regulating competition between two or more players on the basis of rational criteria.

Subjects covered:

- Modeling and simulation
- Linear programming foundations
- Linear programming and game theory

Teaching Method: Distance education with five Group Counseling Meetings (OSS) during the academic year on weekends.
Evaluation: Students are assigned to submit four (4) written assignments during the academic year. The average grade of the four (4) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the four (4) assignments and (b) at least three (3) of the four (4) written assignments have been submitted.

PLI35 Computer Systems Security

Module code: PLI35

ECTS Credit Points: 20

Module Type: Optional

Year: 4th

Language: Greek

Learning Outcomes:

Computer Security

Upon completion of this course, students will be able to:

- Understand the terminology of this area
- Understand operating system security issues
- Develop and manage access control methods
- Protect an information system from malware attacks
- Understand and utilize risk assessment methods
- Develop an information system Security Plan
- Understand the legal aspects of personal data protection

Network Security

Upon completion of this course, students will be able to:

- Understand the terminology of this area
- Understand the OSI network security architecture
- Manage Internet security issues
- Develop security methods at the application level
- Manage selected application security systems
- Understand the legal aspects of protection of data communications

Cryptography

Upon completion of this course, students will be able to:

- Understand the terminology of this area
- Understand the essential mathematical background
- To understand the pros and cons of modern cryptosystems
- Manage a cryptosystem
- Utilize digital signatures
- Understand the legal aspects of using cryptosystems

Subjects covered:

- Computer security
- Network security
- Cryptography

Teaching Method: Distance education with five Group Counseling Meetings (OSS) during the academic year on weekends.

Evaluation: Students are assigned to submit four (4) written assignments during the academic year. The average grade of the four (4) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.
The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.
Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the four (4) assignments and (b) at least three (3) of the four (4) written assignments have been submitted.

PLI36 Advanced Networks and Services

Module code: PLI36
ECTS Credit Points: 20
Module Type: Optional
Year: 4th
Language: Greek
Module general description: PLI36 offers both basic and advanced knowledge of networks and services related to three main axes: The first axis focuses on the pure network part, as illustrated by the IP and TCP protocols. In this context, the offered knowledge covers Ethernet and operating structural principles, network interconnection with switches and routers, IP packet analysis, basic concepts of partitioning and addressing, IPv6 and IPsec protocols, processes and of basic routing algorithms (such as Bellman-Ford and Dijkstra), intra-sectoral (RIP and OSPF) and cross-sectoral routing (BGP). The second axis deals with network design issues starting with network types, basic architectures and corresponding design tools for loss and latency analysis, the M / M /, M / G / 1, and Erlang models, the basic graph algorithms, bridging, minimum shortest tree, shortest path, and flow capacity allocation. The third axis extends knowledge beyond IP networks to other types of networks and services, with an emphasis on photonics, wireless, mobile and satellite networks. Moreover, it covers broader issues related to the development tools for networks and telecommunications services. The above three axes are accompanied by practical training in appropriate open source tools that complement the theoretical knowledge. **Learning Outcomes**: The first pilar refers to a generic networks knowledge consisting in:

- IP and TCP networking protocols
- Ethernet networks
- Interconnection of networks with switches and routers
- IP packet analysis focusing on the concepts of segmentation and addressing.
- IPv6 and IPsec protocols.
- Basic procedures and the basic routing algorithms (such as Bellman – Ford and Dijkstra), intra-sectoral (RIP and OSPF) and cross-sectoral routing (BGP).

Regarding the second pila of basic network design, the students:

- will know how to utilize the different types of networks, the basic network architectures and the corresponding design tools.
- will know the basic network analysis captured by M/M/, M/G/1 and Erlang models.
- will understand concepts such as bridging, minimum overlapping tree, shortest path and capacity allocation based on flows.

With the successful completion of the third axis, i.e., advance network beyond IP design and services, the students:

- will acquire knowledge about photonics, wireless, mobile and satellite networks.
- will gain knowledge about services application frameworks.

It is important to note that the three pillars of theoretical background is complemented by learning how to handle appropriate open source tools related with network design and analysis.

Subjects covered:

- Computer Networks II
- New directions in networks and services
- Network design issues

Teaching Method: Distance education with five Group Counseling Meetings (OSS) during the academic year on weekends.

Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

PLI37 Informatics and Education

Module code: PLI37

ECTS Credit Points: 20

Module Type: Optional

Year: 4th

Language: Greek

Module general description: The purpose of this thematic area is to explore the issue of the integration of Information Communication Technologies in education. The main topics which analyze and discuss this thematic area consist of: computer-assisted learning, learning theories, educational software, open learning environments, computer science in education, teaching computer science, programming as a learning tool in education, educational software, tools for developing educational models, evaluation of educational software, prototyping, and quality control.

Learning Outcomes:

PLI-37–I Didactics of Informatics

a) On successful completion of the study of the first volume students will know:

- the role of Informatics in Education
- the role of Informatics in Greek Education
- advanced concepts of Didactics of Informatics (learning structural and object oriented programming, psychology of programming)
- the role informatics a sa subject matter in education

- specific issues relative to the Didactics of Information focused on structural and object oriented programming

b) On successful completion of the study of the first volume students will know:

- the role of Informatics as a cognitive discipline in alignment with the principles of pedagogy
- the pedagogical and didactical approaches and principles of Informatics and ICT at all levels of an education system

c) On successful completion of the study of the first volume students will know:

- design learning activities and educational scenarios in order to teach informatics as a subject matter
- use appropriate educational software in the teaching of informatics
- apply and evaluate learning activities and educational scenarios into teach informatics as a subject matter

PLI-37–II Informatics in Education

a) On successful completion of the study of the second volume students will know:

- the pedagogical models and approaches concerning the introduction of Information and Communication Technologies in Education
- the evolution of Informatics in Education as different phases
- the Learning Theories (behaviorism, constructivism, socio-cultural theories activity theory) and Information and Communication Technologies (ICT)
- the role of Information and Communication Technologies in teaching and learning (teaching machines, computer assisted learning, microworlds, multimedia and hypermedia learning, virtual reality, e-learning, simulations, modelling, Logo, educational robotics, edutainment).
- the learning theories and instructional strategies integrated with Information and Communication Technologies(ICT)
- the basic principles of communication and interaction between the humans and the computer
- the basic principles of design and evaluation of the education software

b) On successful completion of the study of the second volume students will know:

- the concept of educational software and its usefulness in the educational process
- the concept of open-ended computing environment and its usefulness in the teaching and learning process
- theoretical issues and principles of educational software: principles of instructional design and evaluation of educational software

c) On successful completion of the study of the second volume students will know:

- use appropriate educational software in teaching subjects in various learning areas in primary and secondary education
- use e-learning and distance learning environments in teaching and learning
- consider on the educational applications of the Information and Communications Technologies (ICT)
- design learning activities and educational scenarios for teaching and learning in the curricula of primary and secondary education
- design learning activities with e–learning environments

PLI-37–III Design of Educational Software

a) On successful completion of the study of the third volume students will know:

- the principles of design educational software
- the principles of design interfaces and navigation, content and interaction
- the models for the development of education software
- the tools for the development of education software
- issues related to digitalization of sound, image and video
- issue related to documentation of software
- the principles applied for the evaluation of software
- the principles applied for the pedagogical use of the software
- the issue related to the technological evaluation of the software
- the basic principles related to the qualitative assurance of the educational software

b) On successful completion of the study of the third volume students will know:

- the purpose of designing educational software
- the purpose of evaluating educational software
- the purpose of quality control and assurance of educational software

c) On successful completion of the study of the third volume students will know:

- design multimedia materials for educational use
- design simple educational applications e–learning
- use e-learning tools to design distance learning applications
- develop distance and e-learning applications to teach informatics
- evaluate educational software
- evaluate e–learning environments
- evaluate distance learning applications
- apply quantitative and qualitative methods, technics and tools for the evaluation of educational software

Subjects covered:

- Didactics of ICT
- ICT and Education
- Design of Educational Software

Teaching Method: Distance education with five Contact Sessions held at weekends during the academic year.

Evaluation: Students are assigned to submit four (4) written assignments during the academic year. The average grade of the four (4) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the four (4) assignments and (b) at least three (3) of the four (4) written assignments have been submitted.

PLI40 Project Development in Software Topics

Module code: PLI40

ECTS Credit Points: 20

Module Type: Optional mandatory instead of PLI23, PLI42 or PLI47
Year: 4th
Language: Greek
Module general description: PLI40, as it is implemented during the current academic year, includes the development of a Graduate Thesis (G.T.), which deals with solving, at theoretical and applied level, one or more problems that are related to the sciences and technologies of Informatics and Telecommunications. Therefore, PLI40, within the framework of the thesis, provides the opportunity for synthesis and utilization of the knowledge acquired during the studies. The scientific responsibility for the development of the thesis is assigned to a three-member Judgment Committee (J.C.), one member of which is responsible for supervising and supporting the student (Supervisor), in accordance with the prevailing ethics and practice in Computer Science and respecting the principles of Open and Distance Education as well as of Adult Education.
Learning Outcomes: Upon completing this module, the students will be able to:

- Analyze a complex problem by identifying the basic skills and tools that are necessary for problem solving.
- Design the actions that lead to the solution of the problem, incorporating good practices and composing skills from different scientific fields.
- Implement, evaluate and improve the solution of the problem.
- Incorporate and apply a structured, module and resit methodology of problem solving.
- Have an easy going cooperation with the Supervisor and the members of the JC, by showing responsibility and building up communication skills.
- Write a concise Thesis that includes the analysis of the problem, the methodology used and the produced results.
- Defend publicly their Thesis, answering to relative questions.

For the successful realization of the Thesis, it is suggested to incorporate a four phase methodology: conception, processing, development, transition. At the end of each phase the student has to submit an essay to the JC and is evaluated by the Supervisor.
Subjects covered:

- Compilers
- Databases
- Operating systems

Teaching Method: Distance education including five Group Consultation Meetings (GCM) during the academic year on weekends.
Evaluation: Students are obliged to carry out 4 written assignments in Greek, during the academic year, which are the parts of the Thesis. The average grade of the assignments participates in forming the final grade of the Thesis by 30%, if the thesis is approved for final examination-presentation, and there is a pass grade in the final examination-presentation. The grade of the final examination-presentation, which takes place in front of a three-member committee in a special meeting, participates by the remaining 70% in forming the final grade.

PLI42 Special Issues in Software Engineering

Module code: PLI42

ECTS Credit Points: 20
Module Type: Optional mandatory instead of PLI23, PLI40, PLI47
Year: 4th
Language: Greek
General Module Description: The aim of the course is to offer advanced knowledge and skills related to Software Engineering (Software Technology). In some aspects, it is a continuation of the course PLI11 and to a lesser extent of the course PLI24, especially with respect to the topics described in the book "Software Technology II".
Learning Outcomes:
FORMAL SPECIFICATIONS
Upon successful completion of the module, the student will be able to:

- Describe and explain the term 'software specifications'.
- Reference three categories of specifications depending on the degree of formality: formal, semi-formal and non formal.
- Indicate the major semi-formal specification production techniques.
- State the features of formal specifications' languages
- Have background knowledge on the mathematical tools that are the basis for formal specifications' languages, such as the propositional calculus, the predicate calculus, logic functions and the set theory.
- Explain and apply the axiomatic and algebraic specifications to describe a piece of software and its functions using equations, recurrence relations and regular expressions.
- Write and interpret Z schemata, as well as basic symbols and operators
- Specify using Z schemata the invariance or the change of a software module state, operations, error handling procedures and data manipulation functions.
- Create complex shapes using the Z notation language and specify complex software operations using functions, sequences and multi-sets.
- Give the formal definition of Petri nets and describe their basic concepts, rules and properties.
- Identify and design Petri nets of three different categories: treaty-event, position-transition and networks of discrete items.
- Use effectively tools for designing Petri nets and their practical application.
- Overturn myths about the application of formal specifications.
- Enumerate and apply the 10 commandments of proper practical application of formal techniques.

SOFTWARE VERIFICATION AND VALIDATION
Upon successful completion of the module, the student will be able to:

- Discern software verification and validation (V&V) activities and understand their position in the software lifecycle.
- Discern the static informal V&V techniques from the dynamic informal V&V techniques
  Describe the static V&V techniques (static analysis, walkthrough, review, and more) and know their objectives, application points and the respective advantages of each technique.

- Describe and explain the three phases of testing: unit testing, integration testing and validation testing.
- Explain and effectively apply the most important techniques for designing test cases for the functional testing of software (black box testing) such as: equivalence partitioning, boundary value analysis, cause-effect graph.
- Explain and effectively apply the most important techniques for designing test cases for the structural testing of software (white box testing) such as: basic path testing, loop testing.
- Explain and effectively apply the most important techniques for designing test cases for testing the interfaces between the components that make up a software system
- Know the most important issues for the practical application of various software testing techniques, such as top-down integration testing and bottom-up, alpha and beta testing, performance testing, recovery testing, and more.
- Explain and effectively apply the most important debugging methods following a successful testing phase in order to correct the identified bugs, such as brute force techniques, backtracking and techniques for locating the cause of the bug.
- Design and apply performance testing (load & stress testing) for multi-user applications and web applications in particular.

SOFTWARE MANAGEMENT AND SOFTWARE QUALITY

Upon successful completion of the module, the student will be able to:

- Know what software quality is and how it is assured.
- Discern the differences in the process of software quality assurance compared to other products.
- Know the prevalent models of software quality assurance and effectively implement the ISO9126 standard.
- Know what are the internal and external software quality metrics, which is the procedure of measuring them and to what extent they are interrelated.
- Know and effectively apply the Halstead metrics and interpret the meaning of the results.
- Know the fundamental problem and objectives of the Human Computer Interaction field, as well as the basic interaction modelling theories (such as the human processor model, the keystroke level model, Fitts' Law, Hick-Hyman Law and Power Law of Practice).
- Know and effectively apply the most widely used evaluation methods (heuristic evaluation, cognitive walkthrough, user observation, questionnaires, performance measurement).
- Know and effectively apply the basic techniques for collecting, analysing and interpreting quantitative data in the context of the usability evaluation of an interactive application.
- Select the appropriate combination of usability evaluation methods depending on the type of the interactive application and the stage of its development.

Subjects covered:

- Formal specifications
- Verification and Validation
- Software management and software quality

Teaching Method: Distance education with five Group Counseling Meetings (OSS) during the academic year on weekends.

Evaluation: Students are assigned to submit four (4) written assignments during the academic year. The average grade of the four (4) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.
The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.
Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the four (4) assignments and (b) at least three (3) of the four (4) written assignments have been submitted.

PLI44 Signals and Image Processing

Module code: PLI44
ECTS Credit Points: 20
Module Type: Optional
Year: 4th
Language: Greek
General Description: The main objective of the module is to introduce the students in the fields of signals and their processing, which are fundamental for a large number of areas involving acquisition, processing, storage and transmission of information. In volume A, the notions of signals and systems and the related fundamental mathematical tools are presented (Fourier and Laplace transforms). Volume B focuses on digital signal and image processing, the discrete Fourier transform and the z transform in order to conclude with the design of digital filters. Also, an introduction to digital images is presented. In volume C, the processing of digital images is further described by highlighting image enhancement, segmentation through an introduction to pattern recognition with Bayesian classification.
Learning Outcomes:
On successful completion of this module, students will be able to:

- Understand basic principles of signals and systems; of fundamental transforms (Fourier, Laplace and Z); of convolution, sampling, frequency response and of the basic principles of digital filters in one-dimensional signals and images.
- Interpret one- or multi-dimensional signals (speech, seismic, heart rate, etc), correctly implement the digitization of continuous-time signals, calculate the frequency content of signals and design basic filters for their processing.
- Apply simple digital image processing techniques, like image enhancement, image segmentation and image description
- Analyze and design continuous-time and discrete-time signal processing systems.

Subjects covered:

- Signals and systems
- Digital signal and image processing
- Image analysis and pattern recognition

Teaching Method: Distance education with five Group Counseling Meetings (OSS) during the academic year on weekends.
Evaluation: Students are assigned to submit four (4) written assignments during the academic year. The average grade of the four (4) written assignments, weighted at 30%, is taken into

consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.
The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.
Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the four (4) assignments and (b) at least three (3) of the four (4) written assignments have been submitted.

PLI47 Distributed Systems

Module code: PLI47
ECTS Credit Points: 20
Module Type: Optional mandatory instead of PLI23, PLI40 or PLI42
Year: 4th
Language: Greek
Module general description: The module PLI47 focuses on educating students on distributed systems issues. More specifically, the main target is knowledge acquisition on distributed file systems, code programming using threads and processes, distributed processing and data analysis using Hadoop MapReduce and Spark.
Learning Outcomes:
After completing PLI47 a student will be able:

- to analyze the way distributed systems are operating
- to use Big Data technologies for problem solving
- to analyze the operation of a distributed application
- to design and develop parallel applications using threads in the Java programming language
- to design and develop distributed applications using inter-process communication techniques in Java
- to design and develop distributed applications using the MapReduce programming model and Hadoop, using Java
- to design and develop distributed applications using the Spark distributed engine and the Scala programming language
- to analyze the way modern operating systems and database management systems are operating

Subjects covered:

- Distributed systems
- Operating systems II
- Distributed databases

Teaching Method: Distance education with five Group Counseling Meetings (OSS) during the academic year on weekends.
Evaluation: Students are assigned to submit four (4) written assignments during the academic year. The average grade of the four (4) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the four (4) assignments and (b) at least three (3) of the four (4) written assignments have been submitted.

FYE14 Introduction to Natural Sciences

Module code: FYE14

ECTS Credit Points: 20

Module Type: Optional

Year: 4th

Language: Greek

Learning Outcomes: By the end of this course, students will be able to:

- Describe using the kinematical equations the motion of a body in 1,2 and 3 dimensions, the Newton's laws and the laws for rotation, as well as the conservation laws of momentum, angular momentum and mechanical energy. To explain the pseudo forces in non-inertial frames of reference, and to perceive the concept of conservative forces and potential energy. To examine the motion in the gravitational field, the static equilibrium of a body, the two-body collision, the kinematics of variable-mass systems, the precession and the general motion of a rigid body. To solve complex problems using the free body diagram, to analyze the body's motion in independent coordinates, to combine the Newton laws to describe the general motion of a rigid body.
- Describe the simple harmonic motion, the general solution and the physical meaning of the parameters and constants of this solution, the functional form of the position, velocity and acceleration as well as the kinetic and potential energy of a simple harmonic oscillator system. To examine the harmonic motion of the simple, physical and torsional pendulum as well as of the double pendulum, to describe the oscillation motion with dumping and the forced oscillations with dumping.
- Describe the quantities of pressure and density of a fluid, the variation of pressure in a static fluid, the Pascal's and Archimedes' principles, the effects of surface tension of a fluid, to apply the continuity equation and the Bernoulli equation.
- Determine the electric potential and the electric field from a static charge distribution, to formulate the Gauss's law, the Ohm's law, the Kirchhoff rules, the Ampere's law, the Biot-Savart law, the Faraday law and the Lenz rule. To explain the motion of charges in electric and magnetic fields and the sources of the magnetic field. To solve circuit problems with resistors and capacitors, to explain the functionality of: the capacitor, the solenoid, the transformer and the electric generator, and to describe the main devices that are used in electrical measurements. To infer the completeness of Maxwell's equations for electromagnetism problems solving.

Subjects covered:

- Introduction to mathematics
- Introductory physics

Teaching Method: Distance education with six Contact Sessions held at weekends during the academic year.

Evaluation: Students are assigned to submit six (6) written assignments during the academic year. The average grade of the six (6) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the six (6) assignments and (b) at least four (4) of the six (6) written assignments have been submitted.

DEO10 Law and Administration

Module code: DEO10

ECTS Credit Points: 20

Module Type: Optional

Module characterization: Special Background

Year: 4th

Language: Greek

Module general description: The Module Unit 'LAW AND ADMINISTRATION' aims to familiarise students with the fundamental principles of Law and to introduce them to some of the core issues concerning public administration today.

Particularly, regarding Law it aims:

- To offer students a well-rounded view on fields covered by Law, its divisions as well their characteristics.
- To better educate them on two distinct fields of Law, namely Administrative Law and Commercial Law, as supplemented by Civil Law, as the most directly related to business administration and organizational management, which consists the subject of the broader Module of which this Module Unit is a part. Since modern Administration and entrepreneurship function in the context of european integration and is nationally prescribed by the Constitution, students become accustomed to the basic concepts and principles of constitutional and european law.

Accordingly, regarding Administration it aims:

- To present to students the dimension of labour relations, which are developed within the context of businesses and organizations.
- To familiarize them with the subject, the charasteristics and the principles of administrative actions and the administrative process.

Module Content: The general aim of Module Unit DEO10 is to provide students basic legal education and knowledge on fields of law that are more directly related to the subject of this Module, specifically:

- In the field of public law, with an emphasis on the constitutional and administrative organization of the State
- In the field of private law, with an emphasis on civil law, labour law and commercial law

- In the field of European Union (EU) Law, which co-defines all the fields of national law

The orientation of this Module is primarily theoretical, while it further aims in the development of student skills to apply in practice the offered theoretical knowledge on the existing positive law

Learning Outcomes: Upon successful completion of the module, students will have acquired knowledge and skills related to the subjects, as follows:

Upon the successful completion of the subject**: CONSTITUTIONAL LAW AND EUROPEAN UNION LAW** of the module DEO10, students will be able to:

- To know the meaning and the concept of a Constitution, as well as the rest sources of national law.
- To learn the fundamental principles of constitutional organization in Greece, the concept of the rule of law, and the principle of separation of powers.
- To learn about democracy, the principle of representation, electoral systems, political parties and the kinds of referenda.
- To know the competences of the Parliament, the Government, the President of the Democracy, the right to be elected, the obstacles and the legal position of Members of the Parliament, as well as the functioning of the parliamentary system.
- To learn about the primary and secondary European Union (EU) Law, the relationship between EU Law and national law, the principle of direct effect, the EU institutions and their competences, as well as the four fundamental freedoms of the European Union.
- To learn and use the basic methods and techniques of legal interpretation and argumentation.

Upon the successful completion of the subject: **ADMINISTRATIVE LAW** of the module DEO10, students will be able to:

- To learn the organization of the administrative system in Greece and the concept, the distinctions, the competences and the functioning of administrative organs.
- To learn the distinctions, the type, the basic elements (presumption of legality and enforceability) and the process of revocation of administrative actions.
- To learn the basic elements of the administrative process (consultative procedure, right to a prior hearing, administrative appeals, right of access to public documents).
- To learn the public law rules concerning the civil lialibity of the State.

Upon the successful completion of the subject: **CIVIL LAW AND LABOUR LAW of** the module DEO10, students will be able to:

- To learn the fundamental concepts of civil law, particularly its Fundamental Principles (natural and legal persons, kinds of transactions, conditions for performing a valid transaction, representation and authorisation) and Law of Obligations (regular and irregular development of obligations, major contracts regulated by the Greek Civil Code).
- To learn the fundamental concepts and principles of Individual Labour Law (formation of employment contract, employer-employee obligations, termination of employment contract – temporary and open-ended) and of Collective Labour Law (trade union freedom, trade unions, right to strike, collective labour agreements, mediation, arbitration)

Upon the successful completion of the subject: **COMMERCIAL LAW** of the module DEO10, students will be able to:

- To learn the fundamental concepts and principles of Commercial Law, like systems of defining commercial activity, distinctions of commercial acts in primary and secondary commercial ones, and the acquisition of commercial status.
- To learn specifically the fundamental elements of corporate law, competition law, industrial property law and law of securities.

Subjects covered:

- Constitutional Law and European Union Law
- Administrative Law
- Civil Law and Labour Law
- Commercial Law

Prerequisites: There are no prerequisites for this module.

Postgraduate Courses

Data Science and Machine Learning M.Sc.

Description

The study program "Data Science and Machine Learning" aims at delivering knowledge and developing skills on state-of-the-art methods and computing tools in Data Science and Machine Learning, in an accessible manner and by promoting active learning. DAMA focuses on hands-on computational applications of these methods, utilising data from all modern scientific fields (natural sciences, engineering, informatics, humanities and life sciences). Students will be hands-on practicing using programming tools and up-to-date computing tools. DAMA aims to combine knowledge of fundamental concepts and techniques with specific applications so that its graduates will be aptly skilled in today's labour and market.

Learning Outcomes

On completing DAMA, its graduates will have gained:

- An understanding of the basic principles and methods of Data Science and Machine Learning.
- An ability to use method to collect, manage and analyse large volumes of data (big data).
- An ability to analyse big data and use it for classification and prediction purposes.
- An ability to use machine learning methods and optimization algorithms for decision making.
- An ability to develop machine learning algorithms for specific applications in a variety of scientific fields.
- An ability to use advanced methods for presenting findings to ensure a most effective analysis and communication.
- An understanding of the social and ethical aspects of analysing and presenting data, of privacy protection, of data management taking into accounts the regulatory

framework governing such activities using computers, and of the protection of intellectual property.

Admission Requirements

The Post-graduate programme accepts graduates or higher institution diplomas of related disciplines holding a B2 certification in the English language. The programme is offered in English. The knowledge of an extra foreign language except the language of the programme and good computer-Internet skills would be useful for the successful participation in the programme.

It should be noted that for the successful completion of the programme knowledge of mathematics, probability, good use of computers and basic programming knowledge are required.

(*see Annex*)

Note: Holders of a degree or diploma of higher education means graduates of Greek Universities or Polytechnics or Higher School of Fine Arts or Higher School of Pedagogical and Technological Education or Higher Technological Educational Institutions (ATEI) or those who hold academically equivalent first cycle degrees from recognized foreign educational institutions with the degrees awarded by the Greek Higher Educational Institutions, in accordance with the provisions of article 304 of Law No. 4957/2022 (Government Gazette 141/21.07.2022, vol.)

Marking:For the evaluation of the application to the Postgraduate Studies Programme, it will be examined whether the candidate's institution of study is or may be included in the National Register of Recognised Higher Education Institutions of Foreign Countries and whether the candidate's degree is or may be included in the National Register of Types of Degrees of Recognised Institutions of Foreign Countries.The Hellenic Open University, if the degree is included in the list of article 307 of Law No. 4957/2022, must request a "Certificate of Place of Study", which is issued and sent by the foreign university. If the place of study or part of the studies is confirmed as the Greek territory, the degree is not recognized, unless the part of the studies that took place in the Greek territory is in a public higher education institution or in a recognized foreign educational institution within the meaning of paragraph b) of article 299 of Law No. 4957/2022.

Minimum study duration

2 academic years

ECTS credit points

120

Classification according to ISCED-2011 of UNESCO:

- Based on the level of Education: 7

Classification according to ISCED-2013 of UNESCO:

- Based on the field of Education: 0619: Information and Communication Technologies (ICTs) not elsewhere classified

Learning Material

Learning material used is mainly printed textbooks but also audiovisual and electronic learning material. The printed material is especially adapted to meet the needs and standards of distance education.
Chapters clearly state aims and objectives. Key concepts and expected learning outcomes. Self-assessment questions and exercise.
Alternative teaching material. To assist the students to a better understanding of the main teaching material. It utilizes, clarifies and enriches, if necessary, the already existing material.

Programme Language

The official language of the Program is English. The language in which all material content is presented, written assignments are submitted and related communication is carried out, is English.

Contact

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Course Structure

1st Year	
DAMA50 Mathematics for Machine Learning	(C[1], 30 ECTS)
DAMA51 Foundations in Computer Science	(C, 30 ECTS)
2nd Year	
DAMA60 Algorithmic Techniques and Systems for Data Science and Machine Learning	(C, 30 ECTS)
DAMA61 Numerical and Computational Techniques for Data Science and Machine Learning	(C, 30 ECTS)

Note:
C[1]: *Compulsory*

Module Selection Guidelines

The Programme is structured in two (2) academic years, which include four (4) compulsory modules. Students may choose one (1) to two (2) modules each academic year.
In the first year of studies if students wish to select one module; they can choose either the module DAMA50 or the module DAMA51. If they wish to select two modules they can choose both DAMA50 and DAMA51.
In the second year of studies if students wish to select one module; they can choose either the module DAMA60 or the module DAMA61. If they wish to select two modules they can choose both DAMA60 and DAMA61.
Each academic year students can choose from one (1) up to two (2) modules with full responsibilities.

During the module selection, all modules from previous academic years must be selected and consequently the selection of the modules of the next academic year can begin.
The minimum study duration of the Master's Degree Programme is two academic years.

Course Modules

DAMA50 Mathematics for Machine Learning

Module code: DAMA50
ECTS Credit Points: 30
Module Type: Compulsory
Year: 1st
Language: English
Module general description: The students will learn the basic mathematical tools necessary for Machine Learning (ML). These include basic concepts from linear algebra such as vectors, matrices, measures and operations with vectors and matrices. From calculus students will be exposed to functions of many real variables and the basic concept of the gradient and directional derivative to be applied in backpropagation ML algorithms. Very basic tools of probability, statistics and optimisation will be also introduced. Overall, a student without prior knowledge of these mathematical areas will be able to form a background in order to understand the ML techniques while and student with prior mathematical knowledge will be able to go much deeper in application of mathematics in ML. The mathematical study will be supplemented by computational software that will enable both analytical and numerical evaluations.
Learning Outcomes: After completing this module, students are expected to be able to:

- Recognize that the basic mathematical pillars for Machine Learning are Linear Algebra, Vector Calculus as well as Probability and Statistics and apply analytical and computational tools
- Formulate linear equations with many unknowns, detail matrix techniques for their solution.
- Summarize basic notions of vector spaces, use linear mappings for basis change.
- Use SageMath for solving linear algebra problems.
- Outline the concept of norm of a vector, inner products between two vectors and use it in obtaining the length of a vector.
- Explain what an orthonormal basis is in a vector space and describe the orthogonal complement of a subspace of the vector space.
- Outline the Gram-Schmidt orthogonalization procedure and derive an orthonormal basis for a vector space
- Use SageMath to perform basic vectror manipulations and perform Gram-Schmidt orthogonalization.
- Recall the definition of the trace and the determinant of a matrix and be able to calculate both by hand for simple matrices;, explain the concepts of eigenvalues and eigenvectors of square matrices.
- Describe how a matrix can be decomposed through a Cholesky decomposition and Singular Value Decomposition (SVD), and apply these methods to simple matrices.
- Use SageMath to implement matrix decompositions.

- Outline the concept of the gradient of a function of many variables and describe its geometric significance.
- Summarize the gradient of matrices and its geometric significance and calculate it explicitly in specific cases.
- Summarize the concept of backpropagation and use it in simple models of neural networks.
- Use SageMath for evaluating gradients and derivatives.
- Summarize the properties of single variate and multivariate Gaussian distribution, find marginals and conditionals as well as transformations of the Gaussian function.
- Focus on the binomial Bernoulli distribution and detail the Beta distribution.
- Summarize the conjugate priors connected through Bayes theorem.
- Explain what is sufficient statistics and outline the exponential family of distributions.
- Perform a change of random variables and find the new distribution function.
- Recall how to find minima of a single variable function.
- Summarize the procedure to find the minimum of a multivariate function using the gradient descent algorithm.
- Explain how to perform stochastic gradient descent and what are its advantages and limitations compared to the gradient descent method.
- Describe what are the Lagrange multipliers and explain how they are used in constrained optimization.
- Describe convex optimization.
- Use SageMath to find the minimum of a multivariate function and t to minimize a function with constraints.

Subjects covered:

- Linear Algebra
- Calculus
- Statistics and Probabilities

Prerequisites: There are no prerequisites for this module.

Evaluation: Students are assigned to submit six (6) written assignments during the academic year. The average grade of the six (6) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the six (6) assignments and (b) at least four (4) of the six (6) written assignments have been submitted.

Teaching Method: Distance education with five Contact Sessions held at weekends during the academic year.

DAMA51 Foundations in Computer Science

Module code: DAMA51

ECTS Credit Points: 30

Module Type: Compulsory

Year: 1st

Language: English

Module general description: The students will acquire a strong background as far as the algorithmic aspects and the computational requirements of data science and machine learning approaches are concerned. They will also develop an in depth understanding of the key technologies in data science and data analytics. After they will be presented with the fundamental concepts and principles that underlie the techniques for extracting knowledge from data, they will become acquainted with a number of practical considerations regarding the analysis and the interpretation of the data as well as assessing the quality of the input data and deriving insights from the results of mining the data. By the time the students will complete this module, they will be able to apply theory, languages algorithms and tools to solve real world problems while they will be proficient in interpreting and communicating findings to any kind of audience.

Learning Outcomes:

- Identify what data science is, and how it is related to statistics.
- List basic statistical analysis techniques.
- Indicate the roles and the skills of a data scientist.
- Name and recognize the steps of the data science process.
- Appraise the quality of input data.
- Accept that data science must be applied as an iterative process.
- Code simple algorithms in a high level programming language.
- Apply scraping and data munging.
- Use different data science software packages.
- Use appropriate methods of analysis to build highly understandable and accurate models.
- Assess the fit of a model to the data.
- Investigate potential issues in data and models.
- Interpret and communicate findings to an audience.
- Derive insights from the results of data analys.is
- Describe the terminology of the logic domain.
- Describe the terminology of the search domain.
- Describe the terminology of the decision trees domain.
- Understand the differences between propositional logic and predicate logic.
- Understand the differences between blind and informed search algorithms.
- Use natural language to explain sentences in propositional or predicate logic.
- Apply a search algorithm to a given search space, utilising constraints where applicable.
- Apply decision tree learning to various data sets using the WEKA software.
- Formulate search problems by defining state spaces, start and goal states, and state transition operators.
- Formulate game search problems.
- Analyze a data set identifying features/attributes and classes, towards applying a machine learning algorithm.
- Compare search algorithms in a set of problems.
- Evaluate a decision tree algorithm.
- Describe a world using propositional or predicate logic and apply inferences.
- Construct a heuristic function for a search problem.

Subjects covered:

- Data Structures, Algorithms and Databases
- Data Science Fundamentals
- Artificial Intelligence

Prerequisites: There are no prerequisites for this module.

Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

Teaching Method: Distance education with five Contact Sessions held at weekends during the academic year.

DAMA60 Algorithmic Techniques and Systems for Data Science and Machine Learning

Module code: DAMA60

ECTS Credit Points: 30

Module Type: Compulsory

Year: 2nd

Language: English

Module general description: The students will acquire a strong background on the data structures, the algorithmic aspects and the computational requirements of data mining and machine learning approaches for analyzing very large volumes of data. Among other topics, the module will emphasize on tools for the parallelization of different machine learning algorithms such as Hadoop and Map Reduce, Recommender Systems, Dimensionality Reduction, Finding Nearest Neighbors and Similar Sets, Clustering, Link Analysis, Association Rules and Frequent Itemsets. The students are also expected to build on the basic programming skills that they acquired in DAMA50 and DAMA51 and enhance their understanding of how to apply these skills on a project where they will be asked to work on real data sets and computational infrastructure through R and/or Python and Azure and/or KNIME.

Learning Outcomes: After completing this module, students are expected to be able to:

- Define the importance of Big Data in Machine Learning Applications
- Identify key characteristics of Big Data
- Compare serial and parallel processing techniques for mining data
- Define scalability and fault tolerance for machine learning algorithms
- Apply Big Data tools for solving real life problems
- Identify the Big Data ecosystem
- Describe the benefits of Cloud Computing for Big Data Applications
- Recognize the importance of Distributed File Systems and Map-Reduce
- Create parallel algorithms for mining large volumes of data
- Apply similarity search by using MinHashing and Locality Sensitive Hashing
- Describe Data Stream Processing

- Apply specialized algorithms for dealing with stream data
- Recognize the technology underlying the principles of search engine operation
- Use frequent itemset mining through Apriori and its improvements
- Describe algorithms for clustering Big Data
- Identify key problems for mining data from Web Applications
- Describe algorithms for analyzing social network graphs
- Apply techniques for obtaining the important properties of large datasets
- Use Machine Learning algorithms for mining large datasets

Subjects covered:

- Machine Learning and Data Mining
- Big Data Analytics
- Distributed Learning

Prerequisites: There are no prerequisites for this module.

Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

Teaching Method: Distance education with five Contact Sessions held at weekends during the academic year.

DAMA61 Numerical and Computational Techniques for Data Science and Machine Learning

Module code: DAMA61

ECTS Credit Points: 30

Module Type: Compulsory

Year: 2nd

Language: English

Module general description: The students will be able to implement basic machine learning methods in Jupyter notebooks, use TensorFlow and Keras, write and execute python code, utilize linear and nonlinear regression, support vector machines, perform model regularization, implement decision trees and ensemble learning in the form of random forests. The students are expected to know how to perform dimensionality reduction and use principal component analysis. The module will also focus on neural network methods and deep learning including fully connected deep networks, convolutional neural networks and autoencoders. Use of recurrent neural networks, physics informed neural networks and restricted Boltzmann machines completes the material of the module. DAMA-61 builds heavily on DAMA-50 and after its completion the students will be able to use the mathematical tools acquired in the latter in real world data problems.

Learning Outcomes: After completing this module, students are expected to be able to:

- Recognize and execute Jupyter notebooks with machine learning procedures
- Implement TensorFlow and Keras

- Define Linear and/or nonlinear regression variables in supervised learning mode
- Implement support vector machines for data classification
- Identify decision boundaries
- Create decision trees and implement random forests
- Execute Lasso and alternative regularizations
- Perform dimensionality as well as principal component analysis
- Use TensorFlow/Keras to introduce fully connected neural networks
- Perform Deep Learning training and hyperparameter testing
- Execute code for recurrent neural networks
- Apply convolutional neural networks to specific data sets
- Perform unsupervised learning by implementing autoencoders
- Apply reinforcement learning and physics informed machine learning
- Describe restricted Boltzmann machines

Subjects covered:

- Supervised/Unsupervised Learning
- Neural Networks and Deep Learning
- Optimization

Prerequisites: There are no prerequisites for this module.

Evaluation: Students are assigned to submit six (6) written assignments during the academic year. The average grade of the six (6) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the six (6) assignments and (b) at least four (4) of the six (6) written assignments have been submitted.

Teaching Method: Distance education with five Contact Sessions held at weekends during the academic year.

Quality Management and Technology M.Sc.

Description

The programme aims to provide participants with an integrated specialization in quality management and technology, so as to meet employment needs in industries, and to train engineers and other technicians who perform quality control in industries, health care and other services. Its graduate courses are designed to combine the study of statistical methods and other technical tools for the control and the improvement of quality with the study of quality systems and management principles.

Learning Outcomes

The MSc program on QUALITY MANAGEMENT and TECHNOLOGY prepares specialists with expertise in technology of quality control and assurance.

- Offers further training of specialized personnel, which will staff the quality control and quality assurance departments of manufacturing units, and the institutions of service providers of public and private sector.
- At the level of skills and abilities the graduates of the MSc program in QUALITY MANAGEMENT and TECHNOLOGY know:
- Statistical tools and measuring techniques for "in-line" and "off-line" quality control.
- Developing methodologies to improve quality, based on measurements made and targets set.
- The implementation of specialized techniques of statistical quality control.
- To design quality management techniques during the development and production of a product.
- The implementation of standards of quality assurance and total quality management, as well as models for quality costs and customer-supplier relationships.
- The implementation of environmental management systems, management of quality inspection systems (internal and external inspections), the organization of laboratory tests, checks and verifications and the study of reliability and maintenance systems.

Admission Requirements

The Post-graduate programme accepts graduates or higher institution diplomas of related disciplines. The programme is offered in Greek.
The knowledge of a foreign language and good computer-Internet skills would be useful for the successful participation in the programme.
Note:
Holders of a degree or diploma of higher education means graduates of Greek Universities or Polytechnics or Higher School of Fine Arts or Higher School of Pedagogical and Technological Education or Higher Technological Educational Institutions (ATEI) or those who hold academically equivalent first cycle degrees from recognized foreign educational institutions with the degrees awarded by the Greek Higher Educational Institutions, in accordance with the provisions of article 304 of Law No. 4957/2022 (Government Gazette 141/21.07.2022, vol.)
Marking:
For the evaluation of the application to the Postgraduate Studies Programme, it will be examined whether the candidate's institution of study is or may be included in the National Register of Recognised Higher Education Institutions of Foreign Countries and whether the candidate's degree is or may be included in the National Register of Types of Degrees of Recognised Institutions of Foreign Countries.
The Hellenic Open University, if the degree is included in the list of article 307 of Law No. 4957/2022, must request a "Certificate of Place of Study", which is issued and sent by the foreign university. If the place of study or part of the studies is confirmed as the Greek territory, the degree is not recognized, unless the part of the studies that took place in the Greek territory is in a public higher education institution or in a recognized foreign educational institution within the meaning of paragraph b) of article 299 of Law No. 4957/2022.

Minimum study duration

The minimum period of study for the programme structure without the selection of DIP40 is two (2) years and for the structure with the selection of DIP40 is three (3) years.

ECTS credit points

120

Classification according to ISCED-2011 of UNESCO:

- Based on the level of Education: 7

Classification according to ISCED-2013 of UNESCO:

- Based on the field of Education: 0710 Engineering and engineering trades

Learning Material

Learning material used is mainly printed textbooks but also audiovisual and electronic learning material. The printed material is especially adapted to meet the needs and standards of distance education.
Chapters clearly state aims and objectives. Key concepts and expected learning outcomes. Self-assessment questions and exercise.
Alternative teaching material. To assist the students to a better understanding of the main teaching material. It utilizes, clarifies and enriches, if necessary, the already existing material.

Contact

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Course Structure

A. The structure of the programme without the option of module DIP40
For university graduates who have taken four (4) semester courses in mathematics, it is not required to take module DIP40.
Attendance of these courses is documented by a copy of a detailed grade report or relevant certificate.

1st Year	
DIP50 Basic Tools and Methods for Quality Control	(C[1], 30 ECTS)
DIP51 Quality Planning and Organization	(C, 30 ECTS)
DIP40 Mathematics for Quality Assurance	Optional[2] (Undergraduate Module)
2nd Year	
DIP60 Advanced Tools and Methods for Quality Control	(C, 20 ECTS)
DIP61 Special Topics regarding Quality	(C, 20 ECTS)
DIPDE Thesis	(C, 20 ECTS)

Notes:

[1]C: Compulsory

[2] Optional: DIP40 is an undergraduate-level module and optional in structure A. It consists of two independent subjects, which students choose (either one or both subjects) in parallel with the first-year module(s) and in addition to the 4 compulsory modules of the programme, when they consider that there is a need to fulfill their knowledge. In no case, however, can the unit DIP40 replace any of the other four modules of the programme.

Module Selection Instructions

DIP60 can only be selected when the module DIP50 has been successfully completed in a previous academic year, regardless of the year of study in which it is chosen.
DIP61 can be chosen after successfully completing DIP50 and DIP51 or successfully completing one of them and registering in the other at the same time in the current academic year.
The Thesis can be chosen at the same time with modules DIP60 and DIP61.
It is clarified that, in order to complete the programme in two academic years, students must successfully complete two modules in the first year of study (according to the above instructions) and the last two modules in the second year in parallel with the Thesis.
The presentation of the Thesis will take place after the successful completion of all modules of the programme.
For the award of the post-graduate degree, the successful completion of DIP50, DIP51, DIP60, DIP61 modules and the presentation of the Thesis is mandatory.

B. The structure of the programme with the selection of module DIP40

For University graduates who have not attended four (4) semester courses in mathematics and Technological Educational Institute graduates, the attendance of module DIP40 is mandatory.

1st Year

DIP40 Mathematics for Quality Assurance	Compulsory (Undergraduate Module)
DIP51 Quality Planning and Organization	(C[1], 30 ECTS)
2nd Year	
DIP50 Basic Tools and Methods for Quality Control	(C, 30 ECTS)
DIP61 Special Topics regarding Quality	(C, 20 ECTS)
3rd Year	
DIP60 Advanced Tools and Methods for Quality Control	(C, 20 ECTS)
DIPDE Thesis	(C, 20 ECTS)

Notes:

[1]C: Compulsory

Module Selection Instructions:

Students are required to enroll in the first subject of DIP40 (Mathematics for Quality Assurance) during their first year of study. At the same time, they may, if they wish, to enroll in the second subject of module DIP40 in the first year, as well as in the module DIP51, but not in any other module of the curriculum. If they do not successfully complete the first

subject of DIP40, they will not be eligible to enroll in another modules of the curriculum in the subsequent years.
For the selection of the module DIP50, the previous successful completion of the first subject of module DIP40 (Mathematics for Quality Assurance) is required.
DIP61 can be chosen after successfully completing DIP50 and DIP51 or successfully completing one of them and registering in the other at the same time in the current academic year.
The Thesis can be chosen in parallel with the modules DIP60 and DIP61.
DIP60 can only be selected when module DIP50 has been successfully completed in a previous academic year, regardless of the year of study in which it is chosen.
During the module selection, all modules from previous academic years must be selected and consequently the selection of the modules of the next academic year can begin.
The presentation of the Thesis will take place after the successful completion of all the modules of the programme.
In order to obtain the post-graduate diploma, the successful completion of modules DIP 50, DIP 51, DIP 60, DIP 61 and the preparation of Thesis is required.

Course Modules

DIP40 Mathematics for Quality Assurance

Module code: DIP40
Module Type: Compulsory for students who have not attended four (4) semester courses of mathematics. Optional for students who have attended four (4) semester courses of mathematics.
Year: 1st
Language: Greek
Module general description: The main objective of the module is the completion of the student's knowledge in the field of Maths, to prepare them for the first year of his/her studies, and allow him/her to more easily follow the remaining modules of the "Quality Management and Engineering" Study Program.
Learning Outcomes: After completing this module, students are expected to be able to:

- basic knowledge of differential and integral calculus of one and two variables and can use this knowledge to find optimal solutions (maximum or minimum) of physical problems
- basic knowledge of ODEs
- basic knowledge of vector algebra (scalar and vector product) and can mathematically project vectors of physical quantities in specific directions and determine perpendicular directions to a given plane
- basic knowledge of linear algebra (matrix algebra) and solving linear systems that are the result of many physical problems
- has all the necessary mathematical background to follow without problems DIP 50 (basic methodology of statistics and basic techniques for quality control, assurance and improvement).

Subjects covered:

- Mathematics for Quality Assurance

- Mechanical Drawing

Prerequisites: DIP 40 is at an undergraduate level and optional in structure A. It consists of two independent subjects, which students choose (either one or both subjects) in parallel with the first (1st) year's unit(s) and in addition to the 4 compulsory modules of the programme, when they consider that there is a need to supplement their knowledge.

Students of structure B are required to enroll in the first subject of DIP 40 (Mathematics for Quality Assurance) during their first (1st) year of study. At the same time, they may, if they wish, to enroll in the second subject of DIP 40 during their first (1st) year, as well as in DIP 51, but definitely not in DIP 50.

If, however, they do not successfully complete the first subject of DIP 40, they will not be entitled to enroll in another module of the curriculum. Under no circumstances, however, can DIP 40 replace any of the other four modules in the curriculum.

Evaluation: Students are assigned to submit four (4) written assignments during the academic year. The average grade of the four (4) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the four (4) assignments and (b) at least three (3) of the four (4) written assignments have been submitted.

DIP50 Basic Tools and Methods for Quality Control

Module code: DIP50

ECTS Credit Points: 30

Module Type: Compulsory

Year: 1st

Language: Greek

Module general description: The main aim of DIP50 is to provide students with the theoretical and practical knowledge in basic statistical methodology and basic techniques for testing, assurance and improvement of quality control.

Learning Outcomes: After completing this module, students are expected to be able to,

- identify the basic elements of a probability model and use laws of the axiomatic theory of probability to find unconditional and conditional probabilities.
- describe univariate and bivariate probability distributions and calculate probabilities, moments, and descriptive measures for specified distributions.
- select appropriate probability models to describe the variability of measurable quality characteristics and calculate probabilities and percentiles of well-known distributions by means of formulae, tables or the Minitab statistical package.
- use descriptive measures and graphical procedures to perform exploratory data analysis.
- identify proper statistics and their corresponding sampling distributions for estimation and tests relating to means, proportions, and variances of performance characteristics.

- find confidence intervals and perform hypotheses tests in one and two-sample problems.
- apply simple and multiple linear regression analyses, correlation analysis and methods of selecting an appropriate model.
- distinguish the categories of measurement errors, apply the laws of propagation of random and systematic errors and estimate the variability due to repeatability, reproducibility, and the uncertainty of measurement.
- understand the function of measurement systems and measuring instruments, select an instrument based on its metrological characteristics and explain the process of calibration and the associated documents.
- apply the 7 main tools of statistical quality control, understand the application of 15 additional tools and select the appropriate tool for confronting specific problems.
- select, construct, and interpret the proper control chart to monitor a process.
- design plans of acceptance sampling for attributes, interpret characteristic curves and apply appropriate standards (MIL-STD-105E, ANSI/ASQC Z1.4, etc).
- determine sampling plans for variables and apply the system MIL-STD-414 (ANSI/ASQC Z1.9).

Subjects covered:

- Probability and Statistics
- Quality Control Techniques
- Statistical Quality Control & Sampling

Prerequisites: There are no prerequisite courses for this unit under structure A. DIP40 for structure B.

Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

DIP51 Quality Planning and Organization

Module code: DIP51

ECTS Credit Points: 30

Module Type: Compulsory

Year: 1st

Language: Greek

Module general description: The main purpose of this thematic unit is to equip the student with theoretical and practical training in quality systems and in the basic methodology and techniques of quality organization and management.

Learning Outcomes: After completing this module, students are expected to be able to:

- understand the term Total Quality Control (TQC), the parameters affecting it, and how it can be applied in practice.
- plan and develop the product / service quality[(including the failure mode and effects analysis (FMEA)], and design the production processes involved.
- have a good background on total quality management (TQM) and the various currently applied Quality Assurance Systems (similarities, differences) and total quality prizes (EU, USA, Japan).
- apply the most commonly used tools and techniques (brainstorming, affinity diagram, tree diagram, cause and effect diagram, benchmarking, control diagram, histogram, Pareto diagram, scatter diagram) for quality improvement.
- have a solid knowledge of two of the most important and successful ISO systems; that is ISO 9001: 2008 and ISO 22000:2005 for product quality and food quality and safety, respectively.
- measure, calculate, analyze and evaluate the quality cost by taking into account the occurrence of various failures of different origin.
- understand and apply the various techniques for optimizing the quality cost (cost reduction in conjunction with quality improvement).
- apply a program toward suppliers' assurance, assessment, and certification.
- understand the importance of product safety and consumer protection within the legislative frame of EU.
- comply with the EU legislative frame for Quality development, CE labeling, and safe food trade (HACCP, ISO 22000).

Subjects covered:

- Quality Planning
- Quality Management
- Total Quality
- Supplier - Customer Relationships
- Quality Cost

Prerequisites: There are no prerequisite courses

Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

DIP60 Advanced Tools and Methods for Quality Control

Module code: DIP60

ECTS Credit Points: 20

Module Type: Compulsory

Year: 2nd

Language: Greek

Module general description: The main objective of the module is for students to apply advanced statistical tools to real problems. Initially, students will learn the basic tools of Statistical Process Control, with special emphasis on control charts. In addition, experimental design is introduced and methodologies for analyzing one or more factors in randomized complete group and Latin square designs are studied. Finally, they are studied techniques for the out-of-order quality improvement of a process, giving particular importance to Taguchi methodologies. It should be noted that all of the above is implemented using an appropriate statistical package.

Learning Outcomes: After completing this module, students are expected to be able to:

- distinguish between random (common or usual) and non-random (special) causes of variability in a production process.
- to understand how Statistical Process Control can be used in order to monitor and control a production process, with the ultimate goal of improving its performance.
- apply quality control tools (such as control charts for variables and properties and/or capability indicators) in a production process, aiming to achieve optimal performance (minimization of variability, stability of mean level).
- understand and apply the six-sigma standard in order to strive for continuous process improvement.
- identify experiments with one factor or with multiple factors, as well as experiments grouped by context variables.
- use full or fractional factorial experiments to analyze experiments containing factors with two or three levels.
- apply Taguchi's loss function in order to produce products of the best possible quality.
- implement Taguchi's philosophy of off-line (out-of-process) quality control – selecting appropriate internal and external design tables in order to analyze quality-related measures , in order to determine the appropriate production process conditions so that the process and/or the final product is made robust against the effects of uncontrollable (noise) factors
- use experimental design theory (one or two way ANOVA, Latin squares etc) to investigate the effects of one or more factors over a response variable (characteristic of interest).
- discriminate between random and fixed effects models. Explain when each of them is applicable in a real data problem
- exploit Taguchi’s lists of orthogonal arrays for setting up economical designs for experiments requiring the study of many multi-level factors.
- understand and apply response surface methodology for modelling the shape of a process’ or a product’s response.
- apply the methods of Evolutionary Operation

Subjects covered:

- Statistical Process Control
- Design and Analysis of Experiments
- Continuous Quality Improvement Processes and Techniques

Prerequisites: DIP50

Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.
The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.
Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

DIP61 Special Topics regarding Quality

Module code: DIP61
ECTS Credit Points: 20
Module Type: Compulsory
Year: 2nd
Language: Greek
Module general description: The main objective of this thematic unit is to enrich the knowledge of students in specific quality topics, such as environmental management systems, quality systems inspection and the organization of laboratories, controls and tests, but also in terms of reliability and maintenance, and to be able to conduct studies with the corresponding available tools.
Curriculum of the Module: The unit DIP 61 "Special Topics regarding Quality" covers four thematic areas in 4 volumes listed below:

Volume A: Environmental Management Systems
Volume 1 covers issues related to Environmental Problems and the Legislative Framework (Greece, Europe, International Community) and analyses the Major Environmental Problems such as ozone depletion, greenhouse gases, biodiversity loss, air pollution, water pollution, etc. The concepts of Environmental Management are also analysed, a history of the development of Environmental Management Systems is given, the European approach EMAS is described, and Responsible Care is described. The main part is the presentation and analysis of the 14001 standard (Requirements of the standard, Comparison of 14001 and 9001 standards). Finally, the Community Eco-Management and Audit Scheme – EMAS is presented, how EMS Certification is done and what is the role of environmental inspectors, Product Life Cycle Analysis (LCA), and the different Eco-labels.

Volume B: Quality Systems Inspection
Volume 2 essentially covers the issue of Quality Systems Inspections and focuses mainly on the ISO 9001:2008 standard. Basic concepts of quality are described and the requirements and paragraphs of the standard are presented and analysed. The main types and kinds of inspections are described, the process of planning and implementing the inspection is analysed, as well as the role of the inspector and the inspection team.

Volume C: Organization of laboratories, controls and tests

Volume 3 presents the basic concepts of measurement, metrology and control and testing laboratories. The emphasis is on the analysis of the ISO 17025:2005 standard (requirements of the standard, design and implementation of the standard). Also presented and analysed are the key measurement indicators and the definition of objectives in the implementation of ISO 17025:2005 in Testing and Inspection laboratories.

Volume D: Reliability and Maintenance

Volume 4 consists of two thematic areas, Reliability and Maintenance. The first part presents the basic concepts/definitions of reliability and discusses the concept of failure. The characteristics and techniques of reliability assessment are discussed in detail, and emphasis is also placed on the use of reliability data in risk analysis. The second part presents the basic concepts of maintenance and discusses its importance and significance. The systems and maintenance policies are then analysed and the second part concludes with a presentation and analysis of Total Productive Maintenance (activity, results).

Learning Outcomes: On successful completion of the study of this thematic unit,

With the first part, students will be able to:

- perceive the importance and significance of Environmental Management in a company or organisation through the analysis of key environmental problems
- access and understand the legislative framework governing Environmental Management issues at national, European and international level
- understand and analyse the philosophy and content of the ISO 14001 environmental standard and will be able to study the results of its implementation
- to understand and apply the LCA methodology in real enterprises and organisations
- Finally, they will acquire knowledge about eco-labels and their practical contribution to environmental management

With the second part, students will be able to:

- acquire theoretical knowledge and the ability to interpret and evaluate the paragraphs of the ISO 9001 standard
- learn the types of inspections, identify good and bad practices in the inspection process through case studies
- compile compliance or non-compliance reports and evaluate the progress of the implementation of the standards in the company or organisation
- understand the role and dynamics of the quality inspector and his/her team in the implementation of Quality Management Systems

With the third part, students will be able to:

- understand the importance of measurement and recognise the functions of a control and testing laboratory
- understand the basic principles and requirements of traceability of measurements and the stages of the accreditation process
- understand the requirements of ISO 17052, and assess the criticality of meeting them
- draft procedures and documents of the EMS and to monitor and evaluate the progress of the implementation of the standard
- identify objectives and measurement indicators in the context of ISO 17052 and assess their contribution to improving the effectiveness of the standard

With the fourth and final part, students will be able to

- understand the importance of reliability and gain knowledge of its parameters
- understand the concept and types of failure through examples and applications
- become familiar with and use reliability measurement methods MTTF, FTA, RBD, using statistic packages such as Minitab
- handle and process reliability data and distinguish levels of reliability data
- recognise the difference between the concepts of risk and reliability through examples and applications
- understand the importance and significance of maintenance in quality improvement
- analyse and use important concepts such as downtime analysis, average repair time, etc. through examples
- design and evaluate maintenance policies and will be able to organise a maintenance department using the philosophy of Total Productive Maintenance

Subjects covered:

- Quality and the Environment
- Quality System Audits
- Organization of Calibration and Testing Laboratories
- Reliability and Maintenance

Prerequisites: DIP61 can be chosen after successfully completing DIP50 and DIP51 or successfully completing one of them and registering in the other at the same time in the current academic year.

Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

DIPDE Thesis

Module code: DIPDE

ECTS Credit Points: 20

Module Type: Compulsory

Year: 2nd / 3rd

Language: Greek

General Description: The research objects utilized in writing a thesis are harmoniously integrated into the main orientations of the program, that is, understanding the structure of Matter and the Universe and the Material Sciences and Devices.

The director of the program selects groups of related subjects, on the basis of which the prospective students submit a relevant proposal for elaboration. Subsequently, the Board of Directors (and correspondingly as above) designates the supervising member (First supervisor) and the second member of the Evaluation Committee for each submitted MDE

proposal if it meets the basic academic requirements. Then the first Supervisor, in collaboration with the students, finalizes the topic and the basic content of the MDE in the digital education area within the first month of preparation and gives the final approval.
Thesis subjects may be changed within the first month of writing. In such a case, a relevant request is submitted for approval to the S.P. Director, along with the necessary documentation, by the 1st Supervisor, with notification to the second member of the Examination Committee. In case of approval, the relevant administrative department must be informed.
In particular, the General Categories of subjects for the Master's Thesis are, presently, the following:

- Basic statistical tools for quality improvement
- Statistical process control
- Design of experiments, Taguchi methods for quality control and improvement
- Metrology, calibration, measurement, control and detection methods, reliability, maintenance, organization of calibration and control laboratories
- Quality management systems (ISO 9001), Audit, Total Quality Management, Design for quality
- Quality and Environment, Food safety management systems (HACCP, ISO 22000) and management systems in general.

The theory and practice used to further deepen the student's knowledge is based to some extent on the materials modules.
However, for further deepening and acquisition of specialized knowledge and skills, the student, in collaboration with the supervisor, studies work from the relevant literature. This process usually takes 2-3 months. Then the thesis prepared and is checked in its stages both by the supervisor and by a second evaluator.
Learning Outcomes: The students who will successfully complete the module:

- They will have obtained a deep knowledge of the subject of their study to the extent that they will be able to comfortably and fluently read and acquire information on cutting-edge research topics from publications in research journals of the respective research area.
- They will be able to conduct research studies based on a sample of companies/consumers and case studies.
- They will be able to analyze preliminary data or secondary data statistically.
- They will be able to reach conclusions based on the results of the study and propose specific practical implications

General Regulation for Preparing Graduate Dissertations in PC with an annual Module Correspondence
For more information regarding the Specifications – Useful Material for writing Master's Theses and uploading a Thesis at the H.O.U. Repository, you can go to the Digital Training Area **http://study.eap.gr** and especially to the Program of Studies section.
Prerequisites: The presentation of the Thesis takes place after the successful completion of the program's Course Modules.

Description

The aims of the course are to provide specialized knowledge on waste management techniques and purification processes and to develop understanding of the complex environmental systems, which are affected by waste disposal.

Learning Outcomes

They include the supply of specialized knowledge in the following subjects of waste management (wastewater, solid waste and air pollution): technologies of waste treatment, methodologies of reclamation, understanding the multicomplex structure and functions of the environment which is the final receptor of the wastes, acquiring knowledge relevant to the legislation of waste management for the protection of human health and of the environmental quality, selection of technologies for solving problems related to point pollution sources, planning and designing recycling systems, assessing the economic and environmental parameters of alternative waste treatment systems (mechanical separation, thermal methods with emphasis on incineration, biological methods such as composting and anaerobic digestion), and to compare alternative management scenarios which are based on these technologies. Also, knowledge will be offered in evaluating the natural environmental conditions, the impacts of the contaminants on human health, the methodologies for evaluation of environmental conditions, as well as for restoration and reclamation of the environment. Through the preparation of their thesis, the students must be capable of addressing practical aspects related to waste management in the (terrestrial and aqueous) environment and in the human societies.

Admission Requirements

The Post-graduate programme accepts graduates or higher institution diplomas of related disciplines. The programme is offered in Greek.
The knowledge of a foreign language and good computer-Internet skills would be useful for the successful participation in the programme.
Note:
Holders of a degree or diploma of higher education means graduates of Greek Universities or Polytechnics or Higher School of Fine Arts or Higher School of Pedagogical and Technological Education or Higher Technological Educational Institutions (ATEI) or those who hold academically equivalent first cycle degrees from recognized foreign educational institutions with the degrees awarded by the Greek Higher Educational Institutions, in accordance with the provisions of article 304 of Law No. 4957/2022 (Government Gazette 141/21.07.2022, vol.)
Marking:
For the evaluation of the application to the Postgraduate Studies Programme, it will be examined whether the candidate's institution of study is or may be included in the National Register of Recognised Higher Education Institutions of Foreign Countries and whether the candidate's degree is or may be included in the National Register of Types of Degrees of Recognised Institutions of Foreign Countries.

The Hellenic Open University, if the degree is included in the list of article 307 of Law No. 4957/2022, must request a "Certificate of Place of Study", which is issued and sent by the foreign university. If the place of study or part of the studies is confirmed as the Greek territory, the degree is not recognized, unless the part of the studies that took place in the Greek territory is in a public higher education institution or in a recognized foreign educational institution within the meaning of paragraph b) of article 299 of Law No. 4957/2022.

Minimum study duration

2 academic years

ECTS credit points

120

Classification according to ISCED-2011 of UNESCO

- Based on the level of Education: 7
- Based on the field of Education: 85 Environmental Protection

Classification according to ISCED-2013 of UNESCO

- Based on the field of Education: 0712 Environmental Protection and Technology

Learning Material

Learning material used is mainly printed textbooks but also audiovisual and electronic learning material. The printed material is especially adapted to meet the needs and standards of distance education.
Chapters clearly state aims and objectives. Key concepts and expected learning outcomes. Self-assessment questions and exercise.
Alternative teaching material. To assist the students to a better understanding of the main teaching material. It utilizes, clarifies and enriches, if necessary, the already existing material.

Contact

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Course Structure

1st Year	
DIA50 Natural Environment and Pollution	(C[1], 20ECTS)
DIA51 Solid Waste Management	(C, 20ECTS)
DIA60 Liquid Waste Management	(C, 20ECTS)
DIA61 Management Of Air Pollutants	(C, 20ECTS)
2nd Year	
DIA51 Solid Waste Management	(C, 20ECTS)
DIA60 Liquid Waste Management	(C, 20ECTS)

DIA61 Management Of Air Pollutants	(C, 20ECTS)
DIADE Postgraduate Thesis	(C, 40ECTS)

Note:

C[1]: Compulsory

Module Selection Instructions

Students in the 1st year of studies are encouraged to select up to three modules, if they have the necessary required time. In this case they have to select the module DIA50 (Natural Environment and Pollution) which is compulsory, while the second and third module can be chosen between the DIA51, DIA60 and DIA61. Students can choose the Postgraduate Thesis simultaneously with the last module, with the requirement that they have successfully completed the three modules.

It is clarified that in order to complete the postgraduate programme in two academic years, students should successfully complete during the first academic year three modules (according to the above instructions) and during the second year the last module simultaneously with the Postgraduate Thesis.

During the module selection, all modules from previous academic years must be selected and consequently the selection of the modules of the next academic year can begin.

The presentation of the Postgraduate Thesis takes place after the successful completion of the program's Modules.

To earn the Master's degree, students must successfully complete four modules and successfully complete and present their Postgraduate Thesis.

Course Modules

DIA50 Natural Environment and Pollution

Module code: DIA50

ECTS Credit Points: 20

Module Type: Compulsory

Year: 1st

Language: Greek

Module general description: The purpose of the thematic unit is the education in understanding of physical, chemical, biological and geological processes that take place in the terrestrial, marine and atmospheric environment in combination with the presence of pollutants, in assessing the quality of the environment and environmental conditions and in the assessment of impacts from the disposal of wastes in the environment.

- The soil environment as waste receiver (soil structure and characteristics, soil pollution, transport and degradation processes of pollutants, soil and underground pollution, groundwater quality).
- The marine and aquatic environment as waste receiver (marine pollution and pollutants, sources of marine pollution, pollutant classification and physicochemical properties, transport and degradation processes of pollutants in the marine environment, eutrophication, oil pollution, microplastic pollution).

- The atmosphere as waste receiver (the atmosphere: composition and physicochemical characteristics, pollutant classification and sources, dispersion of air pollutants in the atmosphere, transboundary transport of atmospheric pollution, chemistry of the atmosphere, troposphere and air pollutants, the behaviour of particles in the atmosphere, photochemical smog, ozone depletion, greenhouse effect, acid rain).
- Waste disposal and environmental impacts (impacts of gaseous and particulate emissions on the environment, impacts of organic microcontaminants (pesticides, etc.) and inorganic contaminants (heavy metals, nutrients, etc), pollution indicators, climate change, the greenhouse effect, sea-level rising, desertification, stratospheric ozone depletion, acid rain, effects-toxicity of pollutants and
- particles on living organisms. Impacts of wastes on land. Mechanisms of entry and pollution indicators. Surface water pollution. Soil pollution. Aquifer pollution. Impacts on biosocieties. Impacts on public health, impact assessment studies, risk assessment studies).

Learning Outcomes: Upon successful completion of the course, students should deepen their knowledge into :

- the understanding of the physical, chemical, biological and geological processes that take place in the terrestrial, sea and atmospheric environment in relation to the presence of pollutants.
- the assessment of the quality of the environment and the environmental conditions.
- the determination of the effects of waste disposal on the environment

Subjects covered:

- The terrestrial environment as a recipient of waste
- The marine environment as a recipient of waste
- The atmosphere as a recipient of waste
- Waste disposal and its effects on the environment

Prerequisites: There are no prerequisite courses.

Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

DIA51 Solid Waste Management

Module code: DIA51

ECTS Credit Points: 20

Module Type: Compulsory

Year: 1st/2nd

Language: Greek

Module general description: The purpose of the thematic unit is the acquisition of comprehensive knowledge of all issues related to Solid Waste Management. This includes gaining knowledge of relevant legislation, as well as of the alternative technologies that can be used for the optimum management of solid waste in order to protect public health and the environment. The thematic unit examines three types of waste: (a) non-hazardous solid waste, (b) hazardous waste and (c) agricultural waste. The first two categories concern both municipal and industrial waste depending on the risk they pose. The technologies are described and evaluated both in terms of technical and economic feasibility and in terms of environmental impact. By completing this Thematic Unit, students will be able to propose and evaluate alternative solid waste management scenarios regardless of their origin.

Learning Outcomes: With this thematic unit, students will gain a complete picture of the issues related to solid waste management. Specifically, they will be able to:

- Determine the quantitative and qualitative characteristics of solid waste produced by settlements as well as productive activities such as agriculture and mining activity.
- Get acquainted with the existing legislation, but also the way it is structured and its trends.
- Design the basic features of a solid waste collection system.
- Design the basic features of a recycling system.
- Design the basic features of a landfill site.
- Assess the economic and environmental parameters of alternative waste treatment systems (mechanical separation, thermal methods with emphasis on combustion, biological methods such as composting and anaerobic digestion) and compare alternative management scenarios based on these technologies.
- Assess construction and mining waste management issues.
- Assess special waste management issues (car tires, electronic and electric waste, oils, batteries, etc.).
- Assess the characteristics that render a waste hazardous (e.g. reactivity, corrosiveness, explosiveness, toxicity, radioactivity, etc.).
- Recommend hazardous waste management methods (e.g. stabilization/solidification).
- Propose methods for contaminated soils remediation.
- Propose methods of management of agricultural and livestock solid waste.
- Particular emphasis is placed on the possibility of utilizing solid waste for the production of energy and useful materials within the framework of the principles of a circular economy.

Subjects covered:

- Household and other non-hazardous wastes
- Hazardous waste
- Solid agricultural wastes

Prerequisites: There are no prerequisite courses.

Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

DIA60 Liquid Waste Management

Module code: DIA60

ECTS Credit Points: 20

Module Type: Compulsory

Year: 1st/2nd

Language: Greek

Module general description: The purpose of this thematic unit is the acquisition of comprehensive knowledge of issues related to Wastewater Management. After the successful completion of the three sections of the thematic unit on "Urban Wastewater", "Industrial Wastewater", and "Agricultural Wastewater", students will be able to understand: the qualitative characteristics of urban wastewater, the legislative framework referring to wastewater and environmental protection, pre-processing, primary-, secondary- and tertiary treatment of urban wastewater, the design of an urban wastewater treatment unit, the qualitative-quantitative characteristics of industrial wastewater, as well as the physical, chemical, biological processes of industrial wastewater treatment, ways and methodologies of disposal and reuse of urban and industrial wastewater, as well as of agricultural wastewater, wastewater from mining-metallurgical activities as well as the prevention of pollution from various industrial activities.

Learning Outcomes: After the successful completion of the three modules, the students will acquire the necessary knowledge and will be able to understand in depth

- the quality characteristics of municipal wastewater
- the legislative framework referring to wastewater and environmental protection
- pre-treatment, primary, secondary, tertiary treatment of municipal wastewater
- the design of an urban wastewater treatment plant
- the qualitative-quantitative characteristics of industrial wastewater, as well as the physical, chemical, biological treatment processes of industrial wastewater
- ways and methodologies of disposal and reuse of urban and industrial wastewater, as well as of agricultural wastewater
- wastewater from mining-metallurgical activity as well as pollution from various industrial activities.

Subjects covered:

- Urban wastewaters
- Industrial wastewaters
- Agricultural wastewaters

Prerequisites: There are no prerequisite courses.

Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

DIA61 MANAGEMENT OF AIR POLLUTANTS

Module code: DIA61

ECTS Credit Points: 20

Module Type: Compulsory

Year: 1st/2nd

Language: Greek

Module general description: The aim of the course is Education on:

- the determination of the sources and characteristics of atmospheric pollutants.
- air pollution control technologies.
- the technologies of treatment of air pollutants and decontamination.
- the analytical methods for the determination of air pollutants.

Learning Outcomes: The course offers an overview of the phenomena treated by environmental physics and deals with the basic principles and laws of physics underlying these phenomena. Upon completion of the course the students should be able to:

- clarify the main sources of air pollution (industrial and urban) and the pollutants that are released in their country, as well as from wider areas.
- informed about the spirit of the laws, the content and the future development (trend) of the laws that refer to both emissions and air quality.
- understand the design principles of containment systems for both gaseous and particulate pollutants.
- assess and where appropriate propose/select a technology to solve an air pollution problem from a point (industrial) source.
- understand and apply basic principles of atmospheric sampling and measurement of both gaseous and particulate pollutants.
- evaluate the results of air pollutant measurements in terms of human health risks and air quality indicators.

Subjects covered:

- atmospheric pollutants and their emission control technology.

Prerequisites: There are no prerequisite courses.

Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

DIADE Postgraduate Thesis

Module code: DIADE

ECTS Credit Points: 40

Module Type: Compulsory

Year: 2nd

Language: Greek

General Description: The research topics used by the Program for postgraduate diploma theses are part of the orientations of the four (4) Modules: DIA50 (Natural Environment and Pollution), DIA51 (Solid Waste Management), DIA60 (Liquid Waste Management), and DIA61 (Management of Gaseous Pollutants).

The Director of the Postgraduate Study Program composes groups of related subjects, on the basis of which the students submit a proposal for elaboration. The initial subject declaration is made by the student who declares three preferred subjects from the specific thesis subjects or other subjects after consultation with a thesis supervisor.

The Director of the Postgraduate Study Program appoints the supervising member of the thesis (supervisor A') and also the second member of the evaluation committee for each submitted thesis proposal, as long as she/he meets the basic academic requirements. Then, Supervisor A', in collaboration with the student, finalizes the postgraduate thesis topic and its basic contents in the digital education platform of HOU, within the first month of elaboration and gives the final approval. Thesis subject modification is possible only within the first month of elaboration. In such a case, an official request is submitted for approval to the Director of the Postgraduate Study Program, with the necessary documentation provided by Supervisor A' with notification also to the second member of the evaluation committee.

In the case of approval by the Director of the Postgraduate Study Program, the relevant administrative department is informed accordingly.

In order to substantially deepen their study and acquire specialized knowledge and skills, the student, in collaboration with Supervisor A', collects bibliography, studies, evaluates and compiles international relevant literature from bibliographic databases and other reliable recognized sources of literature during the first months of elaboration (usually 2-3 months). The thesis is then elaborated and is also checked during different stages, both by Supervisor A' and by the second evaluator.

The student is required to submit two progress reports before the final submission of the thesis for evaluation. The 1st progress report is submitted within 2 months from the start of elaboration and must include: a. description of the objective of the thesis, b. description of thesis innovation (what the thesis adds to existing knowledge), and relevant bibliography that the student should have searched for, c. analysis of the experimental process in case of experimental thesis, d. outline of content, and the 2nd progress report, one month before the final submission for evaluation. Supervisor A' evaluates each progress report by writing specific comments and accepts it or not. The rejection of 2 reports is a strong indication of failure to complete the postgraduate thesis during the current academic year. In any case, the members of the evaluation committee are solely responsible for judging whether the student has successfully completed the thesis and can defend it. For any problem that may arise, the Director of the Postgraduate Study Program should be informed.

Experimental theses are carried out wherever possible, while students undertaking non-experimental theses are encouraged to elaborate case studies with clear innovation characteristics. Extensive summaries summarizing the findings and conclusions from selected postgraduate diploma theses prepared in Master's Programs of the School of Science and Technology (SST) are published in its scientific bulletin (https://sst.eap .gr/sstbulletin/), while in collaboration with their supervisors, students are encouraged to publish their theses in peer-reviewed scientific journals and/or international and national conferences.

Learning Outcomes: The students who will successfully complete the module of the postgraduate thesis:

- will be able to use bibliography from bibliographic databases, evaluate and synthesize data and write a scientific text in the form of a thesis – theoretical, applied or experimental – which will be presented in the form of a written text, with the necessary figures, diagrams, photos and images.
- will be able to synthesize and use the knowledge acquired during their studies and deepen their study subject.
- will be able to clearly present scientific data related to their study subject and answer relevant questions from other scientists.

General Regulation for Preparing Graduate Dissertations in PC with an annual Module Correspondence

For more information regarding the Specifications – Useful Material for writing Master's Theses and uploading a Thesis at the H.O.U. Repository, you can go to the Digital Training Area **http://study.eap.gr** and especially to the Program of Studies section.

Prerequisites: The presentation of the Postgraduate Thesis takes place after the successful completion of the program's Course Modules.

Engineering Project Management MSc

Description

The course aims to train professional engineers to move into higher management positions within the construction services industry.

Learning Outcomes

The objective of the postgraduate program entitled "Engineering Project Management" is to train professional engineers to move into higher administrative positions in all phases of analysis, design and creation of construction projects. To achieve this objective, postgraduate students should study the following Topics/Courses: DCHT50 - Principles of Construction Project Organization and Management, DCHT51 - Construction Project Analysis and Design, DCHT60 - Construction Law and Construction Safety and DCHT61 - Construction Economics and Management. After successful completion of DCHT50, postgraduate students will be able to comprehend and apply the principles of business administration, to organize and manage a construction site and will have in-depth knowledge of information systems in construction management. Successful completion of DCHT51 leads to in-depth knowledge of analysis and design of structures, of principles of construction technologies as well as of building materials

and construction equipment. DCHT60 intends to the comprehension of construction law and safety and of environmental impact of construction projects and construction sites. Finally, after successful completion of DCHT61, the postgraduate students will know in-depth the principles of engineering economics, how to achieve successful construction planning and estimation as well as successful construction project scheduling and control.

Admission Requirements

The Post-graduate programme accepts graduates or higher institution diplomas of related disciplines. The programme is offered in Greek.
The knowledge of a foreign language and good computer-Internet skills would be useful for the successful participation in the programme.
Note:
Holders of a degree or diploma of higher education means graduates of Greek Universities or Polytechnics or Higher School of Fine Arts or Higher School of Pedagogical and Technological Education or Higher Technological Educational Institutions (ATEI) or those who hold academically equivalent first cycle degrees from recognized foreign educational institutions with the degrees awarded by the Greek Higher Educational Institutions, in accordance with the provisions of article 304 of Law No. 4957/2022 (Government Gazette 141/21.07.2022, vol.)
Marking:
For the evaluation of the application to the Postgraduate Studies Programme, it will be examined whether the candidate's institution of study is or may be included in the National Register of Recognised Higher Education Institutions of Foreign Countries and whether the candidate's degree is or may be included in the National Register of Types of Degrees of Recognised Institutions of Foreign Countries.
The Hellenic Open University, if the degree is included in the list of article 307 of Law No. 4957/2022, must request a "Certificate of Place of Study", which is issued and sent by the foreign university. If the place of study or part of the studies is confirmed as the Greek territory, the degree is not recognized, unless the part of the studies that took place in the Greek territory is in a public higher education institution or in a recognized foreign educational institution within the meaning of paragraph b) of article 299 of Law No. 4957/2022.

Minimum study duration

2 academic years

ECTS credit points

120

Classification according to ISCED-2011 of UNESCO

- Based on the level of Education: 7
- Based on the field of Education: 52 Engineering and engineering trades

Classification according to ISCED-2013 of UNESCO

- Based on the field of Education: 0732 Bulding and civil engineering

Learning Material

Learning material used is mainly printed textbooks but also audiovisual and electronic learning material. The printed material is especially adapted to meet the needs and standards of distance education.

Chapters clearly state aims and objectives. Key concepts and expected learning outcomes. Self-assessment questions and exercise.

Alternative teaching material. To assist the students to a better understanding of the main teaching material. It utilizes, clarifies and enriches, if necessary, the already existing material.

Contact

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Course Structure

1st Year	
DCHT50 Principles of Project Organization and Management	(C[1],20 ECTS)
DCHT 51 Technique of Construction	(C,20 ECTS)
DCHT60 Legislation and Safety of Technical Projects	(C,20 ECTS)
DCHT61 Economics of Technical Projects	(C,20 ECTS)
2nd Year	
DCHT60 Legislation and Safety of Technical Projects	(C,20 ECTS)
DCHT61 Economics of Technical Projects	(C,20 ECTS)
DCHT DE Thesis	(C,40 ECTS)

Note:

C[1]: Compulsory

Module Selection Instructions:

In the first year of studies, the first chosen module must be DCHT50 and/or DCHT51 and, if a third module is to be chosen, it can be either DCHT60 or DCHT61. Students cannot choose both DCHT60 and DCHT61 unless they have successfully completed at least one of the DCHT50 and DCHT51. The Thesis is carried out either after the successful completion of all the modules or in parallel with the last module of the (DCHT60 or DCHT61).

It is clarified that in order to complete the postgraduate programme in two academic years, students must successfully complete during the first academic year three modules (according to the above instructions) and during the second year the last-module simultaneously with the Thesis.

During the module selection, all modules from previous academic years must be selected and consequently the selection of the modules of the next academic year can begin.

The presentation of the Thesis takes place after the successful completion of the program's Modules.

To earn the Master's degree, students must successfully complete four modules and successfully complete and present their Thesis.

Course Modules

DCHT50 Principles of Project Organization and Management

Module code: DCHT 50

ECTS Credit Points: 20

Module Type: Compulsory

Year: 1st

Language: Greek

Module General Description:

- Basic concepts and theories of Management Science. The business environment, the overall quality, and social responsibility. Administration systems. Company strategic programming. Companies organizational structure. Construction companies' organizational and economic structure. Company personnel. Company equipment management. Financial management, analysis, and prediction. Preparation and presentation of technical and financial tenders for participation in open-bid projects and studies. Construction companies' operational issues.
- Construction site concept and layout. Construction site information systems. Preparatory research. Construction site personnel. Construction site productivity. Construction site mechanical equipment. Construction site equipment management. Value management. Quality assurance. Project implementation. Case studies.
- Technical projects management information systems. Software technical traits in project management. Case studies in project management using software programs. Project management software and business. Database systems in construction project management. Logistic spreadsheets in construction project admeasure. Advanced systems and information technologies in project construction management.

Learning Outcomes: Upon successful completion of DCHT 50, students will be able to:

- Describe the organizational and economic structure of enterprises and in particular of construction enterprises, management systems, strategic planning, and financial management of enterprises.
- Describe the organizational structure of the construction site (technical and administrative staff, machinery, mechanical and other facilities).
- Apply rules for the management of the company and site staff.
- Apply rules for the management of the company's and the site's equipment and materials for the construction of the project.
- Evaluate alternatives concerning the location and layout of the site and its specific characteristics according to the size and characteristics of the project under construction.
- Carry out the necessary analyses – studies for the organization and installation of the site.

- Prepare technical and financial bids for participation in tenders for works and studies and apply the procedures for the award and execution of works.
- Select and use information systems for the management of technical projects at the head office of the contractor and at the construction site.
- Use application software in the management of technical projects (project management packages, databases, spreadsheets).
- Use advanced information systems and technologies in the management of engineering projects

Subjects covered:

- Principles of business administration
- Site organization and management
- Information systems in technical project management

Prerequisites: There are no prerequisite courses.

Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

DCHT 51 Technique of Construction

Module code: DCHT 51

ECTS Credit Points: 20

Module Type: Compulsory

Year: 1st

Language: Greek

Module General Description:

- Subsoil definition and meaning. Modern surveying methods. Instrumentation and monitoring of projects. Temporary and auxiliary structures. Principles of construction projects. Prefabrication and Modular Construction. Quality control. Manufacturing.
- Aggregate materials. Bituminous materials. Concrete. Steel. Masonry. Composite materials. Bonding technology with adhesive materials. Equipment for a construction project. Dams. Bridges. Road works.

Learning Outcomes: Upon successful completion of DCHT 51, students will be able to:

- Evaluate the main parameters that determine the geometric elements of the layout, know the stages of designing a road project, the elements of technical works to be included in the design and elements of road pavement management systems.
- Know the general characteristics, types, design principles and construction methods of bridges.
- Organise the management of the analysis and design of dams, identify the stages of design, organise the management of the construction of a dam, assess the

qualifications for the commissioning of the design of a dam and carry out the necessary environmental restoration works more competently.

- Describe the course of subsoil survey works, apply modern methods of surveying works and the means – methodology of carrying out monitoring measurements in engineering works.
- Propose solutions and measures for safe temporary and special auxiliary structures, implement basic principles of formwork construction in various structures and propose aesthetically acceptable solutions in modern prefabrication projects.
- Evaluate the importance of quality control of construction materials and recognize the potential and characteristics of industrialization.
- Determine the properties relating to the quality of materials used in most civil engineering structures, namely aggregates, steel, concrete, asphalt materials and masonry.
- They propose safe solutions for the construction and repair of certain civil engineering works using composite materials with a cement matrix and adhesive bonding of materials with adhesive substances.
- Evaluate the productivity of the most important construction machineries

Subjects covered:

- Analysis and design of structures
- Principles of construction technology
- Construction materials and construction equipment

Prerequisites: There are no prerequisite courses.

Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

DCHT 60 Legislation and Safety of Technical Projects

Module code: **DCHT** 60

ECTS Credit Points: 20

Module Type: Compulsory

Year: 1st /2nd

Language: Greek

Module General Description:

- Public works. Ways and procedures for assigning and drawing up studies of public projects. Public works construction. Construction contract. Management, and supervision in public projects implementation. Project time scheduling – Project calendar. Admeasures, activities authentication. Contract term amendment.

- The pre-contractual stage of public studies procurement and their related services. The after-contractual stage of public studies procurement and related services. Assignment of public construction projects. Implementation of public construction projects. Statute N. 3389/2008 for public and private partnerships (P.P.P.).
- Key definitions in construction site and project safety. Dangers, measures of prevention, and firefighting. Dangers, measures of prevention, and explosives fighting. Accident management of dangerous substances. Dangers and protection measures from vibrations. Construction site dangers and control measures. Emergency management in construction sites and projects. Construction site accidents in Greece.
- Prediction and environmental impact assessment. Prediction, diagnosis, and risk assessment. Handling environmental impacts. Environmental impact monitoring. Environmental impact assessment. Legislation

Learning Outcomes: Upon successful completion of DCHT 60, students will be able to:

- know the basic legislation governing the award (pre-contractual stage) and execution (contractual stage) of the design of a public project.
- know the basic legislation governing the award (pre-contractual stage) and execution (construction) of a public project.
- be familiar with the basic legislation governing the safety and health of workers in general and of workers in technical works in particular.
- recognize the physical, chemical, biological hazards on a construction site and propose measures to prevent them.
- manage emergency situations on construction sites and technical works.
- know the methodological approach to the preparation of studies, analysis and management of environmental impacts of technical projects.
- assess and prioritize risks and manage environmental impacts.
- be aware of international, European and national legislation relevant to environmental protection.
- know the content of EIAs, public participation and the approval process.
- be informed about the administrative procedure for the authorization of different installations

Subjects covered:

- Legislation on the execution of technical works
- Safety in the execution of works
- Environmental impact of works and construction sites

Prerequisites: There are no prerequisite courses.

Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.
The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

DCHT 61 Economics of Technical Projects

Module code: **DCHT** 61
ECTS Credit Points: 20
Module Type: Compulsory
Year: 1st/2nd
Language: Greek
Module General Description:

- Introduction to construction project economics.
- Fundamental economic principles.
- Methods of economic evaluation of investments.
- Depreciation of assets.
- Equipment replacement decisions.
- Financial business structure.
- Inflation and financial analysis.
- Financial risk management.
- Public projects economic evaluation. Financing project methods. Targets, project analysis. Activities and time management.
- Economic project management. Managing project risks and insurance. Control of project implementation. Delivery, consignment, and project maintenance.
- The role of programming in project management.
- Project time schedule programming. Resources programming. Economic project programming. Project progress control.

Learning Outcomes: Upon successful completion of DCHT 61, students will be able to:

- Apply established methodologies for the economic evaluation of investments
- Estimate over time the value (depreciation) of mechanical equipment in projects and evaluate replacement plans.
- Analyse the financial structure of enterprises and assess financial risks.
- Evaluate the economic feasibility of public projects and determine/evaluate sources of project financing.
- Analyse the structure of engineering projects in the context of the process of their effective management.
- Implement the scheduling of a project based on established methodologies and create the project schedule.
- Plan the allocation of production resources to the work of one or more projects.
- They analyze the cash flow of payments of a project taking into account the availability of capital resources.
- Select appropriate time acceleration solutions for a project.
- They monitor the progress of a project and evaluate solutions for its rescheduling.
- Propose and evaluate risk management measures during the construction or operation of projects.

- Implement the delivery and acceptance procedure of a project and propose a maintenance program for the project.
- Use project planning and management software.

Subjects covered:

- Economics of technical works
- Project design and estimation
- Timing and financial planning of projects

Prerequisites: There are no prerequisite courses.

Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

DCHT DE Thesis

Module code: DCHT DE

ECTS Credit Points: 40

Module Type: Compulsory

Year: 2nd

Language: Greek

General Description: The research objects utilized by the Program when writing diploma theses are harmoniously integrated into the main orientations, i.e. the construction project management.

The Director of the Graduate Program composes a multitude of topics (around 250+), based on which the prospective students submit a relevant proposal for their Thesis. The suggested topics are not binding but aim to inspire the students. Next, the Director appoints the supervising member (A' supervisor) and the second member of the Committee for each submitted MDE proposal, as long as it meets the basic academic requirements. Then the 1st SEP Supervisor, in collaboration with the candidates for preparation students, finalizes the title and the basic content of the MDE in the digital education area and gives the final approval.

Subject modification is possible within the first month of preparation. A relevant request, with the necessary documentation, is submitted for approval to the Director of the Program by the First Supervisor with notification to the second member of the Committee. In the case of approval by the Director, the competent administrative department will be informed accordingly.

The theory and practice used to deepen knowledge is based to some extent on the knowledge and techniques acquired from the Units offered. However, for further deepening and acquisition of specialized knowledge and skills, the student, in collaboration with the MDE supervisor, studies works from the relevant international literature. This process usually takes

2-3 months. Then the MDE is prepared which is checked in its stages both by the supervisor of the MDE and by the second advisor. The postgraduate students have the obligation, due to the Special Regulation for the Preparation of MDE/DXT (https://study.eap.gr/mod/folder/view.php?id=10202), to submit, in addition to the Final Issue of MDE:

a) the Initial Progress Report (12/30 of each year)

b) the 2nd Progress Report (28/2 of each year)

c) the Extended Summary of the MDE (together with the Final Issue)

Learning Outcomes: The students who will successfully complete the module:

- they will have obtained a deep knowledge of the subject of their subject to the extent that they will be able to comfortably and fluently read and acquire information on cutting-edge research topics from publications in research journals of the respective research area.
- They will be able to give high level seminars in which they will be able to explain their subject clearly and to answer related questions from other scientists.

General Regulation for Preparing Graduate Dissertations in PC with an annual Module Correspondence

For more information regarding the Specifications – Useful Material for writing Master's Theses and uploading a Thesis at the H.O.U. Repository, you can go to the Digital Training Area **http://study.eap.gr** and especially to the Program of Studies section.

Prerequisites: The presentation of the Thesis takes place after the successful completion of the program's Course Modules.

Earthquake Engineering and Seismic-Resistant Structures MSc

Description

The scope of the programme is to provide specialized knowledge in the areas of Earthquake Engineering, Seismic Analysis of Structures, Seismic Design and Redesign of Structures.

Learning Outcomes

The students who successfully complete the four units of studies are in a position to:

- to analyze structural dynamics problems in sub-problems and then properly synthesize them, to evaluate structural models and computational methods as related to the dynamic response of structures, to evaluate the results of dynamic structural analyses pertaining to structural engineering practice.
- to perform or evaluate the seismic design of concrete, steel or composite structures
- to identify structures with a high seismic vulnerability and to redesign any vulnerable structure through repairing or strengthening crucial weak elements. Furthermore, a basic knowledge will be acquired for the assessment of the structural capacity and the design of the necessary restoration works for monumental structures, ensuring the preservation of the monument and the architectural heritage.

Admission Requirements

The Post-graduate programme accepts graduates or higher institution diplomas of related disciplines. The programme is offered in Greek.
The knowledge of a foreign language and good computer-Internet skills would be useful for the successful participation in the programme.
Note:
Holders of a degree or diploma of higher education means graduates of Greek Universities or Polytechnics or Higher School of Fine Arts or Higher School of Pedagogical and Technological Education or Higher Technological Educational Institutions (ATEI) or those who hold academically equivalent first cycle degrees from recognized foreign educational institutions with the degrees awarded by the Greek Higher Educational Institutions, in accordance with the provisions of article 304 of Law No. 4957/2022 (Government Gazette 141/21.07.2022, vol.)
Marking:
For the evaluation of the application to the Postgraduate Studies Programme, it will be examined whether the candidate's institution of study is or may be included in the National Register of Recognised Higher Education Institutions of Foreign Countries and whether the candidate's degree is or may be included in the National Register of Types of Degrees of Recognised Institutions of Foreign Countries.
The Hellenic Open University, if the degree is included in the list of article 307 of Law No. 4957/2022, must request a "Certificate of Place of Study", which is issued and sent by the foreign university. If the place of study or part of the studies is confirmed as the Greek territory, the degree is not recognized, unless the part of the studies that took place in the Greek territory is in a public higher education institution or in a recognized foreign educational institution within the meaning of paragraph b) of article 299 of Law No. 4957/2022.

Minimum study duration

2 academic years

Minimum study duration ECTS credit points

120

Classification according to ISCED-2011 of UNESCO

- Based on the level of Education: 7
- Based on the field of Education: 58 Architecture and building

Classification according to ISCED-2013 of UNESCO

- Based on the field of Education: 0732 Building and civil engineering

Learning Material

Learning material used is mainly printed textbooks but also audiovisual and electronic learning material. The printed material is especially adapted to meet the needs and standards of distance education.
Chapters clearly state aims and objectives. Key concepts and expected learning outcomes. Self-assessment questions and exercise.

Alternative teaching material. To assist the students to a better understanding of the main teaching material. It utilizes, clarifies and enriches, if necessary, the already existing material.

Contact

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Course Structure

1st Year	
SMA50 Dynamic Analysis of Structures	(C^1, 20 ECTS)
SMA51 Geotechnical Earthquake Engineering and Seismic Design of Geotechnical Structures	(C, 20 ECTS)
SMA62 Seismic design and redesign of buildings	(C, 20 ECTS)
2nd Year	
SMA63 Special topics in seismic analysis and design of structures	(C, 20 ECTS)
SMADE MSc Thesis	(C, 40 ECTS)

Note:

C^1: Compulsory

Foundation course

The PSP offers a fast-track foundation course. This course is of a supportive nature, and attendance is optional. (*). The program is meant for students who do not possess a Diploma in Civil Engineering, and possess diplomas in other fields of Engineering. Under no circumstances can the course replace any of the other four course modules of the PSP. The course has a duration of three (3) four-hour (4) meetings. The meetings will discuss elements of static structural analysis, elements of numerical structural analysis, elements of material strength, elements of soil mechanics and elements of design and reinforced concrete and steel members. Students will be provided with a syllabus comprised of brief notes (with numerical examples) roughly 80-100 pages in length, and not with a book.

(*) The financial contribution for admitted students until the academic year 2023-2024 is equal to 25% of the cost of a single course module. For students commencing from the academic year 2024-2025 is €300.

Module Selection Instructions

Students in the first (1st) academic year may select all three of the following modules.: SMA50, SMA51, and SMA62. Students who do not possess the necessary time to select all three must first select the module SMA50, or the modules SMA50 and SMA51.

Students can choose the MSc Thesis simultaneously with the module SMA63, with the requirement that they have successfully completed the three modules. In this case the Programme can be completed in two academic years.

During the module selection, all modules from previous academic years must be selected and consequently the selection of the modules of the next academic year can begin.
The presentation of the MSc Thesis takes place after the successful completion of the program's Modules.
To earn the Master's degree, students must successfully complete all four modules and successfully complete and present their MSc Thesis.

Course Modules

SMA50 Dynamic Analysis of Structures

Module code: SMA50
ECTS Credit Points: 20
Module Type: Compulsory
Year: 1st
Language: Greek
Module general description:

- Analysis of the free vibration of a single-degree-of-freedom system (structure) and determination of its response to harmonic or general dynamic loads in time domain
- Formulation and solution of the equation of motion of a multi-degree-of-freedom system (structure) through composition of its mass, stiffness, and damping matrices and calculation of its eigenfrequencies and eigenmodes
- Determination and calculation of the dynamic response of a multi-degree-of-freedom system (structure) through superposition of eigenmodes and by the method of step-by-step integration of its equations of motion
- Determination and calculation of the seismic response of a multi-degree-of-freedom system (structure) by the method of superposition of eigenmodes – design spectrum of seismic code.
- Inclusion and influence of soil-structure interaction in the determination and calculation of the seismic response of a structure
- Seismic response of a structure with base isolation
- Seismic response of a structure equipped with an active or passive seismic protection system
- Seismic response of liquid- or fluid-containing structures (tanks, water towers, silos)

Learning Outcomes: Upon successful completion of SMA 50, students will be able to:

- Describe free and forced oscillation problems of single- and multi-stage elastic structures and calculate their response to dynamic and seismic loads
- Compose the mass, stiffness, and damping matrices of a structure, calculate the eigenfrequencies and eigenmodes of a structure, utilize the above to calculate the dynamic response of a structure through superposition of the eigenmodes-response spectra, or through integration of the equations of motion in time, and finally, apply all the above within the framework of the seismic code (Eurocode 8) to design a structure

- Calculate the seismic response of structures with an isolated base, structures with active or passive seismic protection systems, structures that contain liquid or fluid, and structures built on compliant soil.

Subjects covered:

- Structural Dynamics
- Special Topics of Structural Dynamics

Prerequisites: There are no prerequisite courses.

Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

Students must use specialized software for at least one of the aforementioned five written assignments. Certain software is accessible on the internet (student editions), while students may obtain other software through the 'Structural Technology and Applied Mechanics' Laboratory.

SMA51 Geotechnical Earthquake Engineering and Seismic Design of Geotechnical Structures

Module code: SMA51

ECTS Credit Points: 20

Module Type: Compulsory

Year: 1st

Language: Greek

Module general description:

- Basic elements of engineering seismology: intensity, magnitude, energy, types of faults, empirical relations, wave propagation
- Strong ground motion: accelerometers, recordings of strong ground motions, databases of recordings, ground motion parameters, estimation of ground motion parameters
- Dynamic ground properties (field, experiments), ground seismic responses, ground-structure interaction, local phenomena (ground movement amplification, influence on topography and basin geometry), soil liquefaction, soil subsidence, slope stability
- Design of geotechnical structures according to the seismic code (Eurocode 8)
- Seismic design of underground pipelines, tunnels, and lifelines
- Seismic design of surface and deep foundations (piles) and retaining walls
- Seismic design of embankments, slopes, and dams

Learning Outcomes: Upon successful completion of SMA 51, students will be able to:

- Know the basic parameters of earthquakes and strong ground motions and how they are included in the seismic code (Eurocode 8).

- Know the dynamic behavior of soil, its seismic response and the crucial phenomena of local amplification of ground motion, the effect of ground topography and geometry on ground motion, soil liquefaction, and slope stability.
- Materialize the seismic design of geotechnical structures, i.e. underground pipelines, tunnels, lifelines, surface and deep foundations, embankments, slopes, and dams.

Subjects covered:

- Geotechnical Earthquake Engineering
- Seismic Design of Geotechnical Structures

Prerequisites: There are no prerequisite courses.

Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

Students must use specialized software for at least one of the aforementioned five written assignments. Certain software is accessible on the internet (student editions), while students may obtain other software through the 'Structural Technology and Applied Mechanics' Laboratory.

SMA62 Seismic design and redesign of buildings

Module code: SMA62

ECTS Credit Points: 20

Module Type: Compulsory

Year: 1st

Language: Greek

Module general description:

- Principles of earthquake design of buildings according to Eurocode 8
- Seismic performance levels, design spectra, and methods of analysis of buildings to earthquakes according to Eurocode 8
- Design rules for reinforced concrete buildings according to Eurocode 8
- Design rules for steel buildings according to Eurocode 8
- Design rules for composite (steel-concrete) buildings according to Eurocode 8
- Design rules for timber and masonry buildings according to Eurocode 8
- Assessment methods and building retrofitting rules according to Eurocode 8

Learning Outcomes: Upon successful completion of SMA 62, students will be able to:

- Know the principles of earthquake design of buildings according to Eurocode 8
- Know the seismic performance levels, design spectra, and methods of analysis of buildings during earthquakes according to Eurocode 8
- Know the design rules for reinforced concrete, steel, timber and masonry, and composite (steel-concrete) buildings according to Eurocode 8

- Know the assessment methods and building retrofitting rules according to Eurocode 8

Subjects covered:

- Seismic design of reinforced concrete buildings according to Eurocode 8
- Seismic design of steel and composite buildings according to Eurocode 8
- Seismic design of timber and masonry buildings according to Eurocode 8
- Seismic retrofit of buildings according to Eurocode 8

Prerequisites: There are no prerequisite courses.

Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

Students must use specialized software for at least one of the aforementioned five written assignments. Certain software is accessible on the internet (student editions), while students may obtain other software through the 'Structural Technology and Applied Mechanics' Laboratory.

SMA63: Special topics in seismic analysis and design of structures

Module code: SMA63

ECTS Credit Points: 20

Module Type: Compulsory

Year: 2nd

Language: Greek

Module general description:

- Simulation (frame elements, finite elements, nodes, etc.) and non-linear (material and geometrical) analysis of structures
- Seismic design of bridges made of reinforced and prestressed concreted, steel bridges, and composite bridges according to Eurocode 8
- Seismic design of special structures (tanks, water towers, silos, structures with base isolation, etc.) according to Eurocode 8
- Seismic design of non-structural elements according to Eurocode 8
- Seismic risk analysis (vulnerability, damage, losses), and seismic risk assessment (deterministic and probabilistic)

Learning Outcomes: Upon successful completion of SMA 63, students will be able to:

- Perform the simulation of a structures and conduct its non-linear analysis
- Know the rules for the seismic design of bridges made of reinforced and prestressed concrete, bridges made of steel, and composite bridges, according to Eurocode 8
- Know the rules for the seismic design of special structures and non-structural elements according to Eurocode 8

- Know what it is involved in a seismic risk analysis and how it is performed, as well as the methods of seismic risk assessment

Subjects covered:

- Simulation and non-linear analysis of structures
- Seismic design of special structures (bridges, tanks, water towers, silos, structures with base isolation, etc.) and non-structural elements according to Eurocode 8
- Seismic risk analysis and seismic risk assessment

Prerequisites: There are no prerequisite courses.

Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

Students must use specialized software for at least one of the aforementioned five written assignments. Certain software is accessible on the internet (student editions), while students may obtain other software through the 'Structural Technology and Applied Mechanics' Laboratory.

SMADE MSc Thesis

Module code: SMADE

ECTS Credit Points: 40

Module Type: Compulsory

Year: 2nd

Language: Greek

General Description: The research objects used in the writing of MSc theses are fully integrated into the main orientations of the MSc program, namely seismic engineering and the design of earthquake resistant structures.

The Director of the MSc compiles a large number of topics (about 50), on the basis of which students submit a proposal for a Thesis. The proposed topics are not binding but are intended to inspire the graduate students, Subsequently, the Director appoints the supervising member (Supervisor A) and the second member (Supervisor B) of the Review Committee for each submitted MSc proposal, provided that this proposal meets the basic academic requirements. Then Supervisor A, in collaboration with the student, finalizes the topic and the main content of the MSc Thesis and gives the final approval.

Modification of the topic is only possible within the first month of preparation. A request, with the necessary documentation, shall be submitted for approval to the Director of the MSc by Supervisor A, with notification to Supervisor B, member of the Review Committee. In the case of approval by the Director, the relevant administrative department shall be informed accordingly.

The theory and practice used to deepen knowledge is based to some extent on the knowledge and techniques acquired from the offered Modules. However, for further deepening and acquisition of specialized knowledge and skills, the student in collaboration with the supervisor of the MSc initially studies papers from the relevant international literature. Also, where required, the student learns the use of specialized software relevant to the topic of the MSc in order to cover the static/dynamic numerical analysis part. The literature study and software learning processes usually take 2-3 (two to three) months. The MSc Thesis is then prepared and supervised at all stages by Supervisor A with significant involvement, where needed, of Supervisor B. Postgraduate students are obliged, due to the special regulation that holds for the MSc program regarding the preparation of a Thesis (https://study.eap.gr/mod/folder/view.php?id=21757), to submit, in addition to the Final Thesis:

a) the Initial Progress Report (30/12 of each year)

b) the Final Progress Report (30/03 of each year)

c) the Extended Summary of the Thesis (together with the Final text of the Thesis)

Learning Outcomes: Upon successful completion of SMADE, students will be able to:

- deepen in their field of study to the extent that they will be able to read and draw information on cutting-edge research topics from publications in research journals in the relevant research area with ease
- apply the methods in which they have been specialized to real-life structures
- watch and keep pace with the developments of seismic codes and apply them correctly.

General Regulation for Preparing Graduate Dissertations in PC with an annual Module Correspondence

For more information regarding the Specifications – Useful Material for writing Master's Theses and uploading a Thesis at the H.O.U. Repository, you can go to the Digital Training Area **http://study.eap.gr** and especially to the Program of Studies section.

Prerequisites: The presentation of the Thesis takes place after the successful completion of the program's Course Modules.

Advanced Studies in Physics MSc

Description

The Course aims to offer Natural Science Graduates advanced knowledge on the physical-chemical properties of solid material and surfaces, and allied scientific fields.

Learning Outcomes

After successful completion of the Program of Studies, the students should be able to:

- Understand in depth the basic laws and principles of modern physics and their applications to contemporary areas of science, building on the theoretical background and knowledge acquired through their studies and their systematic exposure to the main applications.

- Develop all necessary skills to attack and solve advanced problems that arise in all areas of modern physics in mathematically sound and complete way.
- Be aware and deepen their understanding of front line research areas through their dissertation work on selected problems of current interest and activity, aiming at the accumulation of the necessary knowledge and skills for future engagement in doctoral studies.

Admission Requirements

The Post-graduate programme accepts graduates or higher institution diplomas of related disciplines. The programme is offered in Greek.
The knowledge of a foreign language and good computer-Internet skills would be useful for the successful participation in the programme.
Note:
Holders of a degree or diploma of higher education means graduates of Greek Universities or Polytechnics or Higher School of Fine Arts or Higher School of Pedagogical and Technological Education or Higher Technological Educational Institutions (ATEI) or those who hold academically equivalent first cycle degrees from recognized foreign educational institutions with the degrees awarded by the Greek Higher Educational Institutions, in accordance with the provisions of article 304 of Law No. 4957/2022 (Government Gazette 141/21.07.2022, vol.)
Marking:
For the evaluation of the application to the Postgraduate Studies Programme, it will be examined whether the candidate's institution of study is or may be included in the National Register of Recognised Higher Education Institutions of Foreign Countries and whether the candidate's degree is or may be included in the National Register of Types of Degrees of Recognised Institutions of Foreign Countries.
The Hellenic Open University, if the degree is included in the list of article 307 of Law No. 4957/2022, must request a "Certificate of Place of Study", which is issued and sent by the foreign university. If the place of study or part of the studies is confirmed as the Greek territory, the degree is not recognized, unless the part of the studies that took place in the Greek territory is in a public higher education institution or in a recognized foreign educational institution within the meaning of paragraph b) of article 299 of Law No. 4957/2022.

Minimum study duration

2 academic years

ECTS study duration

120

Classification according to ISCED-2011 of UNESCO

- Based on the level of Education: 7
- Based on the field of Education: 44 Physical Sciences

Classification according to ISCED-2013 of UNESCO

- Based on the field of Education: 0533 Physis

Learning Material

Learning material used is mainly printed textbooks but also audiovisual and electronic learning material. The printed material is especially adapted to meet the needs and standards of distance education.

Chapters clearly state aims and objectives. Key concepts and expected learning outcomes. Self-assessment questions and exercise.

Alternative teaching material. To assist the students to a better understanding of the main teaching material. It utilizes, clarifies and enriches, if necessary, the already existing material.

Contact

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General Information:

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Course Structure

1st Year	
PSF50 Advanced Studies in Physics	(C^1, 20 ECTS)
PSF51 Mathematical Methods of Physics	(C, 20 ECTS)
PSF60 Advanced Studies in Quantum Physics	(C, 20 ECTS)
2nd Year	
PSF61 Structure of Matter and Universe	(O^2, 20 ECTS)
PSF62 Materials And Devices Science	(O, 20 ECTS)
PSFDE Thesis	(C, 40 ECTS)

Notes:

C^1: Compulsory

O^2: Optional

Module Selection Instructions

Students in the first (1st) academic year may select from one (1) up to three (3) modules, PSF50, PSF51, and PSF60. Students who select only one module are required to select either PSF50 or PSF51. Students who select two modules must select both PSF50 and PSF51. In the second (2nd) academic year students must select one module, either PSF61 or PSF62. The Thesis is carried out either in parallel with the last module of the course or after the successful completion of all four modules of the Programme.

During the module selection, all modules from previous academic years must be selected and consequently the selection of the modules of the next academic year can begin.

It is clarified that in order to complete the Programme in two academic years, students must successfully complete during the first academic year three modules (according to the above instructions) and during the second year the last module simultaneously with the Thesis.

The presentation of the Thesis takes place after the successful completion of the program's Modules.

To earn the Master's degree, students must successfully complete four modules and successfully complete and present their Thesis.
To obtain the postgraduate specialization diploma, students are required to possess a degree or higher education diploma from a similar field, must successfully attend and pass exams at least four modules, and prepare their Thesis, the preparation of which is regulated by the General Regulation for the Preparation of Postgraduate Diploma Theses.

Course Modules

PSF50 Advanced Studies in Classical Physics

Module code: PSF50
ECTS Credit Points: 20
Module Type: Compulsory
Year: 1st
Language: Greek
Module General Description: The Module aims to cover at the postgraduate level the fundamental "classical", i.e., non-quantum, theories, in particular Classical (Newtonian) Mechanics, as expressed by Lagrange, Hamilton, etc., and Maxwell's Classical Electrodynamics. The vast majority of macroscopic physical phenomena may be described by the laws in the aforementioned classical structure. However, even the description of microscopic phenomena based on Quantum Theory is impossible save through a "classic analog" (system). Thus, the quantum mechanical description of any physics system requires sound knowledge of Classical Mechanics and Electrodynamics. It must be noted that Classical Electrodynamics, i.e. the theory of macroscopic electromagnetic phenomena, also includes the Special Theory of Relativity. Only large-scale gravitational phenomena, which are described in the General Theory of Relativity, are not included in the aforementioned diptych, which offers a concise description of physical phenomena at macroscopic distances.
Learning Outcomes: The successful completion of PSF50 aims at the following scientific objectives:

- Ability to formulate equations of motion of physical systems through Principles of Change
- Knowledge and comprehensive understanding of the time evolution of physical systems in configuration space through the solving of the corresponding Lagrange equations
- Knowledge and comprehensive understanding of the time evolution of physical systems in phase space through the solving of the Hamilton equations and/or through the formalism of Poisson curves.
- Knowledge and comprehensive understanding of the issues of small oscillations (Normal Modes).
- Ability to formulate Lagrange and Hamilton formalisms for Continuum Mechanics and Classical Field Theory systems.
- Ability to formulate Maxwell's equations for electrodynamics and their solution in various macroscopic systems.
- Knowledge of the emission and absorption of Electromagnetic Waves.

- Knowledge and comprehensive understanding of the electromagnetic properties of physical systems of Conductors, Dielectrics, and Materials with Magnetic Properties.
- Formulation and solution of the kinematics and electromagnetic behavior of physical systems in the context of the Special Theory of Relativity.
- Knowledge and comprehensive understanding of radiation phenomena of accelerated electric charges.

Subjects covered:

- Advanced Studies in Classical Mechanics
- Advanced Studies in Classical Electromagnetism

Prerequisites: There are no prerequisite courses.

Evaluation: Students are assigned to submit six (6) written assignments during the academic year. The average grade of the six (6) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the six (6) assignments and (b) at least four (4) of the six (6) written assignments have been submitted.

PSF51 Mathematical Methods of Physics

Module code: PSF51

ECTS Credit Points: 20

Module Type: Compulsory

Year: 1st

Language: Greek

Module General Description: Physics as a science acquired substantially changed as it began to use Mathematics already a few centuries ago as its main tool. In modern times, this relationship has strengthened so much that all serious attempt to solve physical problems cannot be understood without the use of Mathematics, but it has also evolved to the point that it acquired a two-way character. According to these considerations, the purpose of module is for the student to acquire the necessary basic knowledge in various areas of Mathematics and to learn how to apply the relevant methods to solve physical problems.

In detail, the content of the module is:

- Differential equations: classification into linear and non-linear, as well as ordinary and partial differential equations. Methods of solving linear differential equations, with constant and non-coefficients (emphasis on second order). Smooth and non-smooth points, applications to physical systems.
- Complex analysis and applications in the calculation of integrals and infinite sums.
- Special functions and orthogonal polynomials. Expansion in eigenfunctions. Laplace, diffusion, Helmholtz, Poisson equations
- Green's functions: Construction of Green's functions for the Helmholtz, Poisson, Laplace equations and for the wave equation.

- Problems in Cartesian, spherical and cylindrical coordinates with homogeneous and inhomogeneous boundary conditions. Expansion in orthogonal polynomials.
- Boundary and initial condition problems.
- Calculus of changes and physical applications.
- Probability theory and experimental data analysis. Applications to physics problems.

Learning Outcomes: Students who successfully complete this module unit will be able to analyze and model natural processes and phenomena with advanced mathematical methods and produce analytical results in several cases. More specifically, students will be able to:

- use basic elements of complex analysis to calculate integrals and infinite series and specifically of the theorems necessary to compute finite integrals.
- solve ordinary differential equations, which often appear in physics, using special functions whose properties are also thoroughly studied.
- apply integral transformations to solve physical problems
- use special functions, the method of separation of variables and appropriate coordinate systems to solve partial differential equations that arise in boundary and initial condition problems.
- solve physics problems using Green's functions
- formulate physical problems in the context of calculus of variations and produce analytical solutions.
- know probability theory, calculate the probability distributions of random variables and their functions, and analyze experimental data.

Subjects covered:

- Mathematical Methods of Physics
- Statistical Methods of Experimental Data Analysis

Prerequisites: There are no prerequisite courses.

Evaluation: Students are assigned to submit six (6) written assignments during the academic year. The average grade of the six (6) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the six (6) assignments and (b) at least four (4) of the six (6) written assignments have been submitted.

PSF60 Advanced Studies in Quantum Physics

Module code: PSF60

ECTS Credit Points: 20

Module Type: Compulsory

Year: 1st

Language: Greek

Module General Description: The aim of the module is the development at the postgraduate level of the fundamental principles, methods, and applications of non-relativistic quantum

mechanics with the use of techniques borrowed from linear algebra, operator theory and differential equations in order to solve problems in the field of study of quantum theory.
Quantum mechanics is the only existing theoretical framework for the study and interpretation of the entirety of the physical processes that occur at the microscopic level. As such, it occupies a prominent position in modern physics and is one of the greatest scientific advances of the twentieth century. PSF60 focuses exclusively on the subject matter of non-relativistic quantum physics which occurs based on the principle of correspondence, from non-relativistic classical mechanics. This theory is successfully used to describe physical phenomena in the field of (relatively) low energies. High energies require the generalization of the theory in relativistic quantum mechanics, which occurs correspondingly from classical relativistic mechanics, but is not part of the syllabus. The methodology developed in the lessons is based on linear algebra, operator theory, and differential equations that serve the solution requirements of physical problems, as appropriate, but also the mathematical foundation of quantum theory. Problems with exact solutions are described in detail based on the mathematical theory of special functions, while for the rest, approximate solution methods are introduced and applied (perturbation method, etc.). A crucial aspect of quantum mechanics are symmetries, wherever they exist, and representations of their operators. Physical problems are split into two basic categories: bound state problems and scattering problems, for which the corresponding solution techniques are taught. The primary applications of non-relativistic quantum mechanics concern problems of atomic and molecular physics, quantum optics, quantum chemistry, nuclear physics and solid-state physics, the latter of which exhibits numerous technological applications in everyday life. High-energy processes, such as those found in elementary particle physics, can only be explained by relativistic quantum mechanics and quantum field theory.

All the laws that govern the microcosm are drawn from the basic principles of quantum physics discussed in PSF60.

Detailed Description

- Schrödinger equation – background: the wavefunction, Introductory mathematical notions, the postulates of quantum mechanics, Heisenberg inequalities.
- Simple quantum Systems: harmonic oscillator-coherent states, one dimensional bound state and scattering problems for one-dimensional potentials.
- Approximate methods: WKB, calculus of variation and introduction to perturbation theory.
- Mathematical formalism of quantum theory: vector spaces, abstract Hilbert spaces, operators on Hilbert spaces, Operators-eigenvalues and eigenstates, Position and Momentum representations of wavefunctions and operators.
- Quantum theory in three dimensions: rotations and angular momentum.
- Schrodinger equation in three dimensions, spherically symmetric potentials, examples and applications, the Hydrogen atom.
- The dynamics of a quantum particle, propagator, Feynman path integrals, density operator.

- Spin, Symmetries, Spherical symmetry, symmetry groups and their representations, angular momentum addition, reflections, parity, time reversal, local gauge symmetry.
- Identical particles.
- Time dependent perturbation theory.
- Scattering: fundamental notions, general theory, scattering matrix, scattering states, scattering for spherically symmetric potentials.

Learning Outcomes: Upon successful completion of PSF60, students will be able to:

- understand how to apply the laws of quantum physics to the real world.
- acquire the technical skills to solve complex problems.
- analyze a variety of exactly solvable trap and scattering problems
- develop and applies approximate methods to study systems of atomic, molecular, nuclear physics and solid state physics.
- compare theoretical predictions with experimental results.
- evaluate modern results (as analyzed in published scientific articles) based on a broad knowledge of the fundamental laws of quantum physics.

Subjects covered:

- Quantum Mechanics
- Quantum Chemistry

Prerequisites: There are no prerequisite courses.

Evaluation: Students are assigned to submit six (6) written assignments during the academic year. The average grade of the six (6) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the six (6) assignments and (b) at least four (4) of the six (6) written assignments have been submitted.

PSF61 Structure of Matter and Universe

Module code: PSF61

ECTS Credit Points: 20

Module Type: Optional

Year: 2nd

Language: Greek

Module General Description: The main objective of this unit is for the student to deepen his/her knowledge and connect the structure of matter from its most elementary form to the cosmological moment when gravity prevails and small and large star systems are being formed (stars, planets, galaxies, etc.). The theoretical background and mathematical tools of these sciences (eg. elementary particle physics, theoretical cosmology, astrophysics, observational cosmology) are used in an attempt to describe physically and mathematically the evolutionary path from Big Bang to large-scale structures, the connection between the micro and macro – scales of the cosmos.

Learning Outcomes: After completing module PSF 61 students will,

- Possess advanced knowledge in Solid-State Physics, Particle Physics, and Quantum Field Theories, and in particular Degree Theories and Astrophysical Cosmology.
- Understand and distinguish the common foundation of all these different fields of physics that describe the microcosm and the macrocosm by combining this knowledge.
- Learn to focus on the syllabus with critical thinking and categorize each piece of knowledge they are taught, given that they are required to cover a very large and diverse material.
- Gradually understand the discovery of the common foundation of the different fields of physics through the analysis and synthesis of different knowledge.
- Reorganize what they learned at the undergraduate level as a science student, laying a solid foundation for their scientific thinking, through the organization and synthesis of the different knowledge.
- Having changed their way of thinking, along with the new knowledge they will have acquired together with their comprehensive understanding of it, students will be able to draw conclusions about the world around them and transfer the skills they have acquired and their judgement to other situations in their lives.

Subjects covered:

- Elementary Particles
- Nuclei
- Solids
- Astrophysics

Prerequisites: There are no prerequisite courses.

Evaluation: Students are assigned to submit six (6) written assignments during the academic year. The average grade of the six (6) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the six (6) assignments and (b) at least four (4) of the six (6) written assignments have been submitted.

PSF62 Materials And Devices Science

Module code: PSF62

ECTS Credit Points: 20

Module Type: Optional

Year: 2nd

Language: Greek

Module General Description: PSF62 aims to discuss and acquaint students with the fundamental electric, optical, structural, and electronic properties of various classes of Advanced Materials, in addition to the basic physical principles that govern and determine the functionality of various Optoelectronic and Photonic Devices as well as Microelectronics Devices used in modern applications based on the properties of these materials. The unit also

aims to teach students the strong correlation between the properties of materials and the function and characteristics of devices. Categories of materials covered in the syllabus are Metals, Semiconductors, Polymers, Magnetic Materials, and Superconductors, and the devices in which these materials are used with applications in power and light generation and electronic applications are p-n contacts, electronic diodes, light-emitting diodes and photodiodes/photodetectors, bipolar contact and field effect transistors, solar cells, lasers, and (micro)sensors.

Learning Outcomes: PSF62 generally aims to provide in-depth knowledge to students of the postgraduate program "Advanced Studies in Physics" regarding both the Physics of various categories of Materials, and the Physics of Optoelectronics and Photonic Devices in addition to Microelectronic Devices used in modern applications whose function depends on the properties of the aforementioned Materials.

The Module aims to provide general and specialized knowledge in the field of Materials and Devices Science. The knowledge focuses

- on the understanding of the behavior of electrons within solid materials and how this behavior categorizes said materials into metals, semiconductors, and insulators,
- the study of the basic manufacturing and characterization processes and fundamental physico-chemical properties of different classes of materials such as Metals, Semiconductors, Polymers, Magnetic and Ceramic Materials, and
- their applications in various categories of Photonic and Optoelectronic Structures and Devices as well as Microelectronics Devices, such as p-n contacts, electronic diodes, light-emitting diodes and photodiodes/photodetectors, bipolar contact and field effect transistors, solar cells, lasers, and (micro)sensors, in order to analyze in detail their principles of function.

A primary objective of the Module is for students to understand the most important optoelectronic and structural properties of the materials in the syllabus and the basic physical and functional principles of the aforementioned devices.

Upon successful completion of PSF62, postgraduate students are expected to possess in-depth knowledge of the properties of these categories of Materials as well as the Physics and functional principles that govern their modern applications in Structures and Devices, mainly in the field of Optoelectronics/Photonics and Energy.

Subjects covered:

- Metals – Semiconductors
- Microelectronics
- Sensors and Biosensors
- Laser Beams – Optoelectronics
- Materials Science
- Polymer Science

Prerequisites: There are no prerequisite courses.

Evaluation: Students are assigned to submit six (6) written assignments during the academic year. The average grade of the six (6) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the six (6) assignments and (b) at least four (4) of the six (6) written assignments have been submitted.

PSFDE Thesis

Module code: PSFDE

ECTS Credit Points: 40

Module Type: Compulsory

Year: 2nd

Language: Greek

General Description: The research objects utilized in writing a thesis are harmoniously integrated into the main orientations of the program, that is, understanding the structure of Matter and the Universe and the Material Sciences and Devices.

The director of the program selects groups of related subjects, on the basis of which the prospective students submit a relevant proposal for elaboration. Subsequently, the Board of Directors (and correspondingly as above) designates the supervising member (First supervisor) and the second member of the Evaluation Committee for each submitted MDE proposal if it meets the basic academic requirements. Then the first Supervisor, in collaboration with the students, finalizes the topic and the basic content of the MDE in the digital education area within the first month of preparation and gives the final approval.

Thesis subjects may be changed within the first month of writing. In such a case, the relevant request is submitted for approval to the S.P. Director, together with the necessary documentation, by the 1st Supervisor, with notification to the second member of the Examination Committee. In case of approval, the relevant administrative body must be informed.

In particular, the General Categories of subjects for the Master's Thesis are, presently, the following:

- Quantum Field Theory - Elementary Particle Physics
- Classical Field Theory – Solitons
- Condensed Matter Physics
- Gravity - General Theory of Relativity
- Cosmology
- Astrophysics
- Astroparticle Physics
- Experimental Physics of Elementary Particles
- Biophysics

The theory and practice used to further deepen the student’s knowledge is based to some extent on the materials modules.

However, for further deepening and acquisition of specialized knowledge and skills, the student, in collaboration with the supervisor, studies work from the relevant literature. This process usually takes 2-3 months. Then the thesis prepared and is checked in its stages both by the supervisor and by a second evaluator.

Learning Outcomes: The students who will successfully complete the module:

- they will have obtained a deep knowledge of the subject of their subject to the extent that they will be able to comfortably and fluently read and acquire information on cutting-edge research topics from publications in research journals of the respective research area.
- They will be able to give high level seminars in which they will be able to explain their subject clearly and to answer related questions from other scientists.

General Regulation for Preparing Graduate Dissertations in PC with an annual Module Correspondence

For more information regarding the Specifications – Useful Material for writing Master's Theses and uploading a Thesis at the H.O.U. Repository, you can go to the Digital Training Area **http://study.eap.gr** and especially to the Program of Studies section.

Prerequisites: The presentation of the Thesis takes place after the successful completion of the program's Course Modules.

Environmental Catalysis for Pollution Abatement and Clean Energy Production MSc

Description

The programme is mainly addressed to Chemists, Chemical Engineers, Physicists, Environmental Scientists and Engineers as well as to Geologists and Materials Scientists and Engineers. The main goal of the program is the detailed study of the catalytic science and technology and their applications in producing clean energy and in the environmental protection.

Learning Outcomes

The graduates are expected to be able to contribute to the development of novel catalysts and catalytic processes (or to the improvement of existing ones) related to the catalytic destruction of pollutants and to the production of environmentally friendly fuels.

Admission Requirements

The Post-graduate programme accepts graduates or higher institution diplomas of related disciplines. The programme is offered in Greek.

The knowledge of a foreign language and good computer-Internet skills would be useful for the successful participation in the programme.

Note:

Holders of a degree or diploma of higher education means graduates of Greek Universities or Polytechnics or Higher School of Fine Arts or Higher School of Pedagogical and Technological Education or Higher Technological Educational Institutions (ATEI) or those who hold academically equivalent first cycle degrees from recognized foreign educational institutions with the degrees awarded by the Greek Higher Educational Institutions, in accordance with the provisions of article 304 of Law No. 4957/2022 (Government Gazette 141/21.07.2022, vol.)

Marking:

For the evaluation of the application to the Postgraduate Studies Programme, it will be examined whether the candidate's institution of study is or may be included in the National Register of Recognised Higher Education Institutions of Foreign Countries and whether the candidate's degree is or may be included in the National Register of Types of Degrees of Recognised Institutions of Foreign Countries.
The Hellenic Open University, if the degree is included in the list of article 307 of Law No. 4957/2022, must request a "Certificate of Place of Study", which is issued and sent by the foreign university. If the place of study or part of the studies is confirmed as the Greek territory, the degree is not recognized, unless the part of the studies that took place in the Greek territory is in a public higher education institution or in a recognized foreign educational institution within the meaning of paragraph b) of article 299 of Law No. 4957/2022.

Minimum study duration

2 academic years

ECTS credit points

120

Classification according to ISCED-2011 of UNESCO

- Based on the level of Education: 7
- Based on the field of Education: 85 Environmental Protection

Classification according to ISCED-2013 of UNESCO

- Based on the field of Education: 0712 Environmental Protection Technology

Learning Material

Learning material used is mainly printed textbooks but also audiovisual and electronic learning material. The printed material is especially adapted to meet the needs and standards of distance education.
Chapters clearly state aims and objectives. Key concepts and expected learning outcomes. Self-assessment questions and exercise.
Alternative teaching material. To assist the students to a better understanding of the main teaching material. It utilizes, clarifies and enriches, if necessary, the already existing material.

Contact

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Course Structure

1st Year	
KPP70 Catalysis	(C[1], 20 ECTS)
KPP71 Catalyst surfaces	(C, 20 ECTS)

KPP80: Pollution Abatement Processes (C, 20 ECTS)

2nd Year

KPP81: Clean Energy Production (C, 20 ECTS)

KPP82 Postgraduate Diploma Thesis (C, 40 ECTS)

Note:

C[1]: Compulsory

Module Selection Instructions:

Students in the first (1st) year may select all three available modules: KPPB70, KPPB71, and KPPB80. Students who do not possess the necessary available time must first select the module PPB70, or the modules KPPB70 and KPPB71.

During the module selection, all modules from previous academic years must be selected and consequently the selection of the modules of the next academic year can begin.

The Postgraduate Diploma Thesis is carried out in parallel with the last module of the course, after the successful completion of all three modules of the Programme.

It is clarified that in order to complete the Programme in two academic years, students must successfully complete during the first academic year three modules (according to the above instructions) and during the second year the last module simultaneously with the Postgraduate Diploma Thesis.

The presentation of the Postgraduate Diploma Thesis takes place after the successful completion of the program's Modules.

To earn the Master's degree, students must successfully complete four modules and successfully complete and present their Postgraduate Diploma Thesis.

Course Modules

KPP70 Catalysis

Module code: KPP70

ECTS Credit Points: 20

Module Type: Compulsory

Year: 1st

Language: Greek

Module general description: The module presents the general characteristics of Catalysis and introduces students to the world of catalysts and catalytic reactions and the study of the catalytic phenomenon through important categories of catalysts that act either dissolved in a solvent (homogenous catalysis), in a biochemical environment (enzymatic catalysis), or as solid surfaces (heterogenous catalysis). Furthermore, the module aims to present the basic concepts of the science of surfaces that are closely related to Catalysis.

Analytical Module Content:

- Introduction
- Catalysis in solutions of acids and bases
- Catalysis in solutions of transition element complexes
- Enzymatic catalysis
- Heterogeneous acid-base catalysis: Zeolites

- Catalysis on the surface of transition metals: Hydrogenation, dehydrogenation and hydrogenolysis of hydrocarbons
- Catalysis on the surface of transition metals: Hydrogenation of CO and catalytic synthesis of NH_3
- Catalysis on the surface of transition metals: Catalytic oxidations
- Catalysis on the surface of transition metal oxides: Redox reactions
- Catalysis on sulfide surfaces of transition metals: Hydrotreatment reactions
- Introduction to surface science
- Basic Concepts of vacuum Technology
- Surface analysis
- Surface structure
- Electronic properties of surfaces
- Surface atomic motion
- Thin films on solid surfaces

Learning Outcomes: Upon successful completion of KPPB70, students will be able to:

- Present in detail the basic concepts of homogenous, enzymatic, and heterogenous catalysis (e.g. activity, selectivity, and stability of catalysts, measures of activity and selectivity, active sites, the catalytic cycle, deactivation and regeneration of catalysts, the general mechanism of catalytic action).
- Taxonomize catalysts and catalytic reactions into crucial reaction categories and present in detail the various aspects of catalytic function per catalyst category (e.g. protonic catalysis in solutions and catalytic surfaces, homogenous catalysis with organometallic complexes, enzyme catalysis, the catalytic activity of metals, oxides, and sulphides).
- Present the basic concepts and methods of the science of surfaces and how it is implemented in heterogenous catalysis.
- Discuss the contributions of catalysis to the chemical industry, the destruction of pollutants, the improvement of traditional fuels and the development of environmentally friendly fuels and processes.
- Identify the post suitable catalyst for a given catalytic reaction.
- Combine various catalytic materials to perform a composite catalytic procedure.

Subjects covered:

- Homogeneous Catalysis
- Enzymic Catalysis
- Heterogeneous Catalysis
- Surface Science

Prerequisites: There are no prerequisite courses.

Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.
The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

KPP71 Catalyst surfaces

Module code: KPP71
ECTS Credit Points: 20
Module Type: Compulsory
Year: 1st
Language: Greek
Module general description: The module focuses on solid catalysts and especially on their surface characteristics. It deals with the structure, preparation and physicochemical characterization of solid catalysts as well as the "physicochemistry" of the reactions that take place on the catalytic surfaces.
More specifically, the structure and general characteristics of solid catalysts are studied, as well as the physicochemical basis of the preparation methods of unsupported and supported catalysts. In addition, the techniques of determining the physical and overall chemical characteristics of solid catalysts, as well as the chemical characteristics of catalytic surfaces, are studied. Adsorption and reaction kinetics on catalytic surfaces are also studied, as well as the effect of mass and heat transfer phenomena on the kinetics of heterogeneous catalytic processes. Finally, the module presents and describes the laboratory catalytic reactors.
Learning Outcomes: Upon successful completion of KPPB71, students will be able to:

- Describe the constituent materials of a static catalyst,
- Describe the physico-chemical characteristics that the constituent materials of a solid catalyst must possess in order to be suitable for specific catalytic processes,
- Explain how the physico-chemical constituents of a static catalyst may be altered during a catalytic process,
- Describe the primary methods of preparing carriers, unsupported and supported catalysts,
- Describe the “oxide/aqueous solution” interface,
- Select the suitable physico-chemical methods of determining specific physical, overall chemical or surface chemical characteristics of solid catalysts,
- Describe the basic principles, corresponding experimental provisions and corresponding experimental processes of the primary methods for determining physical, overall chemical or surface chemical characteristics of static catalysts,
- Describe from both a qualitative and quantitative perspective the kinetics of reactions on catalytic surfaces and the influence of mass and heat transfer phenomena on it,
- Describe the most prominent types of catalytic reactors,
- Select the most suitable laboratory catalytic reactor for a given study.

Subjects covered:

- Structure of solid catalysts
- Synthesis of static catalysts
- Characterization of catalytic surfaces
- Mechanics of catalytic reactions

Prerequisites: There are no prerequisite courses.

Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

KPP80: Pollution Abatement Processes

Module code: KPP80

ECTS Credit Points: 20

Module Type: Compulsory

Year: 1st

Language: Greek

Module general description: The module aims to familiarize postgraduate students with advanced adsorptive, catalytic, and photocatalytic anti-pollution processes, i.e. processes for the destruction or capture of atmospheric pollutants released from static sources (e.g. industrial installations) and mobile sources (e.g. vehicles), as well as processes for the control of pollutants found in various types of waste.

Analytical Module Content:

- Air pollution
- Liquid pollution
- The interface between a charged surface of a solid adsorbent and an aqueous solution
- Adsorption
- Adsorbent materials
- Adsorption technology in antipollution processes
- Control of mobile source emissions
- Control of emitted nitrogen oxides (NOx) from static sources
- Control of emitted volatile organic compounds (VOCs) from static sources
- Catalytic combustion
- Controlling the use and escape of chlorofluorocarbons (CFCs)
- Control of incoming ozone (O3) in aircraft
- Control of carbon dioxide (CO2) and nitrogen oxide (N2O) emissions
- Control of emitted sulfur dioxide (SO2) from static sources
- Catalytic processes of liquid waste and drinking water

Learning Outcomes: Upon successful completion of KPPB80, students will be able to:

- Describe the formation of the main gaseous and liquid pollutants emitted – discharged from mobile and static sources and explain the need to control their emissions, indicating the adverse effects these pollutants have on the environment.
- Describe the structure and composition of the interface that develops between an adsorbent and the aqueous phase.

- Present from both a qualitative and quantitative perspective the adsorption of substances from the gaseous and aqueous phase onto the surface of adsorptive materials.
- Select the most suitable adsorptive material for a given gaseous or aqueous pollution abatement process.
- Select the most suitable adsorption technologies for implementation in the corresponding pollution abatement processes.
- Describe the main primary and secondary catalytic and adsorptive methods of emission control and their function.
- Propose established (state of the art) or potential catalysts for the catalytic methods of emission control and justify their selection based on the conditions a catalyst must have for a given control method, pollutant, and emission source.
- Describe existing and potential applications of catalytic combustion for both primary and secondary control of air pollutant emissions, such as nitrogen oxides (NOx) and volatile organic compounds (VOCs).
- Describe the impact of chlorofluorocarbons (CFCs) on stratospheric ozone and climate change and report on catalytic and non-catalytic processes for the destruction or utilization of CFC stocks.
- Define the basic concepts of photocatalysis and describe photocatalytic processes for the treatment of sewage and potable water.

Subjects covered:

- Catalytic Pollution Abatement Processes
- Adsorptive Pollution Abatement Processes

Prerequisites: There are no prerequisite courses.

Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

KPP81: Clean Energy Production

Module code: KPP81

ECTS Credit Points: 20

Module Type: Compulsory

Year: 2nd

Language: Greek

Module general description: The main objective of the module is to educate students on issues concerning advanced processes related to the clean energy production. More precisely this module aims to familiarize students with the main refinery processes and especially with those targeting to the production of environmental friendly conventional fuels

(hydrodesulphurization), the production of biofuels (bioethanol, biodiesel, renewable diesel, and biogas) and the production, storage and use of hydrogen (Fuel Cells) for the production of electric energy.

Learning Outcomes: After completing this module, the student should be able to:

- Describe the basics of the operation of a petroleum refinery and state the main products.
- Describe the chemistry, operational conditions and required characteristics of catalysts used in the main catalytic processes of a petroleum refinery (reforming, isomerization, catalytic pyrolysis and hydrotreatment).
- Discuss the importance of biofuels for the sustainable growth.
- Describe the production processes of the main biofuels (bioethanol, biodiesel, renewable diesel, biogas, liquid synthetic fuels from gasification of lignocellulosic biomass, liquid biofuels from liquefaction / pyrolysis of lignocellulosic biomass, biofuels from microalgae, and biohydrogen) and discuss their role in the environmental protection.
- Propose suitable catalysts for biofuels production processes.
- Explain the necessity of introducing hydrogen to the energy mix and state the relevant problems which are currently opposing the hydrogen economy.
- Describe the chemistry, operational conditions and catalyst requirements for the catalytic processes used for the production of hydrogen from hydrocarbons (steam or CO2 reforming, catalytic partial oxidation and autothermal reforming).
- Describe processes for the production of hydrogen which are based on the electrolytic, thermochemical or photocatalytic decomposition of water.

Subjects covered:

- Production of clean petroleum fuels
- Methods for the exploitation of biomass for biofuels production
- Production, storage, transportation and use of hydrogen as alternative fuel

Prerequisites: There are no prerequisite courses.

Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

KPP82 Postgraduate Diploma Thesis

Module code: KPP82

ECTS Credit Points: 40

Module Type: Compulsory

Year: 2nd

Language: Greek

General Description:

Aim

The aim of the PDT is to complete the students' knowledge and develop their skills in the processing of independent topics in the Science of Catalysis and its applications in Environmental Protection and Clean Energy Production. The work is carried out based on the student's special interest in a subject, always in consultation with the supervisor and on the condition that the subject is related to the academic subjects of the PDT.

Content

The Diploma Thesis constitutes an individual, self-contained, in-depth scientific and systematic approach to the analysis of a topic and the synthesis of a solution or proposal. It draws on existing literature and/or original research. The Diploma Thesis has a research, study, development or applied research character and is prepared by each student individually. With the guidance of the supervisor, students are given the opportunity to gain significant experiences from the comprehensive study and in-depth investigation of a distinct subject of specialization and are challenged to develop critical and combinatorial thinking, organization and analysis skills, applying the systematic and scientific approach. Through his research, the student must demonstrate the ability to identify problems and challenges in the specific field, evaluate results and propose alternative solutions or strategies.

Procedure

The student submits a proposed thesis topic title, accompanied by the purpose, methodology and expected results. The program proposal must be approved by the supervising professor before the student begins the work. The student is then in constant contact with the supervisor throughout the preparation of the thesis, with continuous guidance and feedback. At the end, the student submits a comprehensive scientific report, which he defends with an oral presentation (supporting a master's thesis) in public and before a three-member examination committee.

Learning Outcomes: Upon successful completion of the PDT, the student will:

- have studied in depth a specific topic of the scientific areas that PDT treats
- have used his relevant knowledge from his studies and developed his compositional ability
- have learned to look for appropriate scientific information through the relevant scientific literature
- be able to design a research plan and develop an appropriate methodology for approaching and investigating a topic under study and organize a plan for its implementation
- have acquired skill in writing a scientific text
- have acquired skill in the organization and oral presentation of a scientific topic
- be able to clearly present his conclusions, as well as the knowledge and reasoning on which they are based, successfully making a comprehensive presentation via ICT, before the three-member examining committee and the public
- be able to describe and document the basic knowledge related to the topic of the thesis
- be able to summarize the existing scientific knowledge and expertise in the subject of the thesis

- be able to combine knowledge to propose solutions to relevant problems or applications
- be able to select appropriate technical/technological approaches and adapt them to the problem to be solved using original thinking
- be able to evaluate the approach/solution he proposes, placing it in a context of comparison with equivalents in the Greek and international literature and commenting on its relative advantages and disadvantages, documenting his opinions and choices

General Regulation for Preparing Graduate Dissertations in PC with an annual Module Correspondence

For more information regarding the Specifications – Useful Material for writing Master's Theses and uploading a Thesis at the H.O.U. Repository, you can go to the Digital Training Area **http://study.eap.gr** and especially to the Program of Studies section.

Prerequisites: The presentation of the Postgraduate Diploma Thesis takes place after the successful completion of the program's Course Modules.

Master in Mathematics MSc

Description

The programme is addressed to mathematicians and intends to offer a more profound understanding of several topics of pure and applied mathematics and as well as of basic concepts of mathematical education.

Learning Outcomes

The program provides a masters level science degree usin methods for distance learning emphasizing on realizable outcomes for students with mathematical background.

On the successful completion of the program students will

- have a systematic understanding and knowledge of the fundamental and advanced concepts, theorems and methods of Real Analysis, of Linear Algebra and of Stochastic Mathematics
- be experienced in developing mathematical models for phenomena arising in the physical sciences, in medicine or in Technology,
- be able to analyze and solve the mathematical problems involved in the modelling process using analytical or numerical methods including differential equations and/ or integral equations,
- get experienced in using a scientific software, like Mathematica, for studying numerically mathematical problems,
- be able to use the Mathematica software, along with other scientific softwares, in teaching mathematics in all education study cycles.

Moreover, the program offers several optional modules. After successfully completed their particular choice of modules the students will acquire special knowledge and understanding. In particular:

By choosing the division in Pure Mathematics the students will be able to:

- to assimilate complex mathematical ideas and arguments from the area of Analysis or from the areas of Algebra and Geometry
- apply the acquired knowledge to the study of problems in other branches of mathematics and in Mathematics education

By choosing the division in applied Mathematics the students will be able to:

- solve mathematical problems that model complex physical phenomena

By choosing the division in Mathematics Education the students will be able to:

- understand in depth the development and the historical evolution of mathematical ideas, mathematical structures and mathematical fields and
- use effectively the acquired knowledge in advancing the teaching techniques in Mathematics education

General skills that the students will be able to demonstrate, upon completing the program "Postgraduate Studies in Mathematics":

- comprehensive understanding and efficient use of complex mathematical concepts and arguments
- development of mathematical and physical intuition
- clarity in arguments and effective oral communication on mathematical ideas and conclusions about mathematics
- effective communication in scientific writing about a mathematical issue
- ability to present their thesis to a relative scientific audience
- ability to advance knowledge and understanding through independent learning
- development of relevant skills for performing scientific research in the field of their specialization, in the frame of a PhD course.

Admission Requirements

The Post-graduate programme accepts graduates or higher institution diplomas of related disciplines. The programme is offered in Greek.

The knowledge of a foreign language and good computer-Internet skills would be useful for the successful participation in the programme.

Note:

Holders of a degree or diploma of higher education means graduates of Greek Universities or Polytechnics or Higher School of Fine Arts or Higher School of Pedagogical and Technological Education or Higher Technological Educational Institutions (ATEI) or those who hold academically equivalent first cycle degrees from recognized foreign educational institutions with the degrees awarded by the Greek Higher Educational Institutions, in accordance with the provisions of article 304 of Law No. 4957/2022 (Government Gazette 141/21.07.2022, vol.)

Marking:

For the evaluation of the application to the Postgraduate Studies Programme, it will be examined whether the candidate's institution of study is or may be included in the National Register of Recognised Higher Education Institutions of Foreign Countries and whether the candidate's degree is or may be included in the National Register of Types of Degrees of Recognised Institutions of Foreign Countries.

The Hellenic Open University, if the degree is included in the list of article 307 of Law No. 4957/2022, must request a "Certificate of Place of Study", which is issued and sent by the foreign university. If the place of study or part of the studies is confirmed as the Greek territory, the degree is not recognized, unless the part of the studies that took place in the Greek territory is in a public higher education institution or in a recognized foreign educational institution within the meaning of paragraph b) of article 299 of Law No. 4957/2022.

Minimum study duration

2 academic years

ECTS credit points

120

Classification according to ISCED-2011 of UNESCO

- Based on the level of Education: 7
- Based on the field of Education: 46 Mathematics and statistics

Classification according to ISCED-2013 of UNESCO

- Based on the field of Education: 0541 Mathematics

Learning Material

Learning material used is mainly printed textbooks but also audiovisual and electronic learning material. The printed material is especially adapted to meet the needs and standards of distance education.

Chapters clearly state aims and objectives. Key concepts and expected learning outcomes. Self-assessment questions and exercise.

Alternative teaching material. To assist the students to a better understanding of the main teaching material. It utilizes, clarifies and enriches, if necessary, the already existing material.

Contact

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Divisions

The Postgraduate Programme leads to the acquisition of a Master's Degree "Master in Mathematics" in one of the following divisions:

- A: Pure Mathematics (MSM83 or MSM85)
- B: Applied Mathematics (MSM82 or MSM84)
- C: Mathematics Education (MSM81)

The PSP awards Master's Diplomas with the following titles: "Master in Mathematics, Specialization in Pure Mathematics", "Master in Mathematics, Specialization in Applied Mathematics", and "Master in Mathematics, Specialization in Mathematics Education", depending on selection of Modules.

Specialization A: Pure Mathematics (selection of MSM83 or MSM85)
Specialization B: Applied Mathematics (selection of MSM82 or MSM84)
Specialization C: Mathematics Education (selection of MSM81)

Course Structure

1st Year	
MSM70 Fundamental Theories and Methods in Mathematics	(C^1, 30 ECTS)
MSM71 Mathematical Models In The Physical Sciences	(C, 30 ECTS)
2nd Year	
MSM80 Computational Methods And Software In Mathematics	(C, 20 ECTS)
MSM81 Historical Evolution & Mathematical Education	Compulsory (For division C, 20 ECTS)
MSM82 Applied Mathematical modelling	(OM^2, 20 ECTS)
MSM83 Analysis	(OM^3, 20 ECTS)
MSM84 Stochastic Mathematics	(OM^2, 20 ECTS)
MSM85 Algebra and Geometry	(OM^3, 20 ECTS)
MSM86 Postgraduate Thesis	(C, 20 ECTS)

Notes:
C^1: Compulsory
OM^2: Optional Mandatory for division B
OM^3: Optional Mandatory for division A
MSM81 is Compulsory for division C

Module Selection Instructions

In order to earn the Master's diploma in mathematics in two years, students are required to select the Modules MSM70 and MSM71 in their first academic year. In their second academic year students are required to select MSM80, and must also select their preferred optional Module, while also preparing and presenting their Postgraduate Thesis.

In any other case, students must first select MSM70 and then the other Modules available in the curriculum. During the module selection, all modules from previous academic years must be selected and consequently the selection of the modules of the next academic year can begin. Additionally, students who wish to select MSM82 must first successfully complete MSM71.
For example, a possible course of studies could be:
1st term: MSM70
2nd term: MSM71, MSM80
3rd term: Optional Modules (MSM81 or MSM82 or MSM85), Postgraduate Thesis
The presentation of the Postgraduate Thesis place after the successful completion of the program's Modules.
To earn the Master's degree, students must successfully complete four modules and successfully complete and present their Postgraduate Thesis.
It must be noted that the two first year modules, MSM70 and MSM71, both entail a considerable workload, a fact reflected in their academic credits (ECTS), compared to those of the other available Modules. Thus, it is recommended that only students who plan to earn the

Master's Degree in two years and possess the necessary required time to participate concurrently in both Modules.

Course Modules

MSM70 Fundamental Theories and Methods in Mathematics

Module code: MSM70
ECTS Credit Points: 30
Module Type: Compulsory
Year: 1st
Language: Greek
Module general description: The objective of the module MSM70 is to teach fundamental mathematical knowledge and techniques from Analysis, Linear Algebra, Probability Theory, and Statistics, in order for students to obtain the necessary foundations to successfully participate in the thematic units of the second term of studies. Lessons will focus on fundamental mathematical principles and familiarization with calculations.
Curriculum of the Module: In particular, the curriculum of MSM70 includes the following topics:
Metric spaces (topology of metric spaces, sequences, continuity). Complete metric spaces. Fixed point theorems. Completion of metric spaces. Normed vector spaces. Matrices.
Eigenvalues - Eigenvectors. Linear Systems. Probability. Conditional probability and independence. Discrete random variables.
Learning Outcomes: Upon successful completion of the module MSM70 "Fundamental Theories and Methods in Mathematics", students will have developed the following skills:

- Knowledge and understanding of the fundamental topological properties of Metric Spaces, such as convergence, continuity, completeness, connectedness and compactness,
- Knowledge and understanding of the fundamental theorems of Linear Algebra, in particular the theorems concerning the structure and properties of finitedimensional vector spaces, linear transformations, matrices, and linear systems of equations,
- Ability to utilize the tools of Linear Algebra in modelling physical problems,
- Ability to implement the aforementioned tools to solve linear systems of differential equations, study Markov chains, and in linear programming,
- Knowledge of the fundamental concepts of Probability Theory and discrete random variables, and the ability to apply the theory in modeling physical problems,
- Ability to make calculations using the forenamed mathematical tools.

General Learning Outcomes: Upon successful completion of MSM70, students will have obtained the following:

- Comprehension of the basic mathematical theories,
- Attainment of the necessary mathematical knowledge to successfully participate in the other thematic units of the curriculum

Subjects Covered:

- Real Analysis
- Linear Algebra

- Elements of Stochastic Mathematics

Prerequisites: There are no prerequisite courses.

Evaluation: Students are assigned to submit six (6) written assignments during the academic year. The average grade of the six (6) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the six (6) assignments and (b) at least four (4) of the six (6) written assignments have been submitted.

MSM71 Mathematical Models In The Physical Sciences

Module code: MSM71

ECTS Credit Points: 30

Module Type: Compulsory

Year: 1st

Language: Greek

Module general description: The module MSM71 aims to provide knowledge on mathematical methods and tools for the analysis of mathematical models in Physical Sciences and Modern Technology.

Curriculum of the Module: In particular, the curriculum of THE MSM71 includes the following topics:

Ordinary Differential Equations (ODEs) and **Systems of ODEs**: Qualitative theory. Phase plane, equilibrium point characterization, Bifurcations, Lyapunov method for studying stability, Sturm theory, Sturm Liouville boundary value problems (BVP).

Partial Differential Equations (PDEs): First order PDEs: Methods for solving linear and non-linear PDEs, classical solutions, weak solutions, shock waves. Second order Linear PDEs: classification, methods of solution: method of separation of variables, Fourier and Laplace integral transforms, Poisson Integral, Green's method. Properties of harmonic functions. Extreme values theorems. Green's function for BVPs.

Linear Operators: Duality and conjugate operators. Green's method for BVPs with linear operator. Existence of solution via alternative Fredholm theorem.

Integral Equations of Fredholm and Volterra type: existence of solution via alternative Fredholm theorem, or fixed point theorem, iterative methods (Successive Approximations, solvent kernel via iterative kernels or Fredholm determinants), Characteristic values and eigenfunctions. Separable kernels and symmetric kernels (Hilbert–Schmidt theory) Fourier and Laplace Integral transform methods. Transformation of integral equations to BVPs or to Initial Value Problems and vice versa.

Learning Outcomes: Upon successful completion of MSM70 "Mathematical Models in the Physical Sciences", students will have developed the following skills:

- Ability to investigate Boundary Value problems, involving Ordinary Differential Equations (ODEs) or ODE systems, to find a unique solution and determine its stability,
- Ability to identify and categorize Partial Differential Equations (PDEs) and Integral Equations (IEs), in order to correctly solve them,

- Ability to apply analytical methods for their solution, such as the Separation of Variables method wherever applicable, the use of integral transformations and the use of the fundamental solution of the corresponding Differential Operator,
- Ability to investigate and find a subspace in which a problem defined by a general linear operator is solvable,
- Ability to study a mathematical problem consisting of an ODE or a PDE and auxiliary conditions as to its well-posedness, i.e., the existence, uniqueness and stability of its solution
- Ability to construct a consistent mathematical model to describe a physical process, such as equilibrium potential, diffusion of a substance, wave propagation, etc.,
- and formulate the corresponding mathematical Boundary and/or Initial Value Problem,
- Ability to construct the Green's function of a Boundary Value problem, using analytical
- methods,
- Ability to use the Green's function in addition to the appropriate integral representations and transformations to solve a Boundary Value Problem.

General Learning Outcomes: Upon successful completion of MSM71, students will have obtained the following:

- Ability to express a mathematical problem in mathematical terms,
- Ability to organize and utilize the knowledge they have obtained through studying and solving individual problems.
- Ability to comprehend and present the modern literature on PDEs, IEs, and their applications in the Natural sciences.

Prerequisites: There are no prerequisite courses.

Subjects Covered:

- Methods for the Analysis of Mathematical Models in Science and Modern Technology
- Differential Equations
- Integral Equations

Evaluation: Students are assigned to submit six (6) written assignments during the academic year. The average grade of the six (6) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the six (6) assignments and (b) at least four (4) of the six (6) written assignments have been submitted.

MSM80 Computational Methods And Software In Mathematics

Module code: MSM80

ECTS Credit Points: 20

Module Type: Compulsory

Year: 2nd

Language: Greek

Module general description: The principal aim of the module MSM80 is to provide the student with substantial experience in using scientific software packages for symbolic and numerical

computations for teaching and research, in order to solve problems stemming from natural sciences corroborating a variety of analytical and computational methods.

Curriculum of the Module: In particular, the curriculum of MSM80 includes the following topics:

Introduction to basic software commands and the Wolfram Language: Definition of functions, symbolic and numerical computation of series and integrals. Functions of several variables, derivatives and partial derivatives. Basic commands for graphical representations, plots of parametric curves in 2D and 3D. Basic commands for handling linear algebra problems (matrix calculus, determinants, eigenvalues and eigenvectors). Lists. Basic symbolic and numerical solving commands for ordinary differential equations. Introduction to the mathematical theory of dynamical systems - Study of non-linear phenomena using software (limit cycles and chaotic phenomena). Basic commands for the study of power series and Fourier series - Implementations of representations by using the software capabilities. Introduction to finite difference numerical methods for partial differential equations. Eigenvalue problems and studies with relevant software commands. Study of partial differential equations by using the software capabilities: Implementations of the representations of the solutions for elliptic, parabolic and hyperbolic equations - Nonlinear problems (nonlinear wave propagation phenomena, reaction-diffusion equations and relevant topics) - Calculus of variations and mathematical software. Integral transformations and mathematical software.

Learning Outcomes: The successful completion of the module MSM80 "Computational methods and software for Mathematics" provides the opportunity for the student to develop the following skills

- Familiarization with the Mathematica software package and practical experience solving mathematical problems.
- Ability to use the software to teach mathematics at various educational levels
- Ability to study various linear and non-linear problems and solve them using the software.
- Ability to use Fourier series methods and then numerical methods for solving ordinary differential equations.
- Ability to use methods of dimensional analysis and perturbation theory to study otherwise unexaminable problems through the use of software packages.
- Ability to utilize methods drawn from the theory of variations by solving boundary value problems for functionals.
- Ability to develop the basic theory and methods of partial differential equations to solve problems primarily through the use of the software package.
- Ability to solve numerical problems of partial differential equations through the finite difference method.

General Learning Outcomes: Upon successful completion of MSMB80, students will have obtained the following:

- Ability to study and solve problems relating to the Natural sciences with various methods of applied mathematics,
- Ability to utilize software packages for both teaching and research purposes,
- Ability to organize and apply the knowledge they have obtained to solve individual problems.

By learning to use the software package, students will obtain a valuable asset for writing both their diploma theses and scientific papers in the fields of Mathematics and the Natural Sciences in general.

Subjects Covered:

- Computational Mathematics (Numerical & symbolic computing techniques & methods using computing systems - packages).
- Computational Applications in Mathematical Modeling.
- Educational software.

Prerequisites: There are no prerequisite courses.

Evaluation: Students are assigned to submit six (6) written assignments during the academic year. The average grade of the six (6) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the six (6) assignments and (b) at least four (4) of the six (6) written assignments have been submitted.

MSM81 Historical Evolution & Mathematical Education

Module code: MSM81

ECTS Credit Points: 20

Module Type: Compulsory for division C

Division: Mathematics Education

Year:2nd

Language: Greek

Module general description: The module MSM 81 aims to present the historical evolution of fundamental mathematical concepts as well as diachronic and contemporary trends in Mathematics Education.

Learning Outcomes: Upon successful completion of MSMB81 “History and Teaching of Mathematics”, students will have developed the following skills:

- Ability to critically assess contemporary questions in Mathematics philosophy
- In-depth knowledge of the evolution of mathematical concepts, structures, and fields
- Knowledge of the factors driving the evolution of Mathematics

More particularly, learning outcomes are the following**:**

- Ability to discern the differences between Logicism, Formalism, and Intuitionism, in addition to the influence of typical results of Logic on these philosophical schools of thought.
- Ability to analyze issues of ontology connected with the schools of mathematical philosophical thought.
- Ability to manage the truth values of mathematical claims within the philosophical school to which they belong.
- Ability to relate philosophical questions about the nature of Mathematics to their teaching practice.

- Ability to examine the structure of an axiomatic system, scrutinize its consistency, and understand the evolution of its axiomatic foundation.

Students are required to actively participate at two levels: a) in the search for reputable literature from free sources (open access journals) that supplements the arguments and critical assessment of their positions, and b) in the application of the knowledge they have obtained in practical teaching circumstances.

Students will obtain the ability to base their assertions not only on their existing experience, but also on references to reputable sources.

The unit offers students the opportunity to develop their ability to manage the knowledge they have obtained, edit scientific papers, and write critical, scientifically documented assertions.

Furthermore, students shall become acquainted with assessing scientific papers drawn from journals and drawing key positions and conclusions from them.

To better connect the aforementioned subjects, students will write “case studies”.

Finally, a separate part of the unit dedicated to the interaction between modern Mathematics and Cognitive Science.

Subjects Covered:

- Historical Evolution of Fundamental Mathematical Concepts
- Diachronic and Contemporary Trends in Mathematics Education
- Foundations of Mathematics & Modern Mathematical Theories

Evaluation: Submission of six (6) written assignments during the academic year, the weighted average grade of which constitutes a 33 percent of each student's grade, if a pass grade (≥5) is obtained in the final or resit examination. The grade of the final or the resit exams is weighted at 67% for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the six (6) assignments and (b) at least four (4) of the six (6) written assignments have been submitted.

MSM82 Applied Mathematical modelling

Module code: MSM82

ECTS Credit Points: 20

Module Type: Optional Mandatory (Students choose between course modules MSM82 and MSM84)

Division: Applied Mathematics

Year: 2nd

Language: Greek

Module general description: The course aims to give students a detailed and practical introduction to basic concepts of Mathematical Modeling and specifically to the concepts of dimensional analysis, scaling, perturbation methods (regular perturbation methods, multiple scales methods, boundary layer method) with the use certain case studies. Additionally the process of mathematical modelling is applied to present the basic concepts of acoustic scattering and tumor growth, as well as the application of electroencephalography (EEG) and magnetoencephalography (MEG). Finally an introduction of the basic concepts of simulation and the programming package OCTAVE is presented.

Curriculum of the Module: The curriculum of MSMB82 includes the following topics:

- Introduction to Mathematical Modelling. Basic Concepts.
- Methods of Mathematical Modelling, Dimensional Analysis, Scaling,
- Perturbation Methods (Regular Perturbation Methods, Poincare Lindstedt Method, Multiple Scales Method, Boundary Layer Theory). Applications Mathematical Models for Diffusion Phenomena.
- Distributions, Green's functions, PDE's of 1st order, Shocks, Mathematical Modelling of Traffic Flow.
- Euler's equations for fluid motion. Derivation of Helmholtz equation. Acoustic Scattering integral representations, Basic Theorems, Low Frequency Scattering
- Mathematical models for E*lectroegephalography* (EEG) and Magnetoencephalography (MEG).
- Basic concepts on simulation. Discrete and Continuous models. Simulation Algorithms.
- Language Programming OCTAVE (MATLAB)

Learning Outcomes: Upon successful completion of MSM82 "Applied Mathematical Standardization", students will have developed the following skills:

- Ability to describe in mathematical terms processes that occur in problems of physics, the biomedical sciences, and continuous-medium engineering.
- Ability to identify and express the dominant mechanisms of physical and biological phenomena, including fluid flow, blood flow, electrochemical nerve impulses, cancer tumor growth, etc.
- Ability to analyze, reproduce, and develop mathematical models related to the Natural Sciences, Medicine and Technology, through applications in wave propagations and scattering as well as heat and mass transfer.
- Ability to apply analytical methods to solve mathematical problems that express phenomena (separation of variables, techniques for solving integral equations, perturbation methods, calculus of variations, etc.)
- Ability to perform parametric studies and draw conclusions regarding model stability and accuracy
- Ability to use mathematical packages (e.g. Mathematica, Matlab, etc.) to validate obtained results, make predictions, and further develop a mathematical model or investigate a process.
- Ability to construct simulation models in Octave-Matlab
- Ability to evaluate a mathematical model through estimation of its solution as derived from its analytical and/or numerical processing and from the corresponding simulation model.

General Learning Outcomes: Upon successful completion of MSM82, students will have:

- Obtained incentives for research in mathematical physics, continuum mechanics, and mathematical standardization
- Obtained experience and the ability to apply mathematical methods in the standardization of processes from various scientific fields
- Learned to identify the mathematical model that exists within a physical process or phenomenon

- Obtained the ability to present a scientific paper or conclusion to both a scholarly and a general audience.
- Learned to communicate with scientists and mechanics from various different fields

Subjects Covered:

- Mathematical modelling
- Simulation
- Applications of mathematical modelling in Science, Medicine, and Technology

Prerequisite Courses: Successful completion of MSM71.

Evaluation: Students are assigned to submit six (6) written assignments during the academic year. The average grade of the six (6) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.
The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.
Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the six (6) assignments and (b) at least four (4) of the six (6) written assignments have been submitted.

MSM83 Analysis

Module code: MSM83

ECTS Credit Points: 20

Module Type: Optional Mandatory (Students choose between course modules MSM83 and MSM85)

Division: Pure Mathematics

Year: 2nd

Language: Greek

Module general description: The Module MSM83 discusses advanced elements of Functional Analysis and Operator Theory.

Curriculum of the Module: In particular, the curriculum of MSM83 includes the following topics:
Metric spaces (topology of metric spaces, sequences, continuity). Complete metric spaces. Fixed point theorems, Cantor, Baire. Completion of metric spaces. Normed vector spaces. Banach spaces. Continuous linear operators and linear functionals in normed spaces, norm of a linear operator, dual space and examples. Inner product spaces. Hilbert spaces (orthogonality, Riesz representation theorem, orthonormal bases). Linear operators on Hilbert spaces (adjoints, orthogonal projections, normal, hermitian and compact operators). Hahn-Banach theorem. Reflexive spaces. The principle of uniform boundedness. Open mapping theorem and bounded inverse theorem. Closed graph theorem. Locally convex spaces. Separation theorems. Continuous functionals in Schwartz spaces. Bounded linear operators on Banach spaces (dual and compact operators). Banach algebras. Spectrum in Banach algebras. Ideals. Spectrum of bounded linear operators in Banach spaces (e.g point, approximate). Spectral theory of compact operators in Banach (or Hilbert) spaces. Unbounded operators in Hilbert spaces (closed, closable, symmetric, hermitian).

Learning Outcomes: Upon successful completion of MSM83 "Analysis", students will have developed the following skills:

- Knowledge and understanding of the fundamental theorems of Functional Analysis, such as the Hahn-Banach Theorem, the Homomorphic Barrier Theorem, and the Open Representation Theorem
- Knowledge of the basics of the theory of normed spaces
- Knowledge of the basics of the theory of classical Banach spaces
- Knowledge of the basics of the theory of Hilbert spaces
- Knowledge and comprehension of the basics of the theory of blocked linear operators in Hilbert spaces
- Ability to apply techniques from Functional Analysis and Operator Theory to the study of problems from Differential Equation Theory

General Learning Outcomes: Upon successful completion of MSM83, students will have:

- Understood the basic concepts and techniques of Mathematical Analysis
- Obtained the ability to apply these techniques to problems in other fields of mathematics

Subjects Covered:

- Elements of Operator Theory
- Functional Analysis

Prerequisites: There are no prerequisite courses.

Evaluation: Students are assigned to submit six (6) written assignments during the academic year. The average grade of the six (6) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the six (6) assignments and (b) at least four (4) of the six (6) written assignments have been submitted.

MSM84 Stochastic Mathematics

Module code: MSM84

ECTS Credit Points: 20

Module Type: Optional Mandatory (Students choose between course modules MSM84 and MSM82)

Division: Applied Mathematics

Year: 2nd

Language: Greek

Module general description: This course includes basic Probability theory and theory of Stochastic processes and also Applications in Stochastic Modelling.

Curriculum of the Module: A detailed description of the course content follows

- Probability Theory: Random experiments and probability spaces, conditional probability and independent events, discrete and continuous random variables (rv), probability mass function and probability density function of a rv, cumulative

distribution function, expectation and variance, the most important discrete and continuous random variables, distribution for a function of a rv, multidimensional rvs and distributions, independence of variables, covariance and correlation, generating functions, laws of large numbers, Central Limit Theorem.

- Stochastic Processes: Stochastic processes in discrete and continuous time, with discrete and continuous values, Markov property, Markov processes in discrete and continuous time, transition and stationary probabilities, Poisson process, random walks, martingales, renewal processes.
- Stochastic Modelling:
    - queuing models with one and multiple serves, exponential models, queueing networks,
    - reliability theory, structure functions, reliability of a system with independent components, system lifetime,
    - Brownian motion: definition and properties, application to gambler's ruin problem, variations of Brownian motion, applications in finance.

Learning Outcomes: Upon successful completion of MSM84 "Stochastic Mathematics", students will have developed the following skills:

- Knowledge of the basics of Probability Theory: probability space, random variables, independence, the function of probability distribution, law of large numbers, central limit theorem,
- Knowledge of the basics of stochastic process theory: discrete stochastic processes, Markov chains, random walks,
- Knowledge of the basics of Stochastic Modelling theory: queueing theory, reliability theory,
- Ability to apply their obtained knowledge in modelling of problems from other disciplines: finance, environmental sciences, engineering, etc.

General learning outcomes: Upon successful completion of MSM84, students will have obtained the following:

- Knowledge of the basic concepts of Probability Theory and Stochastic Process Theory, and capacity to comprehend the stochastic modelling of problems from other disciplines.
- Knowledge of the techniques necessary to construct and study stochastic models and ability to apply them in practice.

Subjects Covered

- Probability Theory
- Stochastic Processes
- Stochastic Modeling

Prerequisites: There are no prerequisite courses.

Evaluation: Students are assigned to submit six (6) written assignments during the academic year. The average grade of the six (6) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.
The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the six (6) assignments and (b) at least four (4) of the six (6) written assignments have been submitted.

MSM85 Algebra and Geometry

Module code: MSM85
ECTS Credit Points: 20
Module Type: Optional Mandatory (Students choose between course modules MSM85 and MSM83)
Division: Pure Mathematics
Year: 2nd
Language: Greek
Module general description: Module MSMB85 discusses the basic elements of Number Theory and its applications in Cryptography, the basic elements of Group Theory and the theory of Euclidean spaces and their isometry groups.
Curriculum of the Module: In particular, the curriculum of the MSM85 includes the following topics:
Number Theory and Algebraic Structures

- Euclidean Division – Arithmetic Algorithms – Fast Multiplication – Greatest Common Divisor – Least Common Multiple – Euclidean Algorithm - Primes– Primitive Analysis and Applications.
- Monoids – Groups – Subgroups – Cyclic Groups – Group Morphisms – Rings – Polynomials – Greatest Common Divisor – Euclidean Algorithm – Polynomial over a Field – Irreducible Polynomials.
- Congruences – Linear Congruences – The Euler ϕ function – Order of an Integer mod n – Finite Fields.
- Integer Factorization Algorithms – Primality Tests – Algorithms for the Computation
- of Discrete Logarithm.

Cryptography and Codes
Fundamentals of Cryptology – RSA, Rabin and ElGamal cryptosystems – Digital Signatures RSA, Rabin and DSA – Diffie-Hellman key protocol– Error Correcting Codes – Linear Codes – Generator Matrices – Control Matrices – Decoding.
Affine Geometry
Affine Spaces – Barycenter – Affine Subspaces – Affine Frames – Affine Maps – Affine Groups – Multilinear Maps – Multiaffine Maps – Polynomial Curves – Berstein Polynomials – Bézier Form of a Polynomial Curve – De Casteljau Algorithm – Subdivision Algorithm – De Boor Algorithm – Derivatives of Polynomial Curves – Joining Polynomial Curves.
Learning Outcomes:
Upon successful completion of MSM85 “Algebra and Geometry”, students will have developed the following skills**:**

- Knowledge of the basic elements of Number Theory
- Knowledge of the applications of Number Theory in Cryptography
- Knowledge and comprehension of Group Theory
- Knowledge of the structure of Euclidean spaces

- Knowledge of the theory of the isometric groups of Euclidean spaces, in particular dimensions 2 and 3.
- Ability to calculate and study groups of symmetries of simple geometric shapes

General Learning Outcomes: Upon successful completion of MSM85, students will have obtained the following:

- Knowledge and comprehension of the fundamental concepts of Number Theory and its applications in Cryptography
- Knowledge of the structure of Euclidean spaces and their isometric groups
- Knowledge of the interaction between Group Theory and Geometry in the study of Euclidean Spaces

Subjects Covered:

- Number Theory
- Group Theory
- Groups and Geometry

Prerequisites: There are no prerequisite courses.

Evaluation: Students are assigned to submit six (6) written assignments during the academic year. The average grade of the six (6) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the six (6) assignments and (b) at least four (4) of the six (6) written assignments have been submitted.

MSM86 Postgraduate Thesis

Module code: MSM86

ECTS Credit Points: 20

Module Type: Compulsory

Year: 2nd

Language: Greek

General Description: The purpose of the Module MSMDE is to synthesize knowledge acquired during the student's studies, through the elaboration of the Postgraduate Diploma Thesis.

The topics of the Diploma Theses concern Mathematical Science and its Applications. They are related to the specialized cognitive areas of the five Modules of the postgraduate program MSM. Also, topics can be proposed by both the Coordinators and the Instructors of the Program and they are subject to the approval of the Academic Committee of the Program. The approved topics are posted on the University's website, before the beginning of the period of submission of the relevant statement by the students.

The M.D.E. can be theoretical-synthetic, applied-experimental or a combination of the two.

A) In theoretical-synthetic theses, students should understand a scientific topic or problem, applying for its study scientific knowledge and experience gained from the Study Program, in combination with a review of proposed literature. They should also be able to write their results and present them in public. .

B) In the applied - experimental projects, students should understand an applied scientific problem, present the tools and methodology for dealing with it and elaborate the process of solving it. They should also be able to write their findings and present them with scientific competence in public.
Therefore, the Module MSMDE, through the elaboration of the Diploma Thesis, provides the opportunity for synthesis and utilization of the knowledge acquired during the studies.
The scientific responsibility for preparing the D.E. is assigned to a three-member Evaluation Committee (EC), one member of which is responsible for the supervision and support of the student (Supervisor), in accordance with the prevailing ethics and scientific practice and respecting the principles of Open and Distance Education and Adult Education.
Learning Outcomes: Upon completion of the Module MSMDE, students will be able to:

- Implement a literature review on a scientific topic in the area of Mathematics, using bibliographic sources and relevant search tools
- search, collect, verify, process critically-synthetically and effectively present information
- analyze a complex problem by identifying the basic knowledge and tools required to solve it.
- plan the activities that lead to solving the problem, by synthesizing knowledge and skills from different subjects.
- realize, evaluate and improve the solution to the problem.
- cooperate smoothly in the context of scientific / research work, demonstrating responsibility and developing communication skills.
- effectively and creatively utilize the online / digital tools / media for the writing / editing / publication of their texts.
- write a comprehensive scientific dissertation, in which the problem, methodology and results of their work will be analyzed
- Present and publicly support their work.

General Regulation for Preparing Graduate Dissertations in PC with an annual Module Correspondence

For more information regarding the Specifications – Useful Material for writing Master's Theses and uploading a Thesis at the H.O.U. Repository, you can go to the Digital Training Area **http://study.eap.gr** and especially to the Program of Studies section.
Prerequisites: The presentation of the Postgraduate Thesis takes place after the successful completion of the program's Course Modules.

Master in Information Systems MSc

Description

The aim of this programme is to offer its students the opportunity to acquire specialized knowledge in Information and Communication Technologies, and to prepare for professional work in the design, development and management of integrated information systems. The program is targeted at science and technology graduates and covers the design and

development of programs and systems, the management and the quality of system development, and advanced issues in telecommunications and networking.

Learning Outcomes

- To understand that Information Technology (IT), is an applied Engineering Science, which provides a set of evidence-based principles, methodologies and techniques that can lead to the development of quality software products
- To understand that programming languages are the technical foundation, on which the required algorithmic concepts -as problem solving methodologies - and the required software engineering concepts -as an approach to the problem of the development of software systems- are developed
- To apply the basic concepts of the logic design and the computer architecture theory in order to design and analyze circuits and to evaluate the performance of different architectures
- To apply modern methodologies in the design and the development of large software system, such as the object-oriented development philosophy and the unified modeling language
- To combine the knowledge gained from the design of databases and the operating systems with a high level programming language, in order to proceed to the design and the implementation of simple information systems
- To apply the knowledge gained from the study of the communication protocols and the computer network theory in order to propose technological solutions at network level (simple, complex networks), at network and IT systems security, and to use network provided development services

Admission Requirements

The Post-graduate programme accepts graduates or higher institution diplomas of related disciplines. The programme is offered in Greek.

The knowledge of a foreign language and good computer-Internet skills would be useful for the successful participation in the programme.

Note 1:

There are two (2) basic prerequisites for attending this programme successfully:

- At least a very good knowledge of mathematics and/or statistical orientation of science/economic studies of the 3rd year of High School (Mathematical thinking).
- Programming knowledge in a modern high-level programming language such as Python which has been taught in post-secondary, technical or university-level courses (Basic knowledge of structured programming).

The essential knowledge is provided in schools of Sciences or Economics studies of universities or in similar schools or departments of Polytechnic schools, etc.. Of course, candidates/students may have gained this knowledge in other ways, such as empirical knowledge at work or with other certificates that may have obtained.

Note 2:

Holders of a degree or diploma of higher education means graduates of Greek Universities or Polytechnics or Higher School of Fine Arts or Higher School of Pedagogical and Technological

Education or Higher Technological Educational Institutions (ATEI) or those who hold academically equivalent first cycle degrees from recognized foreign educational institutions with the degrees awarded by the Greek Higher Educational Institutions, in accordance with the provisions of article 304 of Law No. 4957/2022 (Government Gazette 141/21.07.2022, vol.)

Marking:

For the evaluation of the application to the Postgraduate Studies Programme, it will be examined whether the candidate's institution of study is or may be included in the National Register of Recognised Higher Education Institutions of Foreign Countries and whether the candidate's degree is or may be included in the National Register of Types of Degrees of Recognised Institutions of Foreign Countries.

The Hellenic Open University, if the degree is included in the list of article 307 of Law No. 4957/2022, must request a "Certificate of Place of Study", which is issued and sent by the foreign university. If the place of study or part of the studies is confirmed as the Greek territory, the degree is not recognized, unless the part of the studies that took place in the Greek territory is in a public higher education institution or in a recognized foreign educational institution within the meaning of paragraph b) of article 299 of Law No. 4957/2022.

Contact

Student Records:

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General Information:

Tel.: +30-2610 367805 - 2610 367806 - 2610 367807 -2610 367426. E-mail: info@eap.gr

Minimum study duration

2 academic years

ECTS credit points

120

Classification according to ISCED-2011 of UNESCO

- Based on the level of Education: 7
- Based on the field of Education: 48 Computing

Classification according to ISCED-2013 of UNESCO

- Based on the field of Education: 0610 Information and Communication Technologies (ICTs)

Learning Material

Learning material used is mainly printed textbooks but also audiovisual and electronic learning material. The printed material is especially adapted to meet the needs and standards of distance education.

Chapters clearly state aims and objectives. Key concepts and expected learning outcomes. Self-assessment questions and exercise.

Alternative teaching material. To assist the students to a better understanding of the main teaching material. It utilizes, clarifies and enriches, if necessary, the already existing material.

Course Structure

1st Year	
PLS50 Basic Specializations In Theory And Software	(C[1], 30 ECTS)
PLS51 Basic Specializations In Computer Architecture And Networks	(C, 30 ECTS)
2nd Year	
PLS60 Specialization in Software Engineering	(O[2], 20 ECTS)
PLS61 Software Design and Management	(O, 20 ECTS)
PLS62 Specialization in Networks and Communications	(O, 20 ECTS)
PLSDE Postgraduate Thesis	(C, 20 ECTS)

Notes:

C[1]: Compulsory

O[2]: Optional

Module Selection Instructions

In the first year of studies students are required to successfully attend the module PLS50, then the PLS51 (or both concurrently). In the second year of studies, students may select two of the following modules: PLS60, PLS61, PLS62 and concurrently carry out the Postgraduate Thesis. Students who wish to select PLS60 or PLS61 must first successfully complete PLS50. Students who wish to select PLS62 must first successfully complete PLS51.

It is clarified that in order to complete the Programme in two academic years, students must successfully complete during the first academic year two modules (according to the above instructions) and during the second year the two last modules simultaneously with the Postgraduate Thesis.

During the module selection, all modules from previous academic years must be selected and consequently the selection of the modules of the next academic year can begin.

The presentation of the Postgraduate Thesis takes place after the successful completion of the program's Modules.

To earn the Master's degree, students must successfully complete four modules and successfully complete and present their Postgraduate Thesis.

Course Modules

PLS50 Basic Specializations In Theory And Software

Module code: PLS50

ECTS Credit Points: 30

Module Type: Compulsory

Year: 1st

Language: Greek

Module General Description: A main goal of the PLS50 Module is the students to understand that programming languages are the technical substance on which the required notions of algorithms (as methodologies of problem solving) and of software engineering (as an approach to the problem of software systems development) are developed.

In a combined coverage of the subjects “Programming Languages”, “Algorithms and Complexity” and “Software Engineering”, the goal is the student to acquire basic knowledge

for problem solving algorithms, techniques, tools and languages of programming, as well as, principles of programs' development and theoretical and applied knowledge regarding the feasibility, or the practicality of the algorithmic solutions of certain problems.
The module contains:

Programming languages

Teaching of programming (through a programming language), with emphasis on data types, flow control and iteration structures, functions/methods, simple and complex data structures, memory managements, file management, recursiveness, alphanumeric management, classes and objects, inheritance, encapsulation, abstraction, polymorphism.

Data Structures and Algorithms

Study of structures for the organization and efficient processing of data. Linear (lists, queues, stacks) and non-linear (binary trees and heaps) data structures. Hashing techniques. Search and Classification Algorithms. Graph algorithms. Divide-and-conquer algorithms. Dynamic programming. Algorithm complexity analysis.

Software technology

Software systems development and maintenance methods, tools, and procedures. Software life cycle models. Structured software analysis. Structured software design. Object-oriented software development and unified modelling language. Modelling functional requirements with use cases. Static structure modelling with class diagrams. The latest developments in software technology.

Learning outcomes: Upon successful completion of PLS50, students will achieve the following:

Knowledge:

- Ability to identify the components of programming languages and computer programs
- Ability to write source code with sequence, iteration, and selection programming procedures
- Ability to describe and define data structures and their use
- Ability to list known algorithms and the solutions they provide
- Ability to define complexity measures
- Ability to describe the software system development process
- Ability to identify the differences between object-oriented and structured analysis and software system design.

Comprehension/Applications:

- Ability to write algorithms in pseudocode form
- Ability to convert algorithms into computer programs
- Ability to implement data structures
- Ability to implement modular programs and abstract data types
- Ability to explain the representation of data structures in memory and the use of indicators
- Ability to analyze the complexity of an algorithm, through application of technical knowledge and a particular methodology
- Ability to discern the suitability of a given algorithm to solve a given problem
- Ability to explain the differences between complexity classes

- Ability to specify, analyze, design, implement, test, and maintain software, in accordance with systematic software development procedures.

Problem Solving:

- Ability to compare programming techniques in order to implement specific actions
- Ability to choose between algorithms and data structures to provide solutions for given problems
- Ability to formulate efficient solutions by developing algorithms and data structures as combinations and/or extensions of existing ones, to provide solutions for given problems
- Ability to analyze the complexity of an algorithm by combining and extending already known techniques
- Ability to propose alternative options and compare their advantages during the stages of software systems development.

Subjects covered:

- Algorithms and Complexity
- Programming Languages
- Software Technology

Prerequisites: There are no prerequisites for this module.

Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

PLS51 Basic Specializations In Computer Architecture And Networks

Module code: PLS51

ECTS Credit Points: 30

Module Type: Compulsory

Year: 1st

Language: Greek

Module General Description: Through the Module, students shall specialize in the following fields:

- Analysis and design of Combinational and Sequential Digital Circuits, the fundamental building blocks of digital systems and computer hardware,
- Computer Architecture, particularly the structure and operation of the CPU and the RAM system (main and hidden), and
- Computer Networks, including: fundamental concepts of reference model layers, structure/function/categories/types of networks, routing and data transfer protocols, etc.

Learning outcomes: Upon successful completion of PLS51, students will be able to:

- Analyze and design combinational digital circuits using logic function presentation techniques and Boolean algebra
- Analyze and design sequential digital circuits using techniques for constructing state diagrams, state tables, and excitation tables
- Utilize all the basic concepts necessary to understand Instruction Set Architectures (ISA) and instruction representation with emphasis on the RISC instruction set
- Evaluate the performance of different computer architectures by analyzing (main and hidden) memory system organization techniques, instruction-level parallelism techniques, and the rate at which instructions are executed
- Evaluate the performance of computer networks by applying different interconnection technologies at different levels of the OSI reference model
- Design and configure appropriate computer networks and hierarchical network structures for efficient routing of information and support of multiple applications.

Subjects covered

- Digital systems
- Computer architecture
- Computer networks

Prerequisites: There are no prerequisites for this module.

Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

PLS60 Specialization in Software Engineering

Module code: PLS60

ECTS Credit Points: 20

Module Type: Optional

Year: 2nd

Language: Greek

Learning Outcomes: Upon successful completion of PLS60, students will be able to:

- Utilize all the basic concepts necessary to design and implement databases, and understand the conceptual modeling techniques used in database systems.
- Make full use of the basic relational data model, integrity constraints and update operations.
- Implement a database from scratch, enter data into it and manage it by executing various types of queries (e.g., SQL).
- Describe and understand the properties of processes and the ways they communicate with each other, and implement simple examples of inter-process communication.

- Understand and apply scheduling algorithms and methods for sharing common resources while avoiding deadlocks.
- Describe and understand the ways of organizing memory in addition to the need to adopt virtual memory, paging, and segmentation.
- Utilize modern programming languages.
- Combine their knowledge of databases and/or operating systems, with a high-level programming language in order to design and/or implement simple information systems.
- Learn the basics of data science and how to use a special-purpose language for data analysis/data mining (e.g. Python or R).

Subjects covered:

- Data Management
- Operating systems
- Modern Programming Methods

Prerequisites: PLS50

Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

PLS61 Software Design and Management

Module code: PLS61

ECTS Credit Points: 20

Module Type: Optional

Year: 2nd

Language: Greek

Module General Description: The primary aim of the Module is for students to understand that the solution to a given software system development issue is based on a sturdy theoretical foundation, that includes modern software technology methodology concepts. The unit covers the subject of “Software Design”, “Software Management and Quality”, and “Human-Computer Communication”. Students are expected to become familiar with and be able to apply modern methodologies for the design of large software systems, such as the object-oriented development philosophy supported by the unified modeling language (UML), in order to design complex modern software, assisted by the corresponding tools (CASE), to manage software development projects while ensuring software quality according to the relevant principles, metrics and standards. Finally, students are expected to learn how to design, develop, and evaluate interactive computer systems with user interface design methodologies and tools accompanied by analytical and empirical techniques for the evaluation of interactive systems.

Learning Outcomes: Upon successful completion of PLS61, students will:

- Understand that the solution to a given software system development issue is based on a sturdy theoretical foundation, that includes modern software technology methodology concepts
- Become familiar with and be able to apply modern methodologies for the design of large software systems, such as the object-oriented development philosophy supported by the unified modeling language (UML),
- Design complex modern software, assisted by the corresponding tools (CASE)
- Know the fundamental concepts of object-oriented analysis and software systems design
- Convert class diagrams into object-oriented language (Java) code
- Know the basic concepts of software development project management and carry out basic management tasks for the management of the main parameters of a software development project (cost, time, effort)
- Assess and analyze the different types of risks a software development project may face
- Know the principles, metrics, and widely used software quality assurance standards
- Know the basic principles of the field of human-computer interaction (theoretical foundations, mental models, interaction techniques and technologies)
- Be able to plan interactive computer systems using methodologies and tools for designing user-friendly user interfaces
- Evaluate the usability of software applications.

Subjects covered:

- Software Design
- Software Management and Quality
- Human-Computer Communication

Prerequisites: PLS50

Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

PLS62 Specialization in Networks and Communications

Module code: PLS62

ECTS Credit Points: 20

Module Type: Optional

Year: 2nd

Language: Greek

Learning Outcomes: Upon successful completion of PLS62, students will have achieved the following results:

Knowledge:

- Ability to define network architectures
- Ability to select network protocols for specific applications, encryption algorithms and schemes, error control mechanisms in transmission and storage systems
- Ability to determine the performance limits of protocols and systems

Comprehension/Applications:

- Ability to apply addressing schemes to data networks
- Ability to design/implement multimedia communication systems
- Ability to apply security mechanisms to data networks and information systems
- Ability to program network programming applications through the application of encryption-decryption protocols.

Problem Solving:

- Ability to compare the performance of network protocols and applications
- Ability to compare the performance of security mechanisms in networks and systems
- Ability to compare the performance of encryption schemes
- Ability to decrypt cryptograms
- Ability to propose technological solutions at the network level (simple, complex networks), network security and information systems security.

Subjects covered:

- Issues of Advanced Computer Networking
- Digital Communications
- Cryptography and Network Security

Prerequisites: PLS51

Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

PLSDE Postgraduate Thesis

Module code: PLSDE

ECTS Credit Points: 20

Module Type: Compulsory

Year: 2nd

Language: Greek

General Description: The general categories of subjects for the Postgraduate Thesis (Diploma) determined by the Director of the Program after consultation with the Coordinators of the

Modules are posted on the University's website, before the start of the period for the submission of the relevant statement by the students.
The thematic fields are indicative and are linked to the specialized knowledge areas of the five Thematic Units of the PLS postgraduate study program. Also, topics can be proposed by both the Coordinators and the Instructors of the Program which are subject to the approval of the Academic Committee of the Program.
THE PLSDE includes the elaboration of a Diploma Thesis (D.E.) which will solve, at a theoretical and applied level, one or more problems that are part of the sciences and technologies of Information Technology and Telecommunications. Therefore, the PLSDE, within the framework of the D.E., provides the opportunity for synthesis and utilization of the knowledge acquired during the studies. The scientific responsibility for preparing the D.E. is assigned to a three-member Evaluation Committee (EC), one member of which is responsible for the supervision and support of the student (Supervisor), in accordance with the prevailing ethics and practice in the science of IT and Information Systems and respecting the principles of Open and Distance Education and Adult Education.
Learning Outcomes: Upon completion of their Postgraduate (Diploma) Thesis, students will be able to:

- analyze a complex problem by identifying the basic knowledge and tools required to solve it.
- plan the activities that lead to solving the problem, by identifying and adopting internationally accepted practices and synthesizing knowledge and skills from different subjects.
- realize, evaluate and improve the solution to the problem.
- adopt and apply a structured, modular and iterative problem-solving methodology.
- work smoothly with the Supervisor or his research team and the EC, demonstrating responsibility and developing communication skills.
- write a comprehensive thesis, in which the problem, the methodology and the result of their work will be analyzed.

General Regulation for Preparing Graduate Dissertations in PC with an annual Module Correspondence
For more information regarding the Specifications – Useful Material for writing Master's Theses and uploading a Thesis at the H.O.U. Repository, you can go to the Digital Training Area **http://study.eap.gr** and especially to the Program of Studies section.
Prerequisites: The presentation of the Postgraduate Thesis takes place after the successful completion of the program's Course Modules.

Master's in Teaching Natural Sciences MSc

Description

Description: This Course is designed to offer scientific knowledge as well as technology and methodological skills to Secondary Science teachers. Upon the completion of this course graduates will:

- have a more scientific approach to teaching Physics, Chemistry and Biology

- be able to understand and convey to students, through educational processes, classical and modern theories of Natural Sciences and their role within the unified scientific world
- have acquired requisite skills and scientific competence for using experiments to investigate and prove scientific theories and hypotheses
- have acquired special methodological training to design and carry out educational projects at school or within the wider educational community, or local community
- will have required level of competence to use information technology to design and produce electronic learning material

Admission Requirements

The Post-graduate programme accepts graduates or higher institution diplomas of related disciplines. The programme is offered in Greek.

The knowledge of a foreign language and good computer-Internet skills would be useful for the successful participation in the programme.

Note:

Holders of a degree or diploma of higher education means graduates of Greek Universities or Polytechnics or Higher School of Fine Arts or Higher School of Pedagogical and Technological Education or Higher Technological Educational Institutions (ATEI) or those who hold academically equivalent first cycle degrees from recognized foreign educational institutions with the degrees awarded by the Greek Higher Educational Institutions, in accordance with the provisions of article 304 of Law No. 4957/2022 (Government Gazette 141/21.07.2022, vol.)

Marking:

For the evaluation of the application to the Postgraduate Studies Programme, it will be examined whether the candidate's institution of study is or may be included in the National Register of Recognised Higher Education Institutions of Foreign Countries and whether the candidate's degree is or may be included in the National Register of Types of Degrees of Recognised Institutions of Foreign Countries.

The Hellenic Open University, if the degree is included in the list of article 307 of Law No. 4957/2022, must request a "Certificate of Place of Study", which is issued and sent by the foreign university. If the place of study or part of the studies is confirmed as the Greek territory, the degree is not recognized, unless the part of the studies that took place in the Greek territory is in a public higher education institution or in a recognized foreign educational institution within the meaning of paragraph b) of article 299 of Law No. 4957/2022.

Minimum study duration

2 academic years

ECTS credit points

120

Classification according to ISCED-2011 of UNESCO

- Based on the level of Education: 7
- Based on the field of Education: 44 Physical Sciences

Classification according to ISCED-2013 of UNESCO

- Based on the field of Education: 0538 Physical Sciences involving Physics, Chemistry and Biology

Learning Material

Learning material used is mainly printed textbooks but also audiovisual and electronic learning material. The printed material is especially adapted to meet the needs and standards of distance education.

Chapters clearly state aims and objectives. Key concepts and expected learning outcomes. Self-assessment questions and exercise.

Alternative teaching material. To assist the students to a better understanding of the main teaching material. It utilizes, clarifies and enriches, if necessary, the already existing material.

Contact

Student Records:

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Course Structure

1st Year	
KFE51 Motion, Constitution and Basic Interactions of Matter	(C^1, 20 ECTS)
KFE52 Organization and Interactions at the Molecular Level	(O^2, 20 ECTS)
KFE53 Matter Organization In Living Systems	(O, 20 ECTS)
KFE60 Physical Sciences: History, Epistemology And Didactical Methodology	(C, 20 ECTS)
2nd Year	
KFE52Organization and Interactions at the Molecular Level	(O, 20 ECTS)
KFE53Matter Organization In Living Systems	(O, 20 ECTS)
KFE61 Topics in Modern Physics	(O, 20 ECTS)
KFE62 Educational Technology Applications Laboratory	(O, 20 ECTS)
KFEDE Master's Diploma Thesis	(C, 40 ECTS)

Notes:

C^1: Compulsory

O^2: Optional

Module Selection Instructions

Students in the 1st year of studies are encouraged to select up to three modules, if they have the necessary required time. In this case they have to select the modules KFE51 and KFE60 which are compulsory, while the third module can be chosen between the KFE52 and KFE53. If students do not possess the necessary required time, they are recommended to select as their first module, the one that is most similar to the subject of their bachelor's degree.

Students in the 2nd year of studies can choose the Master's Diploma Thesis either with the simultaneous participation in the last module KFE52, KFE53, KFE62 or KFE62 either after successfully attending the four modules of the programme.
Students who wish to select the module KFE61 should have successfully attended the module KFE51.
The selection of the module precedes the selection of the Master's Diploma Thesis
During the module selection, all modules from the 1st academic years must be selected and consequently the modules of the 2nd academic year can be selected.
In order to complete the Programme in two academic years, students must successfully complete three modules in their first year (according to the aforementioned instructions), and the fourth module concurrently with the Master's Diploma Thesis in the second academic year.
The presentation of the Master's Diploma Thesis takes place after the successful completion of the program's Modules.

To earn the Master's degree, students must successfully complete four (4) modules - two (2) of which are compulsory (C) and two (2) optional (O) - as well as the successful preparation and presentation of the Master's Diploma Thesis or the successful completion of three (3) Modules - two (2) of which are compulsory (C) and one (1) optional (O) -, one (1) laboratory module as well as the successful preparation and presentation of the Master's Diploma Thesis.

Course Modules

KFE 51 Motion, Constitution and Fundamental Interactions of Matter

Module code: KFE51
ECTS Credit Points: 20
Module Type: Compulsory
Year: 1st
Language: Greek
Module General Description: The objective of the module it to educate students in the Theory of Classical and Modern Physics
Learning Outcomes: By the end of this course, students will be able to,

- Describe the laws of motion and the conservation laws of Newtonian Mechanics, the Lorentz transformations of special relativity, the harmonic oscillator in the presence of friction and driving forces, the Fermat principle and the applications of geometrical optics, the laws of Statistical Mechanics and Thermodynamics, the physics of waves and the propagation of electromagnetic waves, the interference and diffraction phenomena, the laws of electrostatics and magnetostatics, the radiation from an accelerated charge and the basic principles of quantum mechanics.
- Apply the laws of classical mechanics and evaluate the planetary motion, solve the equations of motion using numerical methods, explain the relativistic phenomena of radiation, the Doppler effect and the aberration of light, calculate the dipole radiation pattern and the refractive index of low density and dense materials, examine the absorption and the scattering of light, demonstrate the operation of thermal

machines, the black body radiation and the transmission of acoustic waves. Explain the electric field effects in the atmosphere, the operating principle of electron microscopes and electric motors, the plasma oscillations, the Bohm-Aharonov effect, the bremsstrahlung and the synchrotron radiation.

- Examine complicated phenomena using the basic laws of physics, compare modern physics with classical physics analogues, the Fermat's principle with the principle of least action and quantum electrodynamics, and demonstrate the limits of the classical approach to microcosm as well as the use of the thought experiments in physics.

Subjects covered:

- Modern Perceptions of Classical Physics: Review of Classical Physics through the lens of the Modern perception of Nature (Laws of Conservation, Symmetries, Statistical Descriptions of Nature, Electromagnetism, Fields, Waves and Light, Relativity)
- Quantum Description of the Cosmos: Review of Basic Quantum Physics, Applications of Quantum Physics, Applications of Quantum Physics to Solids, Atoms, and Nuclei.
- Elementary Particles and Cosmology

Prerequisites: There are no prerequisite courses.

Evaluation: Elaboration of written assignments and activities during the academic year, the average of the grades of which participates in the formation of the final grade. of module by 30%, if there is a passable in the final or repetitive examinations. In the final written exams the grade of the written assignments participates in the formation of the final grade of module by 70%.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the assignments and activities and (b) at least two (2) of the three (3) written assignments have been submitted.

KFE52 Organization and Interactions at the Molecular Level

Module code: KFE52

ECTS Credit Points: 20

Module Type: Optional

Year: 1st / 2nd

Language: Greek

Module General Description: The Module aims to educate students on issues related to the structure and organization of matter at the molecular level

Learning Outcomes: KFE52 focuses on providing specialized knowledge to teachers of the Natural Sciences in the field of "Organization and Interactions at the Molecular Level", according to the modern requirements of the science of Chemistry, to bolster their teaching work. The learning outcomes of KFE52 focus on providing actual teaching results for students of various different backgrounds (Physics, Chemistry, Biology, etc.) who are studying remotely.

Upon successful completion of KFE52, students will have:

- Gained knowledge of General and Inorganic Chemistry in light of the modern understanding of the structural composition of Matter,
- Obtained a Physical-Chemical overview of Matter by developing modern methodology for the characterization of matter, and

- Been introduced to the Structure, properties, and classification of Carbon Compounds.

Knowledge and Comprehension

By successfully completing KFE52, students will have learned and understood:

- The basic concepts, principles, and applications of Chemistry at the molecular level,
- The terms, conventions, and units of measurement of the corresponding physical quantities,
- The language and mathematical techniques used in Physical Chemistry and General Chemistry,
- The appropriate methods for acquiring, interpreting, and analyzing scientific data and information in Chemistry,
- The contribution of the natural sciences to an informed discussion of physico-chemical phenomena and processes, and some of the limits of current scientific knowledge.

Cognitive Skills

By successfully completing KFE52, students will be able to:

- Utilize and apply their knowledge to understand the information, concepts, principles, and theories connected with particular aspects of the field of Chemistry, such as the properties of elementary particles that comprise matter, the electronic structure of atoms, design the electronic structure of atoms and/or ions, Interpret the formation of bonds between atoms through Lewis, VSPER, valence bond, and molecular orbital theories and compare their approaches, comprehend inclusion compounds and interpret their formation and color, Understand the translational, rotational, and vibrational motion of molecules and their spectroscopic applications, construct kinetic equations and complete them, Know the techniques of kinetic study of chemical reactions, comprehend the 1st and 2nd laws of thermodynamics and their applications.
- Apply their scientific knowledge to solve both familiar and unknown problems. Plan and conduct scientific research,
- Utilize the language of mathematics and calculational techniques, applying mathematical and chemical models to understand physico-chemical phenomena and solve the relevant problems,
- Work with scientific data and information, as well as discuss particular aspects of current research in Chemistry,
- Evaluate information from different sources and make sound decisions, taking into account scientific theories and concepts.

Subjects covered:

- Review of General and Inorganic Chemistry in the prism of the modern understanding of the structural constitution of matter.
- Physicochemical view of Matter with development of modern methodology for the characterisation of Matter.
- Introduction to the structure, properties, and characterization of carbon compounds.

Prerequisites: There are no prerequisite courses.

Evaluation: Students are assigned to submit six (6) written assignments during the academic year. The average grade of the six (6) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.
The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.
Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the six (6) assignments and (b) at least four (4) of the six (6) written assignments have been submitted.

KFE53 Matter Organization In Living Systems

Module code: KFE53
ECTS Credit Points: 20
Module Type: Optional
Year: 1st / 2nd
Language: Greek
Module General Description: The objective of thematic unit KFE53 is to provide master's-level education for teachers in secondary education on the basic scientific approaches to the Life Sciences, as they stand today.
Learning Outcomes: Upon successful completion of KFE53, students will have developed the following skills:

- Comprehensive understanding of the basic and applied scientific directions of the Life Sciences, such as Basic and Clinical Biochemistry, Molecular and Cellular Biology, and Physiology.
- Comprehend, research, and demonstrate through the teaching process, the scientific substance of the classical and modern discoveries of the Life Sciences, in addition to the role they have played in preventing and providing solutions for modern biological problems.
- Possess the necessary skills and scientific competence to research reliable literature and use both established and novel experimental procedures to demonstrate the scientific truth of biological facts.
- Possess the scientific training to plan and implement higher-level educational activities in topics related to biology and health in a secondary-education environment, the wider educational community, and the local community.

Subjects covered:

- Basic Concepts of Biochemistry, Cellular and Molecular Biology.
- Flow of genetic information, Molecular Mechanisms of control of gene expression.
- Genetic engineering – Transgenic systems. Aspects of the fundamental techniques of Molecular Biology.
- Cellular communication, Physiology of intercellular and intracellular communication.
- Cell cycle, Mechanisms controlling cell growth and division.

Prerequisites: There are no prerequisite courses.
Evaluation: Students are assigned to submit six (6) written assignments during the academic year. The average grade of the six (6) written assignments, weighted at 30%, is taken into

consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.
The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.
Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the six (6) assignments and (b) at least four (4) of the six (6) written assignments have been submitted.

KFE60 Physical Sciences: History, Epistemology And Didactical Methodology

Module code: KFE60
ECTS Credit Points: 20
Module Type: Compulsory
Year: 1st
Language: Greek
Module General Description:

History of Science

- The History of Ideas about Motion. Aristotle and his commentators. Elements from the History of Astronomy: Ptolemy, Copernicus, Kepler. The Scientific Revolution. The Physics of Galileo. Descartes. Newtonian Dynamics.

Philosophy of Science

- The philosophy of logical Empiricism. The Contribution of Karl Popper. Explanation. Confirmation. Reduction. The introduction of the historical dimension in the Philosophy of Science. Kuhn and the incommensurability thesis. The epistemological Pluralism of Paul Feyerabend. Lakatos and the Methodology of Scientific Research Programs.

Selection from the Didactics of Science

- The importance of Students' misconceptions. The epistemological obstacle. Professional scientific and School knowledge. Cognitive conflict. Vygotsky's Learning Theories. Inquiry Learning and Inquiry Based Science Education. The STS approach in science teaching. The contribution of History and Philosophy of Science in Science Teaching. The Principles of STEM Education.

Learning Outcomes: The Learning outcomes of this module focus in providing the necessary knowledge and skills to pre-service and in-service secondary science teachers in order to support their professional development.

HISTORY AND PHILOSOPHY OF SCIENCE-LEARNING OUTCOMES

After the completion of this Unit, students should be able to:

- Understand key periods in the history of science, changes in the character of science over time as related to general cultural, economic and intellectual change
- Understand modern trends and key research questions in the fields of History and Philosophy of Science
- Acquire the capacity to analyze and think critically about the broad cultural, political and social contexts shaping scientific change
- Acquire the skills to communicate effectively on issues of science in historical context
- Acquire the capacity to apply the historiographical skills acquired to new historical materials and fields

- Understand problems connected with the nature of scientific knowledge and the capacity to distinguish it from other forms of knowledge
- Understand problems associated with defining the Nature of Science

DIDACTICS OF SCIENCE– LEARNING OUTCOMES

After the completion of this Unit, students should be able to:

- Describe, compare, and contrast major trends in science education research.
- Describe, compare, and contrast major trends in science curriculum development, implementation, and evaluation.
- Evaluate major developments in instructional strategies and the implications of recent learning theories on science instruction.
- Describe developments in the organization of printed and digital science education materials with a special emphasis on science textbooks
- Describe and evaluate recent developments in the evaluation of student performance in science

And finally:

- To acquire skills of designing learning sequences, modules and activities as well as of producing the relevant educational material.

Subjects covered:

- History of Natural Sciences
- Philosophy of Natural Sciences
- Selection from the Didactics of Natural Sciences

Prerequisites: There are no prerequisite courses.

Evaluation: Students are assigned to submit six (6) written assignments during the academic year. The average grade of the six (6) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the six (6) assignments and (b) at least four (4) of the six (6) written assignments have been submitted.

KFE61 Topics in Modern Physics

Module code: KFE61

ECTS Credit Points: 20

Module Type: Optional

Year: 2nd

Language: Greek

Module General Description: The objective of the module it to introduce the students in Modern Physics topics.

Learning outcomes: Upon successful completion of KFE61, students will:

- Understand the basic principles of quantum mechanics, Heisenberg's uncertainty principle, the wave nature of matter, particle-wave duality, the concept of spin, the stability of matter, the hydrogen atom, and the harmonic oscillator.

- Be able to solve Schrodinger's equation for simple one-dimensional dynamics, such as particle motion in quadratic potentials and the tunnel effect.
- Learn the spectrum of elementary particles, their fundamental interactions, and the Feynman diagrams to represent them.
- Understand the dynamics of the universe by solving Friedmann equations
- Comprehend in simple terms the geometry and physics of black holes.

Subjects covered:

- Modern Advances in Particle Physics and the theory of Cosmos
- Modern Advances in Materials Science
- Experimental Methods & Technology

Prerequisites: There are no prerequisite courses.

Evaluation: Students are assigned to submit six (6) written assignments during the academic year. The average grade of the six (6) written assignments, weighted at 30%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 70 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the six (6) assignments and (b) at least four (4) of the six (6) written assignments have been submitted.

KFE62 Educational Technology Applications Laboratory

Module code: KFE62

ECTS Credit Points: 20

Module Type: Optional

Year: 2nd

Language: Greek

Module General Description: The objective of the module KFE62 is to teach the students of the program to the use of modern technologies that support theoretical and laboratory education. Specifically, KFE62 aims at the practical training in IT and communication technologies for the development of educational material and applications related to the natural sciences as well as in the use of remote access laboratory experiments to support the educational process. Using the infrastructure (hardware and software) of the Physics Laboratory of HOU, the students are trained in the development of multimedia content web pages, in computer simulation, in video and entertaining educational material development, as well as in the design and use of modern detection devices that can be used for student educational activities.

Learning outcomes: By the end of this course, students will be able to,

- develop websites with multimedia content that support the educational process in natural sciences
- develop simulation applications for simple physical systems
- develop modern visual material (animations, videos, customized graphs) using spreadsheets and presentation applications
- develop and manage distance learning educational platforms

- evaluate virtual experiments and simulations with educational content related to natural sciences
- conduct modern remote operated experiments to educate students.

Subjects covered:

- Educational Technology
- Experimental Methodology

Prerequisites: There are no prerequisite courses.

Evaluation: The final grade of the course is the weighted sum of the grades in the technological application tasks/activities (20%), the laboratory exercises (30%) and the Project (50%). If the student does not achieve a score greater than or equal to 50% of the maximum possible total score for all assignments/activities of technological applications and laboratory exercises, he/she cannot present and be graded for the Project and will have to repeat the entire course at full financial cost. If the student achieves a score greater than or equal to 50% of the maximum possible score overall for all assignments/activities of technological applications and laboratory exercises, but scores less than 50% of the maximum possible score on the Project, he/she has the right to present the Project in the immediately following academic year at no financial charge, maintaining his/her score on the assignments/activities of technological applications and laboratory exercises.

KFEDE Master's Diploma Thesis

Module code: KFEDE

ECTS Credit Points: 40

Module Type: Compulsory

Year: 2nd

Language: Greek

General Description: The general categories of subjects for Master Diploma Thesis are determined by the Director of the Program after consulting the Coordinators of the thematic units and then they are posted on the HOU website. Special subjects that are linked to the thematic areas of the Thematic Units of the PGP KFE can also be proposed by the students after consulting the tutors of these modules.

Learning Outcomes: By the end of this course, students will be able to:

- apply the knowledge acquired during their studies
- seek, collect, verify, process critically-synthetically and effectively information in the fields of natural sciences
- emphasize the role of the experiment to confirm or reject theoretical models in Natural Sciences
- develop their research skills and critical thinking on subjects related to Natural Sciences
- highlight the technological developments in natural sciences as well as the general cultural, political and social context in which they have been shaped
- use online/digital tools/media effectively and creatively to write/edit/distribute their texts
- use computing tools to process and present their results

- design learning sequences, modules and activities as well as of producing the relevant educational material
- use of recent instructional strategies and learning theories on science instruction
- plan and carry out educational and/or outreach activities in the school community and society

General Regulation for Preparing Graduate Dissertations in PC with an annual Module Correspondence

For more information regarding the Specifications – Useful Material for writing Master's Theses and uploading a Thesis at the H.O.U. Repository, you can go to the Digital Training Area **http://study.eap.gr** and especially to the Program of Studies section.

Prerequisites: The presentation of the Master's Diploma Thesis takes place after the successful completion of the program's Course Modules.

Pervasive and Mobile Computing Systems MSc

Description

The Program aims to establish systematic training of students on the design and development of Pervasive and Mobile Computing systems. The program builds upon students' knowledge in Computer Science and Telecommunications and advances it on issues such Software System Design, Computer Networks, Digital Systems, Human-Computer Interaction, Operating Systems and Distributed Systems. The program is not limited to providing knowledge but also focuses on skill acquisition in designing mobile and pervasive computing systems, requirement analysis, evaluation and selection of technology solutions, analysis of service quality and performance systems, application and service design, through real-life case studies and applications.

Learning Outcomes

- Understand the fundamental concepts of Pervasive Computing
- Analyze problems and case studies of pervasive computing systems and choose the appropriate technological solutions
- Understand basic principles of wireless networking, cellular networks and ad hoc sensor networks
- Understand design principles, implementation methods and evaluation criteria for Pervasive - Computing Systems
- Understand principles of interaction design and human-centered design

Admission Requirements

The Post-graduate programme accepts graduates of higher institution diplomas. The programme is offered in Greek. The knowledge of a foreign language and good computer-Internet skills would be useful for the successful participation in the programme.

Note:

Holders of a degree or diploma of higher education means graduates of Greek Universities or Polytechnics or Higher School of Fine Arts or Higher School of Pedagogical and Technological

Education or Higher Technological Educational Institutions (ATEI) or those who hold academically equivalent first cycle degrees from recognized foreign educational institutions with the degrees awarded by the Greek Higher Educational Institutions, in accordance with the provisions of article 304 of Law No. 4957/2022 (Government Gazette 141/21.07.2022, vol.)

Marking:

For the evaluation of the application to the Postgraduate Studies Programme, it will be examined whether the candidate's institution of study is or may be included in the National Register of Recognised Higher Education Institutions of Foreign Countries and whether the candidate's degree is or may be included in the National Register of Types of Degrees of Recognised Institutions of Foreign Countries.

The Hellenic Open University, if the degree is included in the list of article 307 of Law No. 4957/2022, must request a "Certificate of Place of Study", which is issued and sent by the foreign university. If the place of study or part of the studies is confirmed as the Greek territory, the degree is not recognized, unless the part of the studies that took place in the Greek territory is in a public higher education institution or in a recognized foreign educational institution within the meaning of paragraph b) of article 299 of Law No. 4957/2022.

Minimum study duration

2 academic years

ECTS credit points

120

Classification according to ISCED-2011 of UNESCO

- Based on the level of Education: 7
- Based on the field of Education: 48 Computing

Classification according to ISCED-2013 of UNESCO

- Based on the field of Education: 0619 Information and Communication Technologies (ICTs) not elsewhere classified

Learning Material

Learning material used is mainly printed textbooks but also audiovisual and electronic learning material. The printed material is especially adapted to meet the needs and standards of distance education.

Chapters clearly state aims and objectives. Key concepts and expected learning outcomes. Self-assessment questions and exercise.

Alternative teaching material. To assist the students to a better understanding of the main teaching material. It utilizes, clarifies and enriches, if necessary, the already existing material.

Contact

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Course Structure

1st Year	
SDY50 Basic Software And Networking Technologies	(C[1], 30 ECTS)
SDY51 Global and Pervasive Computing Systems	(C, 30 ECTS)
2nd Year	
SDY60 Design and Analysis of Hardware and Software Systems	(C, 20 ECTS)
SDY61 Mobile Computing Systems	(O[2], 20 ECTS)
SDY62 Embedded Systems	(O, 20 ECTS)
SDYDE Postgraduate (Master's) thesis	(C, 20 ECTS)

Notes:

C[1]: Compulsory

O[2]: Optional

Module Selection Instructions

Students in the first year of studies may select whichever of the two first modules they wish, SDY50 or SDY51.

In the second year of studies students must select SDY60 and one additional module from the remaining modules of the second academic year. Students who select SDY61 are awarded a Postgraduate Specialization in "Mobile Computing Systems", while students who select SDY62 are awarded a Postgraduate Specialization in "Embedded Systems".

Students who have successfully completed either SDY50 or SDY51 must select the remaining module from the first year, and may also select SDY60 if the wish. Students who have successfully completed SDY50, SDY51, and SDY60 must select the remaining module of the second year.

It is clarified that in order to complete the Programme in two academic years, students should successfully complete during the first academic year two modules (according to the above instructions) and during the second year the last two module simultaneously with the Postgraduate (Master's) Thesis.

During the module selection, all modules from previous academic years must be selected and consequently the selection of the modules of the next academic year can begin.

The presentation of the Postgraduate (Master's) Thesis takes place after the successful completion of the program's Modules.

To obtain the postgraduate specialization diploma, students are required to possess a degree or higher education diploma from a similar field, must successfully attend and pass exams at least four modules, and prepare their Postgraduate (Master's) Thesis, the preparation of which is regulated by the General Regulation for the Preparation of Postgraduate Diploma Theses.

Course Modules

SDY50 Basic Software And Networking Technologies

Module code: SDY50
ECTS Credit Points: 30
Module Type: Compulsory
Year: 1st
Language: Greek
Module General Description: The main purpose of the module is to introduce students to the area of Pervasive Computing as a cutting-edge area of Informatics that provides a set of documented principles, methodologies and techniques, which can be used to develop pervasive computing systems having the capability to sense conditions of their environment and adapt transparently to those conditions. Students will first be trained in the basic principles and concepts of Pervasive Computing Systems, so as to be able to before moving on to study key topics and application areas of such systems. Two very important enabling technologies for Pervasive Computing are Distributed Systems and Wireless Networking, to which much of the student study load is devoted. In addition to imparting knowledge and acquiring skills, the module aims to provide students with a positive attitude regarding the ability to constantly monitor technological developments so that they stay up-to-date with the relevant cutting-edge technologies, which they will be able to theoretically understand as well as apply in systems development.
Learning Outcomes: On successful completion of the study of this module, students will be able to:

- Understand the basic concepts of pervasive computing
- Evaluate the necessity of addressing issues of privacy in pervasive computing
- Understand positioning technologies
- Understand data fusion techniques from multiple sensors
- Understand the role of distributed systems (DS) and middleware in PCS
- Recognize specialized issues of MS (system models, process communication, operating systems, distributed file systems, peer-to-peer systems, web services)
- Analyze MS issues and case studies and select the suitable technologies for their implementation
- Evaluate the role of wireless networks for PCS
- Understand the basic principles and technologies of wireless networking
- Understand the functional principles of mobile cellular networks
- Understand the basic principles of unstructured wireless sensor networks

Subjects covered:

- Wireless network protocols, services, and applications
- Advanced issues in the design of distributed systems
- Middleware design

Prerequisites: There are no prerequisite courses.
Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 40%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.
The grade of the final or the resit exams shall be weighted at 60 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

SDY51 Global and Pervasive Computing Systems

Module code: SDY51
ECTS Credit Points: 30
Module Type: Compulsory
Year: 1st
Language: Greek
Module General Description: Pervasive and Mobile Computing (PMC) systems are already widespread and are set to significantly influence the future of computing technology. These are systems that enable access and use of information and services by anyone, anywhere, anytime, in the most appropriate way at any time, depending on the circumstances, significantly enhancing human activities and dramatically modifying every aspect of our daily lives. The goals of SDY51 include the presentation of pervasive and global computing systems, the design issues that exist overall, the technologies and architectures that have been proposed, the infrastructures that are required, and the systems that have been developed. By studying the educational material of SDY51, students obtain significant theoretical and practical benefits.

In addition to imparting knowledge and acquiring skills, SDY51 aims at the adoption by students of a positive attitude regarding the ability to continuously monitor technological developments so that they remain up-to-date on the prevailing cutting-edge technologies, which they will be able to theoretically understand and apply to system development.

Finally, through the preparation of group work in the form of a project and the writing of a tentative scientific publication, students acquire an important set of 21st century skills and become able to work individually or join groups, manage their time and organize tasks achieving optimal performance.

Learning Outcomes: On successful completion of the study of this volume, students will be able to:

- Understand the basic concepts of pervasive and mobile computing (PMC) systems
- Know architectural and functional models of various types of PMC systems
- Understand PMC systems design principles
- Know PMC systems development methodologies
- Understand basic principles in user interaction models with PMC systems
- Understand the differences between direct and implicit interaction in PMC systems
- Analyse, implement and evaluate tagging and scanning technologies
- Understand the principles of the “Internet of Things”
- Understand the concept of "context" in PMC systems
- Analyze context models in PMC systems
- Apply design principles and develop context-aware PMC systems
- Understand architectures and characteristics of intelligent PMC systems
- Understand Ambient Intelligence concepts
- Understand PMC systems evaluation methodologies and criteria

- Apply PMC systems through case studies
- Synthesize design principles, methodologies and PMC technologies for the development of low/medium fidelity prototypes (mock-up, Android apps)
- Be aware of international scientific reference literature in the field

Subjects covered:

- Architectures of Pervasive and Mobile Computing systems
- Topics in design and programming
- Special topics in the development of pervasive computing systems

Prerequisites: There are no prerequisite courses.

Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 40%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 60 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

SDY60 Design and Analysis of Hardware and Software Systems

Module code: SDY60

ECTS Credit Points: 20

Module Type: Compulsory

Year: 2nd

Language: Greek

Learning Outcomes:

On successful completion of the study of this volume, students will be able to:

- Analyze the goals and principles of interaction design
- Analyze the methods of human centric design
- Understand tools for programming interactivity
- Programming interaction for mobile and ubiquitous devices
- Identify user needs for interactive devices
- Understand basic principles for user collaboration
- Develop software prototypes with contemporary tools
- Design interactive prototypes with microcontrollers
- Analyze case studies in education, entertainment, work, wellness, environment.

Subjects covered:

- Interaction and Appliance Design
- Performance Analysis of Large scale Systems
- Case Studies and Applications

Prerequisites: There are no prerequisite courses.

Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 40%, is taken into

consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.
The grade of the final or the resit exams shall be weighted at 60 % for the calculation of the final grade.
Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

SDY61 Mobile computing systems

Module code: SDY61
ECTS Credit Points: 20
Module Type: Optional
Year: 2nd
Language: Greek
Module General Description: The main purpose of the module is to introduce students to the latest technologies of wireless and mobile communications that include Internet of Things, 5G and 6G communications, Industry 4.0, Big Data as well as topics related to security/privacy. Moreover, students will be trained to issues related to mobile computing services and applications such as organization and design, adaptation to the special user requirements, evaluation and assessment of utility and non-functional requirements of mobile computing systems, case studies and use of essential technologies for the implementation of mobile computing applications. Finally, through the preparation of group work in the form of a project and the writing of a tentative technical report, students acquire an important set of skills and techniques for the design, preparation, writing and presentation of small scale technical reports and scientific texts**.**
Learning Outcomes: On successful completion of the study of this module, students will be able to:

- Discuss and describe the design of wireless mobile networks and demonstrate their use
- Analyze, examine, and evaluate specialized issues of wireless mobile networks, such as quality of service and security
- Assess and evaluate the utility and non-functional requirements of mobile computing systems
- Prepare, organize, experiment with, and design mobile computing services
- Explain and demonstrate the need to adapt mobile computing application to specific user requirements
- Analyze, evaluate, and discuss issues and case studies of mobile computing applications, and choose, modify, and develop the necessary technologies to implement them

Subjects covered:

- Protocols, Architectures, and Services for Wireless and Mobile Networks
- Design of Mobile Computing Applications
- Case Studies and Applications

Prerequisites: There are no prerequisite courses.

Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 40%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.
The grade of the final or the resit exams shall be weighted at 60 % for the calculation of the final grade.
Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

SDY62 Embedded systems

Module code: SDY62
ECTS Credit Points: 20
Module Type: Optional
Year: 2nd
Language: Greek
Module General Description: The main objective of the module is obtained knowledge and the acquisition of skills, regarding the scientific area of Embedded Systems, as a modern and future cutting-edge area, of the science of Informatics and Computer Engineering also. An expanded set of fundamental principles and practices, techniques and methodologies are provided, based on which one can design, implement, optimize and evaluate the performance of embedded systems, for current and future applications such as: Electronic cars, Avionics, Railways, Telecommunications, Healthcare, Cybersecurity, Consumer electronics, Construction equipment, Smart applications: homes, buildings, cities etc, Supply chain, Robotics, etc. Students will first be trained in the fundamental principles and concepts of Embedded Systems. Then, they will delve into specific issues and application areas of the methodologies included: such as machine learning, artificial intelligence, etc. An equally important subject of study is the internet of things (IoT), in the applications of integrated systems, where particular emphasis is placed. In addition to the acquisition of knowledge and skills, this module aims at the adoption by students of a positive attitude regarding the ability to continuously monitor both scientific and technological developments in order to stay up to date on the relevant cutting-edge technologies, to be able to understand them theoretically and apply them successfully in the design and implementation of current and future embedded systems.
Learning Outcomes: On successful completion of the study of the module, students:

- Can understand the basic principles of designing embedded systems.
- Have acquired appropriate experience in hardware design of embedded systems.
- Can apply architecture design techniques, as well as embedded systems development methodologies.
- Can support problem analysis and case study of embedded systems.
- Have the ability to implement digital circuits/systems in FPGAs.
- Are able to design special purpose processors and co-processors in FPGAs.
- Have acquired fundamental knowledge of hardware/software co-design.
- Have understood the evaluation criteria of embedded systems.

- Can evaluate the performance of both applications and techniques based on embedded systems.

Subjects covered:

- Design of digital systems
- Design of embedded systems
- Case Studies and Applications

Prerequisites: There are no prerequisite courses.

Evaluation: Students are assigned to submit five (5) written assignments during the academic year. The average grade of the five (5) written assignments, weighted at 40%, is taken into consideration for the calculation of the final grade. The grade of written assignments is activated only with a score equal to or above the pass level (≥5) in the final or resit exams.

The grade of the final or the resit exams shall be weighted at 60 % for the calculation of the final grade.

Students have the right to participate in the final/resit exams if (a) at least 50% of the potentially excellent grade has been obtained when adding the total of the five (5) assignments and (b) at least three (3) of the five (5) written assignments have been submitted.

SDYDE Postgraduate (Master's) thesis

Module code: SDYDE

ECTS Credit Points: 20

Module Type: Compulsory

Year: 2nd

Language: Greek

General Description: Theses can be:

1. **Research/Theoretical**: they focus on the development of a new theoretical model or the extension of an existing one and its application in solving problems,

2. **Research/Developmental**: focus on the development of a "new" system, based on existing theory and usually the dominant part of the work, so that its application can be demonstrated, and

3. **Applied:** they focus on the development of a large application useful in some area of interest using one or more software packages.

The scientific responsibility for preparing the Thesis (MDE) belongs to the tutor who has the responsibility of supervising and supporting the student (Supervisor), according to the prevailing ethics and practice in the science of Informatics.

A Thesis topic can be proposed by the candidate Supervisor to the Director of the SDY. The candidate Supervisor must fill in and send to the Director the MDE SDY Subject Submission Form, which explicitly mentions the purpose and expected scope of the Thesis, the main tasks and main stages, the required equipment and where is located, any other provided infrastructure (space, laboratories, libraries, etc.) and any required movements in the context of preparing the Thesis.

Students are given the opportunity to propose their own Thesis subject. In this case, they should get in touch with either a candidate Supervisor or the Director of the SDY, so that the MDE SDY Subject Submission Form can be created and posted.

The Director collects the topics that have been proposed, composes one or more volumes of topics and posts them on the online education platform study.eap.gr, so that they can be accessed by all the students of SDY.
The Initial Topic Declaration by the student is made on the open.eap.gr online platform and must be related to a specific topic from the MDE topics volume.
Learning Outcomes: Upon completion of this module, students should be able to:

- analyze a complex problem by identifying the basic knowledge and tools required to solve it,
- plan the activities that lead to solving the problem, identifying and adopting internationally accepted practices and synthesizing knowledge and skills from different subjects,
- implement, evaluate and improve the solution to the problem,
- adopt and apply a structured, modular and iterative problem-solving methodology,
- work smoothly with the Supervisor, demonstrating responsibility and developing communication skills,
- write a comprehensive thesis in which the problem, the methodology and the result of their work will be analyzed,
- present their work in front of an audience, answering any questions asked in relation to their work.

Therefore, the preparation of the Thesis provides the opportunity for synthesis and utilization of the knowledge acquired in specific individual cognitive areas.
General Regulation for Preparing Graduate Dissertations in PC with an annual Module Correspondence
For more information regarding the Specifications – Useful Material for writing Master's Theses and uploading a Thesis at the H.O.U. Repository, you can go to the Digital Training Area **http://study.eap.gr** and especially to the Program of Studies section.
Prerequisites: The presentation of the Postgraduate Thesis takes place after the successful completion of the program's Course Modules.

Chemical and Biomolecular Analysis

Type of Postgraduate Programme

Master of Science, M.Sc.

ECTS of M.Sc.

The total sum of ECTS (European Credit Transfer and Accumulation System) required for the postgraduate degree in "Chemical and Biomolecular Analysis" is 90 ECTS (30 ECTS per semester).

Duration of Study

The minimum time required for the completion of the Program is three (3) academic semesters.

Language of the M.Sc.

The official language of the M.Sc. is Greek. This means that the language in which all materials content and written assignments is Greek.

Classification according to ISCED-2011 of UNESCO:

Based on the level of Education: 7

Classification according to ISCED-2013 of UNESCO:

Based on the field of Education: 0512 – Biochemistry

Contact

Student Records:

Tel.: +30-2610 367331. E-mail: xba@eap.gr

General Information:

Tel.: +30-2610 367805 - 2610 367806 - 2610 367807 - 2610 367426. E-mail: info@eap.gr

Admission Requirements

The Post-graduate programme accepts graduates or higher institution diplomas of related disciplines. The programme is offered in Greek.

The knowledge of a foreign language and good computer-Internet skills would be useful for the successful participation in the programme.

Note:

Holders of a degree or diploma of higher education means graduates of Greek Universities or Polytechnics or Higher School of Fine Arts or Higher School of Pedagogical and Technological Education or Higher Technological Educational Institutions (ATEI) or those who hold academically equivalent first cycle degrees from recognized foreign educational institutions with the degrees awarded by the Greek Higher Educational Institutions, in accordance with the provisions of article 304 of Law No. 4957/2022 (Government Gazette 141/21.07.2022, vol.)

Marking:

For the evaluation of the application to the Postgraduate Studies Programme, it will be examined whether the candidate's institution of study is or may be included in the National Register of Recognised Higher Education Institutions of Foreign Countries and whether the candidate's degree is or may be included in the National Register of Types of Degrees of Recognised Institutions of Foreign Countries.

The Hellenic Open University, if the degree is included in the list of article 307 of Law No. 4957/2022, must request a "Certificate of Place of Study", which is issued and sent by the foreign university. If the place of study or part of the studies is confirmed as the Greek territory, the degree is not recognized, unless the part of the studies that took place in the Greek territory is in a public higher education institution or in a recognized foreign educational institution within the meaning of paragraph b) of article 299 of Law No. 4957/2022.

It is clarified that holders of a first degree of Higher Education are accepted in the Postgraduate Program.

Module Structure:

1st Semester:	
XBA50 Modern Chemical Analysis	(C[1], 15 ECTS)
XBA51 Current Topics in Applied Molecular Biology	(C, 15 ECTS)
2nd Semester:	
XBA52 Special Topics in Clinical and Applied Biochemistry	(C, 15 ECTS)
Students choose one of these laboratory modules:	
XBA53 Laboratory on Chemical Analysis	(C, 15 ECTS)
XBA54 Laboratory on Biomolecular Analysis	(C, 15 ECTS)
3rd Semester	
Students choose one of these laboratory modules:	
XBA53 Laboratory on Chemical Analysis	(C, 15 ECTS)
XBA54 Laboratory on Biomolecular Analysis	(C, 15 ECTS)
XBADE Postgraduate Diploma Thesis	(C, 15 ECTS)

Note:
C[1]: Compulsory

Module Selection Instructions

Students may select from one (1) to two (2) Modules per semester.
Students in the 1st semester may select either XBA50 or XBA51, or both simultaneously.
Students in the 2nd semester may select XBA52 and either XBA53 or XBA54, in whichever order they prefer.
Students who wish to select the Laboratory Module XBA53 must either have completed XBA50 or select it concurrently with XBA50.
Students who wish to select the Laboratory Module XBA54 must either have completed XBA51 and XBA52 or select it concurrently with XBA51 or XBA52.
Students in the 3rd semester must select the Laboratory Module (XBA53 or XBA54) they did not select in the previous semester and prepare their Postgraduate Diploma Thesis.
The preparation of the Postgraduate Diploma Thesis presupposes the successful attendance of all Modules and one of the Laboratory Modules: XBA53 or XBA54.
The presentation of the Postgraduate Diploma Thesis presupposes the successful completion of all Modules and Laboratory Modules of the Programme.
When selecting Modules, students must first pass all the available Modules that belong to the previous term and then select Modules belonging to the next semester. For example, a student who has successfully completed one (1) first-semester Module and wishes to select two (2) Modules in the second semester must select their one (1) remaining first-semester Module and one (1) second-semester Modules, etc.
The minimum duration of studies is one and a half (1 ½) years. To obtain the Postgraduate Specialization Diploma, students must successfully complete the three (3) Modules, the two (2) Laboratory Modules, prepare and present their Postgraduate Diploma Thesis.

Students' evaluation: Grade assessment of a Module/Laboratory Module – Participation in Final Exams

Module Evaluation:

a1. Two (2) Educational Activities (E.A.) that contribute to the final grade with a weight equal to 5% each of them.
a2. Two (2) Written Assignment (W.A.) which contributes to the final grade with a weight equal to 15% each of them.
The grade of the Educational Activities and Written Assignments is secured when a grade equal to or above the passing grade (≥5) in the final exam or resit is achieved only.
a3. Final exam or resit (FE) contribute to the final grade with a weight equal to 60%.
The **Final Grade** of each Module on the scale of 1 to 10 is calculated as:
Final Grade = (EA1×0,05) + (EA2×0,05) + (WA1×0,15) + (WA2×0,15) + (FE×0,6)

Laboratory Module Evaluation:
a1. Two (2) Educational Activities (E.A.) that contribute to the final grade with a weight equal to 5% each of them.
a2. Two (2) Written Assignment (W.A.) which contributes to the final grade with a weight equal to 15% each of them.
The grade of the Educational Activities and Written Assignments is secured when a grade equal to or above the passing grade (≥5) in the face to face laboratory activities only.
a3. Face to face laboratory exercise (LE) contribute to the final grade with a weight equal to 60%.
The **Final Grade** of each Laboratory Module on the scale of 1 to 10 is calculated as:
Final Grade = (EA1×0,05) + (EA2×0,05) + (WA1×0,15) + (WA2×0,15) + (LE×0,6)

Establishment of participation right in the final exam or face to face laboratory exercise:
Participation in the final examination or face to face laboratory exercise will be allowed, if:

1. the sum of the grades of the aforementioned assignments (see a1 and a2) is equal to, or greater than 50% of the assigned grading scale, i.e. at least 20 points out of 100, based on the weights mentioned in points a1 and a2,
2. at least 3 of the 4 Activities and Assignments should be submitted.

EA & WA grade on the scale of 1 to 100				
EA1 (5%)	EA2 (5%)	WA1 (15%)	WA2 (15%)	Minimum grade that is required for participation in final exams
EA1 × 0.5	EA2 × 0.5	WA1 × 1.5	WA2 × 1.5	20/100

Information about the Course Modules

XBA50 Modern Chemical Analysis

Module Code: XBA50
ECTS Credits: 15
Module Type: Compulsory
Semester: First (1st)
Teaching Language: Greek
Module Content: XBA50 aims to train scientists in the principles, methods, instrumentation, and applications of modern chemical analysis.
Analytical Module Content:

- Introduction to the Principles of Instrumental Analysis
- Introduction to Spectrometric Methods and Optical Atomic Spectrometry

- Atomic Absorption Spectrometry, Atomic Fluorescence Spectrometry, Atomic Emission Spectrometry
- Atomic Mass Spectrometry
- Atomic X-ray Spectrometry
- Introduction to Molecular Absorption Spectrometry in the Ultraviolet / Visible (UV/Vis)
- Applications of Visible / Ultraviolet Molecular Absorption Spectrometry
- Introduction to Infrared Spectrometry - Applications of Infrared Spectrometry
- Molecular Mass Spectrometry
- Characterization of Surfaces with Spectroscopy and Microscopy
- Introduction to Electroanalytical Chemistry - Potentiometry
- Introduction to Chromatographic Separations
- Gas chromatography
- Liquid chromatography - Thermal Methods
- Determination of Particle Size

Learning Outcomes:

Upon completion of this module, students will be able to:

- describe the main methods of instrumental analysis, namely the spectroscopic, electrochemical, chromatographic, radiochemical, and thermal analytical methods, as well as methods of surface chemical analysis
- describe the fundamental principles and methods of atomic spectroscopy, molecular spectroscopy, electroanalytical chemistry, and chromatography
- describe the fundamental principles and methods of thermal analysis methods, radiochemical methods, particle size determination methods, and automated methods
- describe the advantages and drawbacks of each method of analysis
- identify the instrumentation of analytical methods
- select the most suitable method of analysis for a given case, considering its sensitivity, repeatability, and accuracy
- calibrate, standardize, and validate instrumental analysis methods

Module Subjects:

- Theoretical Foundation of Modern Analytical Chemistry
- Material and Surface Characterization and Analysis Methods
- Instrumental Analysis – Instrumentation and Analytical Applications

Prerequisite courses: No prerequisites

Teaching Method: distance using the EAP Distance Learning Platform and conducting Group Counseling Meetings (tele-OSS).

XBA51 Modern Topics in Applied Molecular Biology

Module Code: XBA51

ECTS Credits: 15

Module Type: Compulsory

Semester: First (1st)

Teaching Language: Greek

Module Content: XBA51 aims at a deep understanding of the evolutionarily conserved process of coding and transfer of genetic information from cell to cell, through the structure and

function of the genome and its detailed regulation at different levels. In addition, an understanding of the mechanisms that ensure the fidelity and accuracy of the transmission and expression of genetic information, the repair systems and the modern methodology involved in their study. Finally, the study of the effects on the genome of environmental factors that adversely affect life and normal cellular function.

Learning Outcomes:

Upon completion of this module, students will be able to:

- describe the basic structure and function of proteins, DNA and RNA.
- describe the basic molecular processes of genome replication and transcription, as well as translation.
- name the mechanisms regulating all the above processes.
- use classical and modern techniques of molecular biology.
- identify molecular damage at the genome level resulting from mutations, genetic recombination and epigenetic modifications.
- define the molecular basis of carcinogenesis and the manifestation of various diseases.
- define the biology of systems
- describe the contribution of current bioinformatics analysis to the development of applied molecular biology

Module Subjects:

- Principles of Genomics and Post-Genomics
- Genome Sequencing Analysis
- Modern Gene Expression Determination Methods
- Molecular Oncology – Smart Drugs

Prerequisite modules: No prerequisites

Teaching Method: distance using the EAP Distance Learning Platform and conducting Group Counseling Meetings (tele-OSS).

XBA52 Special Topics in Clinical and Applied Biochemistry

Module Code: XBA52

ECTS Credits: 15

Module Type: Compulsory

Semester: First (1st)

Teaching Language: Greek

Module Objectives: The module aims at the general overview and understanding of the basic concepts of Clinical and Applied Biochemistry, the basic principles of the structure and function of life macromolecules, and the in-depth study of cellular biochemical pathways and their interconnections. Moreover, the module is also focused on the specific genetic, acquired and environmental events towards biochemical imbalance, diseases and clinical symptoms. At the same time, the module will present the basic principles of experimental procedures for the study of cellular homeostasis, and the biochemical/molecular pathways in the development and progression of human diseases, as well as laboratory methods/assays in diagnosis, the treatment, prognosis and prevention of diseases.

Aims:

The study of the basic principles of Clinical and Applied Biochemistry & Molecular Diagnostics for:

a. the understanding of the basic biochemical and molecular processes involved in the normal human physiology, as well as the interruptions of these processes during the development of diseases.

b. the understanding of the basic principles and how to apply the laboratory methods of Modern Clinical Chemistry, Clinical Biochemistry and Molecular Diagnostics in the diagnosis, prognosis, treatment and monitoring of the patients.

c. the study of the basic principles and quality control procedures of the Clinical Biochemistry laboratory and evaluation of diagnostic methods and results

d. At the same time, the aim is to acquaint students with the different applications of Analytical Clinical Biochemistry and automated analysis in modern clinical practice, the handling of biological samples, as well as the rules of safety and ethics of the modern clinical laboratory.

Learning Outcomes:

Upon completion of this module, students will be able to:

- know the basic principles, concepts, terminology and applications related to the science of Clinical and Applied Biochemistry,
- know the basic principles of human pathobiochemistry,
- understand the basic biochemical/molecular cellular pathways and the interactions between them, during the normal functioning of the human organism, as well as their disruptions in pathological conditions.
- understand the principles of application and utilization of classic and modern laboratory methods of Clinical
- applied Biochemistry and Molecular Diagnostics
- able to choose the appropriate diagnostic tests based on the clinical needs
- able to interpret analytical results
- understand the processes and importance of quality control in the Clinical Biochemistry laboratory
- identify and evaluate analytical errors
- describe the way of correction of analytical errors and of calibration procedures
- know the appropriate and safe handling of biological samples and of control reagents
- understand the modern automated biochemical analysis and organology
- know of the established disease biomarkers and their clinical evaluation

Module Subjects:

Prerequisite courses: No prerequisites

Teaching Method: distance using the EAP Distance Learning Platform and conducting Group Counseling Meetings (tele-OSS).

XBA53 Laboratory on Chemical Analysis

Module Code: XBA53

ECTS: 15

Module Type: Compulsory

Semester: Second (2nd) or Third (3rd)

Teaching language: Greek

Module Content: The module XBA53 aims to provide laboratory training for scientists in the principles, methods, instrumentation, and applications of modern chemical analysis. It aims to familiarize scientists with the modern laboratory and experimental equipment used in chemical analysis, as well as how to use it correctly and effectively.

Learning Outcomes:

Upon completion of this module, students will be able to:

- describe laboratory safety regulations
- evaluate the experimental results of chemical analyses
- statistically process the results of chemical analyses
- operate modern laboratory equipment, such as spectrometers, chromatographs, spectrophotometers, diffractometers, fluorimeters etc.
- select the most suitable method of analysis for a given application
- design and perform classical and modern chemical analysis experimental protocols
- apply their skills to solve problems that occur in chemical analysis
- make use of analytical instruments and techniques in order to research problems that require chemical analysis in their solution

Module Subjects:

- Laboratory Safety Regulations; Statistics, Chemometrics
- Modern Chromatographic Techniques
- Modern Spectrometric Techniques
- Electroanalytical and Complexometric Techniques
- Combined Analytical Techniques

Prerequisite modules: Selection of XBA53 is possible with simultaneous selection of XBA50 or with complete XBA50

Teaching Method: distance using the EAP Distance Learning Platform and conducting Group Counseling Meetings (tele-OSS).

XBA54 Laboratory on Biomolecular Analysis

Module Code: XBA54

ECTS credits: 15

Module Type: Compulsory

Semester: Second (2nd) or Third (3rd)

Teaching language: Greek

Module Content: The module XBA54 aims to train scientists in the principles, methods and organization of modern biomolecular analysis. Postgraduate students are trained in laboratory organization and laboratory quality control and also, they get hands-on familiarization with modern laboratory and experimental equipment related to Biomolecular analyses.

Learning Outcomes:

Upon completion of this module, students will be able to:

- describe quality assurance procedures in experimental protocols used in service provision, as well as in research.
- handle biological material appropriately and carry out laboratory techniques for the isolation and quantitative/qualitative detection of biological macromolecules.
- utilize molecular techniques to detect and identify microorganisms and viruses in biological materials and food.

- detect mutations and polymorphisms, but also biochemical alterations of DNA, related to pathological conditions.
- apply enzyme-linked immunosorbent assays (ELISA) to target sample molecules related to clinical diagnosis, either using antigens/antibodies or enzymatic reactions.

Module Subjects:

- Quality assurance of laboratory biomolecular analyses
- Techniques for the isolation of nucleic acids and proteins
- Detection of infectious agents in biological materials and food
- Detection of gene mutations and epigenetic modifications
- Immunochemical methods

Prerequisite modules: Selection of XBA54 is possible with simultaneous selection of XBA51/XBA52 or after completion of XBA51/XBA52

Teaching Method: distance using the EAP Distance Learning Platform and conducting Group Counseling Meetings (tele-OSS).

XBADE Postgraduate Diploma Thesis

Module Code: XBADE

ECTS credits: 15

Module Type: Compulsory

Semester: Third (3rd)

Teaching language: Greek

Module Content:

Aim

The aim of the Postgraduate Diploma Thesis is to complete the students' knowledge and develop their skills in the processing of independent topics in the Science of Chemical and Biomolecular Analysis and their applications. The work is carried out based on the student's special interest in a subject, always in consultation with the supervisor and on the condition that the subject is related to the academic subjects of the Postgraduate Diploma Thesis.

Content

The Postgraduate Diploma Thesis constitutes an individual, self-contained, in-depth scientific and systematic approach to the analysis of a topic and the synthesis of a solution or proposal. It draws on existing literature and/or original research. The Postgraduate Diploma Thesis has a research, study, development or applied research character and is prepared by each student individually. With the guidance of the supervisor, students are given the opportunity to gain significant experiences from the comprehensive study and in-depth investigation of a distinct subject of specialization and are challenged to develop critical and combinatorial thinking, organization and analysis skills, applying the systematic and scientific approach. Through his research, the student must demonstrate the ability to identify problems and challenges in the specific field, evaluate results and propose alternative solutions or strategies.

Procedure

The student submits a proposed thesis topic title, accompanied by the purpose, methodology and expected results. The program proposal must be approved by the supervising professor before the student begins the work. The student is then in constant contact with the supervisor throughout the preparation of the thesis, with continuous guidance and feedback. At the end, the student submits a comprehensive scientific report, which he defends with an

oral presentation (supporting a master's thesis) in public and before a three-member examination committee.

Learning Outcomes:

Upon successful completion of the PDT, the student will:

- have studied in depth a specific topic of the scientific areas that PDT treats
- have used his relevant knowledge from his studies and developed his compositional ability
- have learned to look for appropriate scientific information through the relevant scientific literature
- be able to design a research plan and develop an appropriate methodology for approaching and investigating a topic under study and organize a plan for its implementation
- have acquired skill in writing a scientific text
- have acquired skill in the organization and oral presentation of a scientific topic
- be able to clearly present his conclusions, as well as the knowledge and reasoning on which they are based, successfully making a comprehensive presentation via ICT, before the three-member examining committee and the public
- be able to describe and document the basic knowledge related to the topic of the thesis
- be able to summarize the existing scientific knowledge and expertise in the subject of the thesis
- be able to combine knowledge to propose solutions to relevant problems or applications
- be able to select appropriate technical/technological approaches and adapt them to the problem to be solved using original thinking

For more information regarding the Specifications – Useful Material for writing An MSc Dissertation and submitting it to HOU Repository, please visit the portal **http://courses.eap.gr**. The General Regulation for the presentation of an MSc Dissertation in postgraduate degree programmes organized on a semi-annual basis is available at **https://www.eap.gr/en/semi-annual-programs/**

Prerequisites: The presentation of the Postgraduate Diploma Thesis takes place after the successful completion of the Modules of the Program.

Cultivations under Cover-Hydroponics (Joint Degree)

Purpose - Description

The object of the Inter-Institutional Master's Program entitled "Cultivations under Cover - Hydroponics" is the scientific study and research on issues related to meeting the modern needs of the ever-evolving labor market regarding Covered Cultivations. That is, the construction design, the choice of materials, the cultivation techniques, the new water and chemical saving technologies (hydroponics, screenhouses), the energy saving technologies and the nutrition and plant protection of integrated fruit and vegetable production with reduced inputs.

The main objective of the specific Master's Program is to offer the necessary theoretical knowledge, practical (laboratory and field) training, familiarization and practice in the use of

new technologies and the assimilation of applied research in the context of the preparation of graduates of the subject, for jobs claim and the creation of new jobs through self-employment.
In the context of the Master's Program, the Laboratory of Sustainable Waste Management Technologies of the Hellenic Open University, and the Analytical Laboratories and the Greenhouse Facilities of the Agricultural University of Athens will be used, which are fully equipped with modern scientific equipment.

Aim

The aims of the Inter-Institutional Master's Program are:

- The improvement of the quality and quantity of the products produced through better and new cultivation techniques (hydroponics, new substrates, composition and management of nutrient solutions).
- The reduction of energy inputs (energy saving, utilization of biomass and other renewable energy sources, better microclimate management).
- The reduction of chemical inputs (integrated production, insect-proof nets, photoselective covering materials).
- Better management of water resources (closed hydroponic systems).
- The restructuring of plant capital (testing new varieties).
- The traceability, standardization and certification of the produced products.

The Inter-Institutional Master's Program aims to fill the existing gap in the integrated training of scientists in construction, equipment, cultivation techniques, water and nutrition management and environmental protection.
It is addressed to scientists, graduates of environmental, agricultural, polytechnic and positive sciences, who will acquire horizontal knowledge of the "Cultivations under Cover" ecosystem with vertical specialized knowledge for deepening their cognitive object through their master's thesis.

Learning Outcomes

The learning outcomes expected upon successful completion of the Master's Program are summarized as follows:

1. Training of scientists in the principles, methods and equipment required for cultivation in greenhouses and screenhouses.
2. Training of specialist scientists in the modern technologies of hydroponic cultivation.
3. The scientific and technological training of scientists regarding the applications of modern methods of cultivation and bioclimatic planning in research, in the industry of agricultural equipment and agricultural supplies.
4. The familiarization of postgraduate students with modern laboratory and experimental equipment.
5. Training of postgraduate students in organization and operation of greenhouse and screenhouse units.
6. The creation of a competent human resource of specialized scientists who will be able to staff existing under cover cultivation units, study offices, agricultural research

centers and public services and also to work as self-employed in their own under cover production unit.

Joint Degree with the Agricultural University of Athens (AUA)

Type of Postgraduate Programme

Master of Science, M.Sc.

ECTS of M.Sc.

The total sum of ECTS (European Credit Transfer and Accumulation System) required for the postgraduate degree in "Cultivations under cover- Hydroponics" (Joint Degree) is 120 ECTS (30 ECTS per semester).

Duration of Study

The minimum time required for the completion of the Program is two (2) years or four (4) academic semesters.

Language of the M.Sc.

The official language of the M.Sc. is Greek. This means that the language in which all materials content and written assignments is Greek.

Classification according to ISCED-2011 of UNESCO:

Based on the level of Education: 7

Classification according to ISCED-2013 of UNESCO:

Based on the field of Education: 0812 Horticulture

Admission Requirements

Eligible are:

1. Graduates of Agricultural Sciences and Dietetics-Nutrition Sciences.
2. Graduates of Sciences (Chemistry, Biology, Physics, Biological Applications and Technologies, Biochemistry and Biotechnology, Molecular Biology and Genetics, and Environment)
3. Graduates in Engineering Sciences
4. Graduates of the undergraduate programme of the E.A.P. “Studies in Natural Sciences”
5. Graduates of equivalent or related faculties of the above-mentioned Universities, Polytechnics and Technological Educational Institutions in Greece or abroad.
6. Holders of a degree from a Greek or Cypriot University and recognised similar institutions abroad, as well as graduates of TEI of a related unit.

The language of instruction is Greek. In addition to the language of instruction, a very good knowledge of English is required to attend the programme.

Note:

Holders of a degree or diploma of higher education means graduates of Greek Universities or Polytechnics or Higher School of Fine Arts or Higher School of Pedagogical and Technological Education or Higher Technological Educational Institutions (ATEI) or those who hold academically equivalent first cycle degrees from recognized foreign educational institutions with the degrees awarded by the Greek Higher Educational Institutions, in accordance with the provisions of article 304 of Law No. 4957/2022 (Government Gazette 141/21.07.2022, vol.)

Marking:

For the evaluation of the application to the Postgraduate Studies Programme, it will be examined whether the candidate's institution of study is or may be included in the National Register of Recognised Higher Education Institutions of Foreign Countries and whether the candidate's degree is or may be included in the National Register of Types of Degrees of Recognised Institutions of Foreign Countries.

The Hellenic Open University, if the degree is included in the list of article 307 of Law No. 4957/2022, must request a "Certificate of Place of Study", which is issued and sent by the foreign university. If the place of study or part of the studies is confirmed as the Greek territory, the degree is not recognized, unless the part of the studies that took place in the Greek territory is in a public higher education institution or in a recognized foreign educational institution within the meaning of paragraph b) of article 299 of Law No. 4957/2022.

It is clarified that holders of a first degree of Higher Education are accepted in the Postgraduate Program.

Contact

Student Records:

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General Information:

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Course Structure:

The total number of credits (ECTS) required for the award of the postgraduate degree is one hundred and twenty (120 ECTS). During the Programme, students are required to attend eight (8) Modules, to carry out Internship and to prepare the Postgraduate Diploma Thesis. The Internship is carried out in the third (C') semester of study, while the Postgraduate Diploma Thesis is carried out in the fourth (D') semester of study.

The programme is structured as follows:

1st Semester	
KYK50 Under cover crop environment	(C[1], 10 ECTS)
KYK51 Plant protection of vegetable crops under cover	(C, 10 ECTS)
KYK52 Integrated and organic cultivation of vegetables under cover	(C, 10 ECTS)
2nd Semester	
KYK53 Construction and equipment of crops under cover	(C, 10 ECTS)
KYK54 Hydroponic crops under cover	(C, 10 ECTS)
KYK55 Stress physiology	(C, 10 ECTS)
3rd Semester	

KYK56 Production of cut flowers, pot plants and nursery stock under cover	(C, 10 ECTS)
KYK57 Environmental policy, environmental studies and recycling of crop waste under cover	(C, 10 ECTS)
KYKPA Internship	(C, 10 ECTS)
4th *Semester*	
KYKDE Postgraduate Diploma Thesis	(C, 30 ECTS)

Note:
C[1]: Compulsory

Module Selection Instructions

Students may select from one (1) to three (3) Modules (**with the limitation of 30 ECTS per semester**).

The selection of the Modules is made in the order of the structure. For example, in the first semester, if they select one (1) Module, they must select KYK50. If students select two (2) Modules they must also select KYK51. If students wish to take three (3) Modules, they may also choose KYK52.

During the module selection, they must select in order of priority the Modules of the following semesters if they have completed all the Modules of the previous semester or they select at the same time the ones you have left (from the previous semester).

The preparation of the Postgraduate Diploma Thesis presupposes the successful attendance of all Modules and Practice.

The presentation of the Postgraduate Diploma Thesis presupposes the successful completion of all Modules and the Practice of the Programme.

The successful completion of eight (8) Modules, the Practice and the Postgraduate Diploma Thesis is mandatory for the award of the Postgraduate Diploma.

Students' evaluation: Grade assessment of a Module – Participation in Final Exams

Module Evaluation:

a1. Two (2) Educational Activities (E.A.) that contribute to the final grade with a weight equal to 10% each of them.

a2. One (1) Written Assignment (W.A.) which contributes to the final grade with a weight equal to 20%.

The grade of the Educational Activities and Written Assignment (WA) is secured when a grade equal to or above the passing grade (≥5) in the final exam or resit is achieved only.

a3. Final exam or resit (FE) contribute to the final grade with a weight equal to 60%.

The **Final Grade** of each Module on the scale of 1 to 10 is calculated as:

Final Grade = (EA1×0,1) + (EA2×0,1) + (WA×0,2) + (FE×0,6)

Establishment of participation right in the final exam:

Participation in the final examination will be allowed, if:

1. the sum of the grades of the aforementioned assignments (see a1 and a2) is equal to, or greater than 50% of the assigned grading scale, i.e. at least 20 points out of 100, based on the weights mentioned in points a1 and a2,
2. at least 2 of the 3 Activities and Assignment should be submitted.

EA & WA grade on the scale of 1 to 100			
EA1	EA2	WA	Minimum grade that is required

(10%)	(10%)	(20%)	for participation in final exams
EA1 × 1	EA2 × 1	WA × 2	20/100

Information about the Course Modules

KYK50 Under cover crop environment

T.U. Code: KYK50

ECTS: 10

T.U. Type: Compulsory

Semester offered: First (1st)

Teaching Language: Greek

Aim of the T.U.: This module aims to provide a background of knowledge about the greenhouse environment, the main climate parameters that shape it, how they are measured and the main types of sensors as well as the basic energy and mass balances of the greenhouse and how they can be used in the selection of the appropriate greenhouse environmental control system.

Learning outcomes: Upon successful completion of this module, students will be able to:

- Understand the greenhouse as a crop production system.
- Understand the effect of solar radiation (intensity and spectrum) on plant growth and morphology.
- Recognize the different bands of the solar radiation spectrum and their relationship with agricultural production as well as how to measure them.
- Understand and calculate basic elements of solar techniques.
- Understand solar maps and use them to determine shading periods.
- Calculate the heating-ventilation and cooling periods using the climograph.
- Be familiar with greenhouse covering materials, their properties and how to choose them according to the type of greenhouse and the crop.
- Be familiar about the use of screens as shading equipment and more generally the use of screenhouses for the production of agricultural products.
- Understand the basic concepts of the greenhouse energy balance and use it to select the appropriate greenhouse air conditioning system.
- Understand the basic concepts of greenhouse water balance and how this affects the humidity inside the greenhouse.
- Be informed about temperature and solar radiation measurement sensors, their operating principles and the selection of different types of sensors.
- Be informed about humidity, speed and wind direction sensors, their operating principles and the selection of different types of sensors.

Subjects covered:

- Elements of solar technology
- Greenhouse covering materials
- Screenhouse covering materials
- Energy balance of protected cultivations
- Climograph of climate suitability for protected cultivations
- Water balance under cover

- Sensors measuring environmental parameters under cover

Prerequisites: There are no prerequisites for this T.U..

Teaching Method: Distance learning using the HOU's e-learning platform and conducting Group Consultative Meetings (tele-GCM).

KYK51 Plant protection of vegetable crops under cover

T.U. Code: KYK51

ECTS: 10

T.U. Type: Compulsory

Semester offered: First (1st)

Teaching Language: Greek

Aim of the T.U.: The content of this course targets on the knowledge of the pests and diseases of vegetable crops cultivated under cover and their impact on the plant growth, survival and production. Acquiring this background will permit pest and diseases diagnosis based on symptoms but mostly will allow development of control strategies in an integrated manner.

Learning outcomes: Upon successful completion of this unit, students will be able to:

- Acquire the basic knowledge about the attacks caused to cultivated plants by pests (insects, mites, nematodes).
- To still recognize the symptoms caused to plants by pests. To know basic elements of their classification, their biology and their ecology.
- Understand the economic dimension of dealing with pests. Theoretical approach to coping. Methods of estimating population density. Biological control. Natural Control Methods, Biotechnological methods (Use of resistant varieties, growth and behavior of insects, exfoliation of sterilized insects). Chemical control in the context of integrated treatment. Planning of Integrated Crop Managing Strategies (case studies). Interaction of the animal enemy with the environment and with other microorganisms.
- Understand the risks from the reckless use of plant protection products and the methods and rules for the safety of use for the user, the consumer of agricultural products and the environment. Training in the principles of plant protection of agricultural crops and the means and methods used in the integrated treatment of plant pests, in order to ensure plant health of crops, with the least possible disruption to the ecosystem.
- Describe symptomatology, etiology, biology and epidemiology of the main fungal, prokaryotic, viral and non-infectious diseases of vegetable crops (tomato, cruciferous vegetables, courgettes, bulbous and leafy vegetables).
- Know the principles of integrated disease management of vegetable crops (cultural measures, chemical, biological and integrated control).
- Understand the biology and epidemiology of the above-mentioned horticultural plant diseases.
- Develop skills to observe symptoms, identify signs (through stereoscopic and microscopic observations), spores and fruiting bodies, being able to do a correct diagnosis and control the diseases.
- Be able to constantly be informed on important issues that concern diseases of vegetable crops.

Subjects covered:

I. Enemies

- Animal enemies of cover crops (insects, mites, nematodes, rodents).
- Morphology, bio-ecology.
- Modern methods of diagnosing enemies of cover crops.
- Integrated treatment of cover crop enemies.

II. Diseases

- Modern methods of diagnosis of cover crop diseases
- Integrated management of crop diseases
- Molecular Phytopathology of crop diseases
- Agricultural pharmacology-residues of plant protection products
- Plant-pathogen interaction
- Environmental ecotoxicology

Prerequisites: There are no prerequisites for this T.U..

Teaching Method: Distance learning using the HOU's e-learning platform and conducting Group Consultative Meetings (tele-GCM).

KYK52 Integrated and organic cultivation of vegetables under cover

T.U. Code: KYK52

ECTS: 10

T.U. Type: Compulsory

Semester offered: First (1st)

Teaching Language: Greek

Aim of the T.U.: The module aims to provide a background of knowledge about the current status and perspectives of vegetable production in Greece, the impact of the environmental factors on the productivity and quality of greenhouse vegetable crops and the modern cultivation practices of vegetables grown under low tunnels, greenhouses of nethouses that are compatible with agriculture sustainability and protect the environment and human health.

Learning outcomes: Upon completion and successful examination of the module the postgraduate student will know:

- What are the most important vegetable crops.
- What is the nutritional value of the most important vegetable crops.
- What is the current status of vegetable production in Greece (in terms of production area, crop productivity, imports and exports, economic feasibly of the production).
- What are the modern technologies for the establishment and production of vegetables (nurseries, morning gardening techniques, greenhouses, hydroponics) according to the principles of integrated production management and according to the principles and protocols of organic farming.
- The post-harvest handling of the vegetables, including their placing on the market.

Based on the above background knowledge, the postgraduate student who has successfully completed the module will be able to prepare a technical study for vegetable cultivation, to grow a vegetable as a producer, to provide advice to producers on vegetable cultivation, to work in organic vegetable certification bodies and horticultural integrated production management organizations and to work in research projects related to vegetables.

Subjects covered:

- Classification and short presentation of vegetables.
- Effect of the root and aerial environment on vegetable crops under cover.
- Vegetable propagation – Propagation material, nurseries, asexual propagation.
- Vegetable production in low tunnels.
- Vegetable production in greenhouses.
- Vegetable production in nethouses.
- Integrated management of irrigation and fertilization of vegetables under cover.
- Modern integrated cultivation management techniques for vegetable crops under cover.
- Organic vegetable production under cover.
- Harvesting – post-harvest handling of vegetable crops under cover.

Prerequisites: There are no prerequisites for this T.U..

Teaching Method: Distance learning using the HOU's e-learning platform and conducting Group Consultative Meetings (tele-GCM).

KYK53 Construction and equipment of crops under cover

T.U. Code: KYK53

ECTS: 10

T.U. Type: Compulsory

Semester offered: Second (2nd)

Teaching Language: Greek

Aim of the T.U.: The aim of the Module is to provide students with specialized knowledge on the design and equipment of greenhouses and net greenhouses, with particular emphasis on the types and materials of construction of greenhouses and net greenhouses and on the techniques of dimensioning the microclimate control systems of greenhouses and the irrigation network of greenhouses and net greenhouses.

Learning outcomes: Upon successful completion of this module, students will be able to:

- Understand the basic and critical characteristics of the materials used for the construction of the frame of different types of greenhouses and net greenhouses.
- Analyze the individual design steps of a greenhouse and/or net greenhouse.
- Dimension the heating, ventilation, cooling, CO2 enrichment systems of greenhouses and the irrigation systems of greenhouses and net greenhouses.
- Use energy-saving techniques and technologies and use renewable energy sources.

Subjects covered:

- Types, materials, technical specifications of greenhouses and screenhouses
- Greenhouse heating
- Ventilation
- Greenhouse cooling
- Greenhouse enrichment with CO_2
- Energy saving and use of renewable energy sources
- Irrigation of screenhouses
- Plant factories

Prerequisites: There are no prerequisites for this T.U..

Teaching Method: Distance learning using the HOU's e-learning platform and conducting Group Consultative Meetings (tele-GCM).

KYK54 Hydroponic crops under cover

T.U. Code: KYK54

ECTS: 10

T.U. Type: Compulsory

Semester offered: Second (2nd)

Teaching Language: Greek

Aim of the T.U.: The content of the module "Hydroponic Crops under Cover" is the familiarization of students at a theoretical and practical level with the systems, equipment and substrates for hydroponic cultivations, as well as with the preparation of nutrient solutions. Emphasis is also placed on the irrigation of hydroponic crops, as well as the nutritional needs of the main vegetables and succulent flowers grown hydroponically in the greenhouse.

Learning outcomes: After completing this module, students will be able to:

- carry out a technical study for hydroponic cultivation of vegetables and cut flowers in the greenhouse
- cultivate a vegetable or ornamental plant as a producer in a hydroponic system
- calculate nutrient solutions
- provide advice to producers for the hydroponic cultivation of vegetables and cut flowers
- work in greenhouses growing vegetables or cut flowers in open or closed hydroponic systems.

Subjects covered:

- Introductory concepts and definitions. Historical review. Feasibility of cultivation in hydroponic systems
- Substrates for hydroponic crops
- Equipment for hydroponic crops
- Water culture systems (flotation system, NFT, DFT, aeroponics)
- Soilless culture systems on substrates (cultivation on bags, pots, plant containers, hydroponic channels)
- Preparation of nutrient solution
- Control and adjustments of nutrient solution in open hydroponic systems
- Control and adjustments of nutrient solution in closed hydroponic systems
- Irrigation of hydroponic crops
- Special part: The following aspects will be presented for the most important greenhouse plants. Choosing and establishment of a hydroponic system, soilless cropping technologies, nutrition and irrigation.

Prerequisites: There are no prerequisites for this T.U..

Teaching Method: Distance learning using the HOU's e-learning platform and conducting Group Consultative Meetings (tele-GCM).

KYK55 Stress physiology

T.U. Code: KYK55

ECTS: 10

T.U. Type: Compulsory

Semester offered: Second (2nd)

Teaching Language: Greek

Aim of the T.U.: The content of this course targets on the knowledge of the structural and functional changes that occur in a cultivated plant in the presence of a biotic or abiotic stress factor in the environment.

Learning outcomes: Upon successful completion of this module, students will be able to:

- Know the basic concepts and terminology of stress physiology.
- Know the effects of abiotic stress factors (water scarcity, salinity, extreme temperatures, problematic light regime, CO_2 or O_2 deficiency) on the structure and function of cultivated plants.
- Knowledge of the effects of biotic stress factors (pathogens and pests) on the structure and function of crop plants.
- Exploit the beneficial effects of stress factors on the production and quality of products.
- Be aware of the interactions of greenhouse crops with climate change.

Subjects covered:

- Introduction to the basic structure and functions of plants.
- Climate change and its possible impacts on agricultural production: the scenarios
- Warming and its effects.
- Salinity in soil or nutrient solution.
- Water shortage.
- Low irradiance.
- Absence of ultraviolet radiation and the morphogenetic effects.
- Variations in CO2 concentration.
- Insufficient aeration of the soil or nutrient solution.
- Oxidative stress: The crossroads where undesirable side effects of stresses meet.
- The chemical arsenal of plants against pathogens and insects.
- The defence mechanisms of plants against pathogens and insects.

Prerequisites: There are no prerequisites for this T.U.

Teaching Method: Distance learning using the HOU's e-learning platform and conducting Group Consultative Meetings (tele-GCM).

KYK56 Production of cut flowers, pot plants and nursery stock under cover

Code TU: KYK56

ECTS: 10

Type of TU: Compulsory

Semester offered: First (1st)

Teaching Language: Greek

Aim of the Thematic Unit: The aim of the unit KYK56 is to familiarize the postgraduate students with modern techniques of cultivation of flowering plants in greenhouses and net

gardens that aim at the production of fresh flowers, pot plants and propagating material for floriculture and are compatible with a sustainable agriculture that protects the environment.

Learning outcomes: Upon successful completion of this unit, students will be able to know:

- What are the individual branches of floriculture and what are the most important ornamental plants per branch,
- What is the current situation in the Greek floriculture sector (in terms of area, productivity, imports & exports, economics of cultivation).
- what are the modern technologies for the establishment and production of cut flowers, pot plants and propagating material for horticulture – landscape architecture.

Also, the student will be able to:

- carry out a technical study for a greenhouse plant for the production of cut flowers, pot plants or propagating material for floriculture,
- grow a flowering plant as a producer,
- advising producers on the cultivation of flowering plants under cover,
- work on research projects related to floriculture.

Subjects covered:

- Importance and prospects of modern business floriculture
- Botanical and cultural classification of ornamental plants
- Classes of floricultural production under cover (cut flowers, pot plants, flowering plant propagating material)
- Influence of environmental factors on floricultural production under cover (root environment, sunlight and light, temperature, air humidity)
- Propagation of ornamental plants. Classical methods (inbred reproduction by seed, asexual reproduction by division, cuttings, cuttings, cuttings, underground germination). Tissue culture. Ornamental plant inoculations. Flower nurseries.
- Modern techniques for the production of dormant flowers under cover.
- Modern techniques for the production of pot plants under cover.
- Application of chemical growth regulators to floricultural crops under cover
- Post-harvest handling (standardisation, preservation and marketing of floricultural products

Prerequisites: There are no prerequisites

Teaching Method: distance using the EAP Distance Learning Platform and conducting Group Counseling Meetings (tele-OSS).

KYK57 Environmental policy, environmental studies and recycling of crop waste under cover

T.U. Code: KYK57

ECTS: 10

T.U. Type: Compulsory

Semester offered: Third (3rd)

Teaching Language: Greek

Aim of the T.U.: This module aims to provide a background of knowledge about the factors, parameters and methodologies regarding the safe reuse of treated municipal wastewater and biosolids in agriculture.

Learning outcomes: Upon successful completion of this module, students will be able to:

- Know the environmental policies at international and national level regarding the reuse of wastewater and biosolids in agriculture.
- Know the composition of treated wastewater and biosolids.
- Know the advantages and disadvantages of reusing treated municipal wastewater and biosolids.
- Understand the advantage of the safe reuse of wastewater and biosolids.
- Apply the composting of biosolids in agriculture.

Subjects covered:

- Implementation of the directives of International organizations such as the FAO, USEPA and the rules established by the Greek State based on the Directives of the European Union.
- The Greek policy and legal framework governing the application of treated wastewater and sludge to agriculture and the environment.
- Composition of the treated wastewater and sludge.
- Quality parameters: (a)-Organic matter (BOD, COD) (b)-Microorganisms (bacteria, fungi, viruses, protozoa, helminths, etc.) (c)-chemical elements (macro-, micronutrients, heavy metals).
- Toxic organic compounds, xenobiotics, pharmaceutical substances, microplastics and other toxic substances.
- Advantages and disadvantages of reusing treated municipal wastewater and sludge in cultivations under cover.
- Effects of treated municipal wastewater on soil and plants and prediction of the risk of soil pollution with heavy metals using pollution indicators.
- Management methods for effective reuse of treated wastewater and sludge to mitigate risks to plant, soil, and human health, and environmental quality.
- Management systems of the treated wastewater in the cultivations under cover such as: transport, storage, distribution and application in greenhouse crops.
- Sludge composting by mixing it with various plant residues to produce organic fertilizers suitable for greenhouse cultivation.

Prerequisites: There are no prerequisites for this T.U.

Teaching Method: Distance learning using the HOU's e-learning platform and conducting Group Consultative Meetings (tele-GCM).

KYKPA Internship

Code: KYKPA

ECTS Credits: 10

Type: Compulsory

Semester in which it is offered: Third (3rd)

Language of instruction: Greek

General Description: The Internship includes 15 days of practical training in greenhouses and greenhouses of public institutions (Research Institutes, Universities) and/or in private organized crop enterprises under the supervision and guidance of a supervising professor. The Thematic Union Internship includes the following stages.

1. First phase before the start of the semester:

- Search by the student of the institution implementing the internship.
- Contact an internship office of HOU
- Approval by the KYKPA Coordinator
- Declaration of the Internship institution at the Internship Office of HOU.
- Agreement between student and institution

2. Second phase

1st G.C.M : Internship guidance.

- Implementation of a 15-day internship:

During the 15-day internship the students they are called:

- To be informed about the organization's activities regarding Cover Crops, the sector's problems, prospects and subsidy programs for the sector.
- To attend field work in a greenhouse in the area and to register his equipment.
- To be informed about issues of marketing crop products under cover.
- To collaborate with members of the host institution in job search techniques in the field of Covered Crops.

2nd G.C.M.: Internship report and guidance for writing the final written assignment.

3. Third phase
   - Submission of the Final Written Assignment.
   - Oral Presentation/Examination of Final Written Assignment.

Learning outcomes: Upon successful completion of the KYKPA, students will have gained a first insight into their professional field as qualified managers for the field of cover crops and hydroponics and will have understood how the theoretical knowledge gained in the previous units is linked to their practical application.

Prerequisites: There are no prerequisites

KYKDE Postgraduate Diploma Thesis

Code: KYKDE

ECTS Credits: 30

Type: Compulsory

Semester in which it is offered: Fourth (4th)

Language of instruction: Greek

General Description: The Postgraduate Diploma Thesis will be a scientific paper of a bibliographical nature and/or a research paper and will be an in-depth investigation of a topic as it is currently formulated. The specific topic will be related to the P.D.Th. and a subject area and the student will be given the opportunity to work in depth on a subset of the science that interests him/her the most. A supervisor – advisor will be appointed who will cooperate and advise the student as well as a three-member committee that will evaluate the Thesis. There will be frequent face-to-face meetings or teleconferences between the supervisor and the student until the teaching objectives of the dissertation are fulfilled. The student will undertake the writing of the dissertation ~80-100 pages, and at the end, before the three-member examination committee, in an open seminar, the student will present the P.D.Th. in the form of a lecture. It has a duration of one academic semester.

Diplomas are based on specific data obtained from the experimental act. The content is just as strict in a scientific sense. Postgraduate dissertations often include some practical work by

students, who are expected to collect data through experimental activities. For students, the Dissertation is part of a broader research and data collection process.
Indicative topics for research:

- Energy use efficiency within greenhouses of different type and cultivation mode.
- Greenhouse climate effect on transpiration and water use
- The effect of ventilation of the greenhouse on cultivation microclima and other characteristics Evaluation of the different lettuce varieties against pathogen attacks
- The use of endophytic microorganisms against phytopathogenic fungi in hydroponic lettuce culture
- Light intensity and quality within greenhouses
- Factors affecting CO2 concentration within greenhouses
- Interaction between phenolics and plant growth in greenhouse cultivations

Learning outcomes: The learning outcomes expected upon successful completion of the Postgraduate Diploma Thesis are summarized as follows:

- Training scientists in the principles, methods and equipment required for greenhouse and netgarden cultivation.
- Training of specialists in modern technologies for hydroponic crops.
- Scientific and technological training of scientists in the application of modern cultivation methods and bioclimatic design in research, the agricultural equipment and agricultural supplies industry.
- To familiarise postgraduate students with modern relevant laboratory and experimental equipment.
- The training of postgraduate students in the organisation and operation of greenhouse and net-grower units.
- The creation of an adequate human potential of qualified scientists who will be able to staff existing units of production of products under cover, study offices, agricultural research centres and public services on the one hand and
- to work as self-employed in their own relevant unit of production of products under cover on the other hand.

For more information regarding the Specifications – Useful Material for writing An MSc Dissertation and submitting it to HOU Repository, please visit the portal **http://courses.eap.gr**. The General Regulation for the presentation of an MSc Dissertation in postgraduate degree programmes organized on a semi-annual basis is available at **https://www.eap.gr/en/semi-annual-programs/**

Prerequisites: The presentation of the Postgraduate Thesis takes place after the successful completion of the Modules of the Program.

Precision Agriculture (Joint Degree)

Joint Degree with the University of Patras (UP)

Type of Postgraduate Programme

Master of Science (MSc)

ECTS

The total sum of ECTS (European Credit Transfer and Accumulation System) required for the postgraduate degree in "Precision Agriculture" is 90 ECTS (30 ECTS per semester).

Duration of Study

The minimum time required for the completion of the Program is three (3) academic semesters.

Language

The official language of the Program is Greek. This means that the language in which all materials content and written assignments is Greek.

Classification according to ISCED-2011 of UNESCO:

Based on the level of Education: 7

Classification according to ISCED-2013 of UNESCO:

Based on the field of Education: 0811 - Agronomy and crop science

Admission Requirements

The IPSP accepts:

1. Agricultural & Forestry Sciences Graduates
2. Engineering Graduates
3. Sciences and Economics Graduates
4. Graduates of Greek H.E.I., Polytechnic, and T.E.I. departments in fields related to the above-mentioned fields, as well as graduates of recognized foreign such institutions.

All students must possess a very good level of proficiency in English.

Note:

Holders of a degree or diploma of higher education means graduates of Greek Universities or Polytechnics or Higher School of Fine Arts or Higher School of Pedagogical and Technological Education or Higher Technological Educational Institutions (ATEI) or those who hold academically equivalent first cycle degrees from recognized foreign educational institutions with the degrees awarded by the Greek Higher Educational Institutions, in accordance with the provisions of article 304 of Law No. 4957/2022 (Government Gazette 141/21.07.2022, vol.)

Marking:

For the evaluation of the application to the Postgraduate Studies Programme, it will be examined whether the candidate's institution of study is or may be included in the National Register of Recognised Higher Education Institutions of Foreign Countries and whether the candidate's degree is or may be included in the National Register of Types of Degrees of Recognised Institutions of Foreign Countries.

The Hellenic Open University, if the degree is included in the list of article 307 of Law No. 4957/2022, must request a "Certificate of Place of Study", which is issued and sent by the foreign university. If the place of study or part of the studies is confirmed as the Greek territory, the degree is not recognized, unless the part of the studies that took place in the Greek territory is in a public higher education institution or in a recognized foreign educational institution within the meaning of paragraph b) of article 299 of Law No. 4957/2022.

It is clarified that holders of a first degree of Higher Education are accepted in the Postgraduate Program.

Contact

Student Records:

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General Information:

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Course Structure

The total academic credits (ECTS) required to obtain the Postgraduate Specialization Diploma are 90 ECTS. The Programme in "Precision Agriculture" is organized in three (3) academic semesters, with eight (8) Modules, one (1) Laboratory Module and the preparation of a Thesis. The minimum duration of studies is one and a half (1 ½) years. To obtain the Postgraduate Specialization Diploma, students must successfully complete the eight (8) Modules, the single (1) Laboratory Module, prepare and present their Thesis.

The programme is organized per semester as follows:

1st Semester	
EGA50 Introduction to Precision Agriculture	(C[1], 7 ECTS)
EGA51 Remote Sensing – Geographic Information Systems	(C, 8 ECTS)
EGA52 Modern Trends in Plant Production	(C, 8 ECTS)
EGA53 The economics of precision agriculture	(C, 7 ECTS)
2nd Semester	
EGA54 Integrated Pest and Disease Management	(C, 8 ECTS)
EGA55 Rational Management of Water Resources in Agriculture	(C, 8 ECTS)
EGA56 Big Data Analysis	(C, 7 ECTS)
EGA57 Environmental policy/waste management	(C, 7 ECTS)
3rd Semester	
EGALM Practical Applications of Precision Agriculture	(C, 10 ECTS)
EGADE Thesis	(C, 20 ECTS)

Note:

C[1]: Compulsory

Module Selection Instructions

Students may select from one (1) to four (4) Modules (up to 30 ECTS) per semester.

When selecting Modules, students must first pass all the available Modules that belong to the previous term and then select Modules belonging to the next semester. For example, a student who has successfully completed one (1) first-semester Module and wishes to select four (4) Modules in the second semester must the three (3) remaining first-semester Modules and one (1) second-semester Module (to a maximum of 30 ECTS per semester) etc.

Students may participate in the Laboratory Module upon successful attendance all eight (8) Modules of the Programme.

The presentation of the Thesis takes place after the successful completion of the program's Modules and the Laboratory Module.

To obtain the Postgraduate Specialization Diploma, students must successfully compete the eight (8) Module, the single (1) Laboratory Module, and prepare and present their Thesis.

Students' evaluation: Grade Assessment of a Module – Participation in Final Exams

Module Evaluation:

a1. Two (2) Educational Activities (E.A.) that contribute to the final grade with a weight equal to 10% each of them.

a2. One (1) Written Assignment (W.A.) which contributes to the final grade with a weight equal to 20%.

The grade of the Educational Activities and written assignment (WA) is secured when a grade equal to or above the passing grade (≥5) in the final exam or resit is achieved only.

a3. Final exam or resit (FE) contribute to the final grade with a weight equal to 60%.

The **Final Grade** of each Module on the scale of 1 to 10 is calculated as:

Final Grade = (EA1×0,1) + (EA2×0,1) + (WA×0,2) + (FE×0,6)

Establishment of participation right in the final exam:

Participation in the final examination will be allowed, if:

1. the sum of the grades of the aforementioned assignments (see a1 and a2) is equal to, or greater than 50% of the assigned grading scale, i.e. at least 20 points out of 100, based on the weights mentioned in points a1 and a2,
2. at least 2 of the 3 Activities and Assignment should be submitted.

EA & WA grade on the scale of 1 to 100			
EA1 (10%)	EA2 (10%)	WA (20%)	Minimum grade that is required for participation in final exams
EA1 × 1	EA2 × 1	WA × 2	20/100

Information about the Course Modules

EGA50 Introduction to Precision Agriculture

Code TU: EGA50

ECTS: 7

Type of TU: Compulsory

Semester offered: First (1st)

Teaching Language: Greek

Course Content: Precision Agriculture is a new method of farm management whereby inputs (pesticides, fertilizers, seed, irrigation water) and farming practices are applied according to the needs of the soil and crops as they vary in space and time. The main objectives of the EAG 50 module are to provide basic knowledge on (i) increasing crop yields, (ii) improving the quality of the products produced, (iii) using agrochemicals more efficiently, (iv) saving energy, (v) protecting soil and water from pollution.

Learning Outcomes:

Upon completion of the module "Introduction to Precision Agriculture" students will be able to:

- know the basic principles, methods and objectives of GA, as well as the problems it has to deal with
- adopt GA tools to achieve the individual objectives in agricultural production

- know the purpose that led to the mapping of agricultural production.
- become familiar with the available systems and technological tools used to measure and record production data on fruit and vegetables and major crops
- be familiar with the modern available systems and individual sensory instruments used for the collection of ground-based geospatial data and the various parameters for which they allow mapping.
- be familiar with the systems available for the application of inputs (fertilisers, irrigation and plant protection products) at variable rates and the data which allow each application
- become familiar with the basic principles and technologies that allow automatic navigation of agricultural vehicles, as well as the available modern commercial systems
- be familiar with the modern robotic systems available on the market
- be familiar with the most widespread applications of GA in tree crops around the world
- identify which systems enable different applications of GM in large crop plants
- know the basic principles used for modelling agricultural production
- use new data to develop crop production prediction models

Subjects:

- Fundamentals of precision agriculture.
- Basic principles of precision agriculture.
- Adoption at European and global level and applications in different crops

Prerequisite courses: There are no prerequisites for this T.U.

Teaching Method: distance using the EAP Distance Learning Platform and conducting Group Counseling Meetings (tele-OSS).

EGA51 Remote Sensing – Geographic Information Systems

Course Unit Code: EGA51

Credits ECTS: 8

Course Type: Compulsory

Semester: First (1st)

Language: Greek

Course Content: The Thematic Unit aims to familiarize students with the tools, technology, and methods of implementing spatially differentiated cultivation in standard production systems. These tools include: global navigation satellite systems (GNSS/GPS) with application on agricultural vehicle navigation and sampling, remote sensing (satellite and UAV) for documenting crop properties, spectroscopy and towed sensors for recording soil properties, GIS for spatial interpolation of point measurements and spatial analysis.

Learning Outcomes:

Upon successful completion of the Thematic Unit “Remote Sensing - Geographic Information Systems”, students will be able to:

- understand the basic concepts of remote sensing, Geographic Information Systems, GNSS/GPS, and know how to implement them in precision agriculture
- be familiar with satellite ground observation and UAV systems, and understand their capabilities and limitations

- understand the theoretical framework of digital image processing and digital image processing techniques
- understand the uses of vegetation indices and image classification
- be familiar with the basic principles of spectroscopy and understand the use of spectrometers in precision agriculture
- possess the theoretical framework in spatial analysis and be familiar with the main spatial analysis techniques
- be familiar with zoning techniques, through the use of spatial data generated by precision agriculture tools
- produce fertilizer prescription maps

Subjects:

- Presentation of the basic GIS and geographical analysis principles. Focus on agriculture-related GIS applications.
- Management of spatial data from sensors used in precision agriculture applications.
- Basic principles of remote sensing and digital image processing used in precision agriculture applications.
- Unmanned aerial vehicles (UAVS or drones) and very-high-resolution satellites

Prerequisite courses: There are no prerequisites for this T.U.

Teaching Method: distance using the EAP Distance Learning Platform and conducting Group Counseling Meetings (tele-OSS).

EGA52 Modern Trends in Plant Production

Course Unit Code: EGA52

Credits ECTS: 8

Course Type: Compulsory

Semester: First (1st)

Language: Greek

Course Content: The unit EGA52 aims to provide students with basic knowledge about the latest developments in Precision Agriculture techniques regarding the cultivation of fruit trees, grapevines, and field crops. Lessons will focus especially on the comparative evaluation of the most widespread cultivation techniques and the solutions to basic challenges of each stage of agricultural production. The prospects of crop production in different regions of Greece are also explored.

Learning Outcomes:

After the successful completion of the Thematic Unit (T.U.) “Modern Trends in Plant Production”, students will be able to:

- identify new trends in precision agriculture techniques regarding the cultivation of fruit trees, grapevines, and arable crops.
- adapt crop management and agricultural ecosystems to a constantly shifting environment, in order to limit CO2 emissions and slow down climate change.
- adopt methods - practices for the sustainable management of land resources.
- adopt new methods to strengthen the resilience of plants and improve crop production.
- adopt new pest control techniques in sustainable agriculture systems.

- update their knowledge on new technologies and approaches on the sustainable use of plant protection products.
- adopt the best practices for the production of safe and quality agricultural products.
- document the contribution of precision agriculture to sustainable crop production management.
- evaluate the results of the implementation of modern plant protection and fertilization systems through the use of new technologies in arable crops and fruit trees

Subjects:

- Introduction to plant Physiology, propagation, Mineral nutrition, Irrigation, Flowering, and fruiting, Fruit growth and development, Maturation, Harvesting, Integrated Crop and Orchard Management.
- Modern cultivation techniques in large-scale crops.
- Modern orchard and vineyard cultivation techniques.
- Cultivation practices for sustainable farm management

Prerequisite courses: There are no prerequisites for this T.U.

Teaching Method: distance using the EAP Distance Learning Platform and conducting Group Counseling Meetings (tele-OSS).

EGA53 The economics of precision agriculture

Course Unit Code: EGA53

Credits ECTS: 7

Course Type: Compulsory

Semester: First (1st)

Language: Greek

Course Content: The unit covers both basic and advanced concepts of the economics of agricultural production, and aims to present the methodology required for the analysis, management, and implementation of Precision Agriculture (PA) and new agricultural technologies. Lessons thus focus on the concept of innovation and business restructuring, and discuss decision-making processes, planning, organization, and financial planning methods for agricultural enterprises. Students will also be taught the methodology of preparing investment plans together with the production cost of agricultural products.

Learning Outcomes:

Upon successful completion of the Thematic Unit “The Economics of Precision Agriculture”, students will be able to:

- identify the means of organizing and managing an agricultural enterprise.
- understand the impact of management methods on the financial results of agricultural enterprises.
- identify product and process innovation and their impacts on the financial results of agricultural enterprises.
- contextualize precision agriculture techniques for changing, innovative agricultural enterprise management.
- understand the changes brought about by precision agriculture applications on farms.
- document the impact of precision agriculture application on the financial results of agricultural enterprises

Subjects :

- Basic Agricultural Enterprise Organization and Management concepts.
- Innovations and Innovation Management.
- Financial Analysis / Evaluation of Agricultural Enterprise Investments.
- Applications, financial, political, and environmental impacts of Precision Agriculture

Prerequisite courses: There are no prerequisites for this T.U.

Teaching Method: distance using the EAP Distance Learning Platform and conducting Group Counseling Meetings (tele-OSS).

EGA54 Integrated Pest and Disease Management

Course Unit Code: EGA54

Credits ECTS: 8

Course Type: Compulsory

Semester: Second (2nd)

Language: Greek

Course Content: The unit EGA54 covers the use of innovative methods and approaches to predict the occurrence and population densities and manage pests and plant diseases with an emphasis on precise application of selected interventions. The course aims to (a) broaden the knowledge on aspects of pest and disease management of crops, (b) to raise awareness and perform training on predictive population models, their development and use for predicting the occurrence and implement control activities of both pests and diseases that infest the most important crops, (c) use of softwres to execute plant protection algorithms and decision support systems, and (d) analyze pros and cons of adopting the principles of precision pest management. Students will obtain knowledge related to the development of plant protection programs that are based on climatic data with the goal of reducing unnecessary application of synthetic chemical for plant protection purposes.

Learning Outcomes:

Upon successful completion of the Thematic Unit “Integrated Pest and Disease Management”, students will be able to:

- understand the need for plant protection interventions.
- possess a theoretical foundation on the principles of integrated plant protection, as well as its limitations and advantages.
- develop integrated crop pest and disease control programs.
- develop rudimentary predictive models to predict the occurrence of pests and diseases.
- develop plant protection algorithms.
- understand the negative impact of plant protection interventions on the environment and human health.
- utilize computer programs related to precision agriculture applications for plant protection.
- evaluate the effectiveness of plant protection programs with the use of modern technology

Subjects:

- Entomology and plant pathology

- Introduction to integrated pest and disease management. Crop damage, production loss, quality deterioration, and economic loss.
- Mapping and analysis of infestation populations and spatial distribution.
- Prognostic models for pests and disease
- Examples of crop protection applications

Prerequisite courses: There are no prerequisites for this T.U.

Teaching Method: distance using the EAP Distance Learning Platform and conducting Group Counseling Meetings (tele-OSS).

EGA55 Rational Management of Water Resources in Agriculture

Course Unit Code: EGA55

Credits ECTS: 8

Course Type: Compulsory

Semester: Second (2nd)

Language: Greek

Course Content: The unit EGA55 aims to introduce students to the use of Precision Agriculture tools for the management of irrigation water and fertilizers in agriculture. Lessons will initially focus on providing fundamental knowledge regarding the movement and availability of water and minerals in soil, their absorption by plants, and their role in physiological processes. Subsequent lessons will discuss a wide spectrum of applications and methodologies capable for the precise temporal-quantitative determination of irrigation water and fertilizer needs based on sensor readouts and/or software models.

Learning Outcomes:

After the successful completion of the Thematic Unit (T.U.) “Rational Management of Water Resources in Agriculture”, students will be able to:

- understand the need for more efficient use of irrigation water and reduction of the water footprint of crops grown in the current bioclimatic conditions.
- understand the importance of soil analysis for efficient irrigation scheduling.
- understand the role of specific equipment to monitor water kinetics in soil.
- evaluate the importance of water for plant production and the ecophysiological mechanisms of plant adaptation to drought
- be familiar with modern scientific methods capable for the calculation of crop's water requirements.
- Use novel methodologies and tools for increasing irrigation efficiency
- implement regulated deficit irrigation methodologies according to plant’s phenological stage.
- understand climate factors that may affect the evapotranspiration of a crop.
- Understand the irrigation system’s operation and be able to select the appropriate system
- understand the (negative) impact of irrigation with saline water on crops.
- adopt new precision irrigation practical applications for tree and horticultural crops, as well as for field crops.
- understand the significance of irrigation and evaluate the negative environmental impacts of over-irrigation

Subjects:

Prerequisite courses: There are no prerequisites for this T.U.
Teaching Method: distance using the EAP Distance Learning Platform and conducting Group Counseling Meetings (tele-OSS).

EGA56 Big Data Analysis

Course Unit Code: EGA56
Credits ECTS: 7
Course Type: Compulsory
Semester: Second (2nd)
Language: Greek
Course Content: The impact of data on correct, timely decisions in Precision Agriculture is a factor on which modern agricultural activities and enterprises hinge. Technological progress and applications, such as the use of smart-phones, the installation of sensors etc., result in the production of truly impressive volumes of data, which hold immense potential if analyzed and treated with the objective of improving agricultural support and decision-making.
Learning Outcomes:
Upon successful completion of the Thematic Unit "Big Data Analysis" students will be able to:

- understand the basic structures used for modeling, organizing, and storing data in actual data management systems.
- know the different means and languages used to retrieve data from a data processing system.
- understand Data Science and how it differs from Knowledge Discovery from Databases, and how it relates to other key fields of Science, such as Statistics, Machine Learning, Databases, Pattern Recognition, Parallel Programming, and Artificial Intelligence.
- understand the basic stages of Data Mining, as well as the various different or alternative techniques used in implementing each stage.
- understand the basic tasks that can be implemented through data mining.
- understand and apply different techniques and algorithms for each of the aforementioned basic tasks.
- utilize a data mining tool (e.g. R, Rattle, Weka, Knime, etc.) to solve a Data Mining challenge.
- understand how to evaluate and compare the results of different techniques and algorithms as they apply to different data discovery challenges.
- know and understand when a challenge may be expressed as a Data Mining problem, how data must be prepared for that particular problem, and what form of task and/or algorithm is most appropriate to solve it.
- understand that Data Mining is a repetitive, multi-level, and interactive process, the results of which at every stage/level must be evaluated both by objective measures of correctness and validity and by specialized experts/engineers.
- understand that the models produced by Data Mining are not absolutely accurate, and do not conform to set rules, but often attempt to conform to (what are known as) "opportunistic" data.
- know that experience is crucial when selecting the most appropriate model (and the parameters that define it) as well as the algorithms that produce it.

- understand that data quality largely defines the results of this process, while generous time needs to be dedicated to data integration, cleansing, selection, and transformation.
- understand that the simplest models are often the best.
- understand that no Data Mining technique is better than all the others in solving a problem.
- know the properties of big data and understand the different methods of data mining that can deal with each of them.
- know the different applications and means of utilizing Big Data Mining techniques in Precision Agriculture

Subjects:

Prerequisite courses: There are no prerequisites for this T.U.

Teaching Method: distance using the EAP Distance Learning Platform and conducting Group Counseling Meetings (tele-OSS).

EGA57 Environmental Policy / Waste Management

Course Unit Code: EGA57

Credits ECTS: 7

Course Type: Compulsory

Semester: Second (2nd)

Language: Greek

Course Content: The T.U. aims to provide students the opportunity to analyze and evaluate policies, measures, and projects designed to effectively and rationally manage waste, for the sustainable use of resources and the prevention of environmental degradation, or the preservation, restoration, and improvement of the environment. The T.U. discusses the wider institutional waste management framework in accordance with the directives of International Organizations such as the FAO, US EPA, as well as the laws enacted by the Hellenic Republic according to European Union Directives. Furthermore, lessons will also discuss the Greek policy and legal framework that governs the applications of treated wastewater and sludge in agriculture and the environment.

Learning Outcomes:

Upon successful completion of the T.U.:

- Students will know the decisions of international conferences, European Parliament directives on the environment and climate change, and the quality limits in place for the reuse of liquid and solid waste in agriculture.
- Students will learn the natural, chemical, and biological properties, as well as the toxic compounds, xenobiotics, pharmaceuticals, micro-plastics, and other toxic substances present in wastewater and sludge.
- Students will know the benefits and potential challenges of utilizing wastewater and sludge, as well as the criteria for crop selection, controlled application of waste and biosolids in agriculture, reducing risks and protecting public health.
- Students will be able to apply pollution load indicators to assess the extent and density of heavy metal pollution, as well as learn the factors that need to be taken into account for the management systems of treated urban wastewater in agriculture.
- Students will know the benefits for agriculture of biosolids composting

Subjects:

- Treated wastewater and sludge composition.
- Methods of managing and effectively re-using wastewater and sludge to mitigate dangers to soil, plants, public health, and environmental quality.
- Software for the safe re-use of biosolids waste and wastewater in agriculture.
- Policy applications and organizing responses to real waste management challenges through the planning of appropriate local-level environmental policy

Prerequisite courses: There are no prerequisites for this T.U.

Teaching Method: distance using the EAP Distance Learning Platform and conducting Group Counseling Meetings (tele-OSS).

EGALM Practical Applications of Precision Agriculture

Course Unit Code: EGALM

Credits ECTS: 10

Course Type: Compulsory

Semester: Third (3rd)

Language: Greek

Aim of the Course: The EGALM "Practical Applications of Precision Agriculture" aims to analyze, present, and provide students with specialization in Precision Agriculture applications connected with five of the Modules that belong to the Programme, namely:

EGA51. Remote Sensors - Geographic Information Systems (GIS /Remote sensing / UAV)

EGA52. Modern Trends in Plant Production

EGA54. Integrated Pest & Disease Management

EGA55. Rational Management of Water Resources in Agriculture

EGA56. Big Data Analysis

Additionally, laboratory practical training is provided at the Plant Production Laboratory of the University of Patras.

Learning Outcomes:

Upon successful completion of the Laboratory Module "Practical Applications of Precision Agriculture", students will be able to:

- be familiar with the use of modern scientific instruments.
- apply modern analytic techniques in the laboratory.
- deal with challenges that arise during laboratory analyses.
- evaluate the results of laboratory measurements.
- be familiar with the use of modern smart agriculture software.
- adopt modern agricultural applications.
- be familiar with the installation and use of new field measurement systems

Prerequisite courses: Students may participate in the Laboratory Module upon the successful completion of all eight (8) Modules of the Programme.

EGADE Thesis

Course Unit Code: EGADE

Credits ECTS: 20

Course Type: Compulsory

Semester: Third (3rd)

Language: Greek

Aim of the Course: The research objects utilized in writing a thesis are harmoniously integrated into the main orientations of the program, that is, understanding and implementation of tools, methods and technologies of Precision Agriculture.

The director of the program selects groups of related subjects, on the basis of which the prospective students submit a relevant proposal for elaboration. Subsequently, the Board of Directors (as above mentioned) designates the supervising member (First supervisor) and the second member of the Evaluation Committee for each submitted MDE proposal if it meets the basic academic requirements. Then the first Supervisor, in collaboration with the students, finalizes the topic and the basic content of the MDE in the digital education area within the first month of preparation and gives the final approval.

The key subjects of the module are:

In particular, the General Categories of subjects for the Master's Thesis are, presently, the following:

- Precision agriculture applications-Robotics
- Remote Sensing – Geographic Information Systems Soil Science, Hydraulic, Rational Management of Water Resources in Agriculture
- Economics
- Big Data Analysis
- Phytopathology
- Artificial intelligence
- Internet of things (IOT)
- Ecophysiology
- Environmental Policy / Waste Management

The theory and practice used to further deepen the student's knowledge is based to some extent on the materials modules. However, for further deepening and acquisition of specialized knowledge and skills, the student, in collaboration with the supervisor, studies work from the relevant literature. This process usually takes 2-3 months. Then the thesis prepared and is checked in its stages both by the supervisor and by a second evaluator.

Key subjects of the module is the set of all subjects of individual modules as they are written in the respective outlines.

Learning Outcomes:

The students who will successfully complete the module:

- they will have obtained a deep knowledge of the subject of their subject to the extent that they will be able to comfortably and fluently read and acquire information on cuttingedge research topics from publications in research journals of the respective research area.
- They will be able to give high level seminars in which they will be able to explain their subject clearly and to answer related questions from other scientists

For more information regarding the Specifications – Useful Material for writing An MSc Dissertation and submitting it to HOU Repository, please visit the portal **http://courses.eap.gr**. The General Regulation for the presentation of an MSc Dissertation in postgraduate degree programmes organized on a semi-annual basis is available at **https://www.eap.gr/en/semi-annual-programs/**

Prerequisite courses: Students may present and defend their Postgraduate Diploma Thesis after successfully completing all the Thematic Units and the Thematic Laboratory Unit of the Program

M.Sc. in Epidemiology

Objectives - Aim

The program provides training in Epidemiology and its specialties. It will provide postgraduate students with knowledge and skills that they can use in medical research and public health. They will be taught epidemiological methods, which will assist them in clinical medical research, in the practical application of public health in various fields and in the evaluation of health care and in the investigation of the cause of the disease and the evaluation of interventions for the prevention or control of the disease. The directions will also give a specialization in epidemiology.

Learning Outcomes

Upon completion of the Postgraduate course, students will be able to:

- Have significant knowledge of the role and contribution of epidemiology in other areas related to health
- Select the appropriate plans and develop detailed protocols for epidemiological studies
- Manage computerized epidemiological data and perform appropriate statistical analyzes
- Evaluate the results of epidemiological studies (their own or other researchers), including the critical evaluation of the study in question, the design of the study, the methods and behaviors, statistical analyzes and interpretation

ECTS Credits

The total number of ECTS required for the acquisition of the Master's degree is 90 ECTS.

Characterization of the Post-graduate Programme

Master of Science (M.Sc.)

Classification according to the UNESCO Code ISCED-2011

Based on the level of study: 7

Classification according to the UNESCO Code ISCED-2013

Based on the field of Education and Training: 0912 – Medicine

Specializations of the Programme

The Post-graduate Programme "M.Sc. in Epidemiology" has three specializations:
(1.) Clinical Epidemiology,

(2.) Environmental Epidemiology,
(3.) Social Epidemiology.

Language of instruction

The language of instruction of the program, as well as of the Master's thesis, is Greek.

Duration of studies

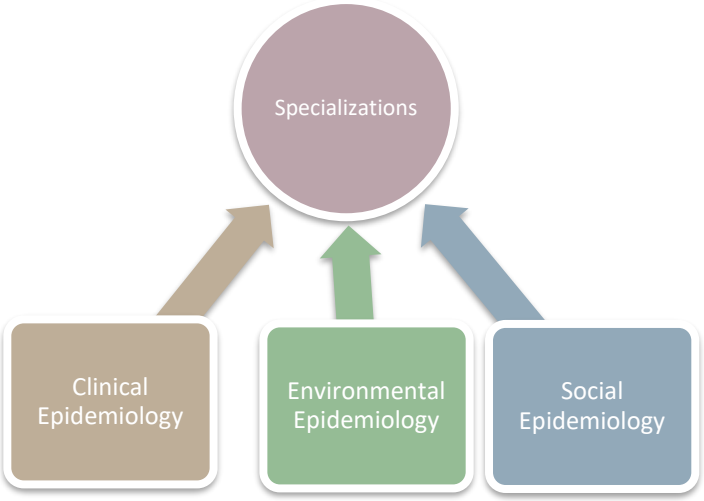
The minimum duration for the completion of the program. The minimum duration of study is one and a half (1 ½) academic years, i.e. three (3) semesters.

Admission Requirements

The Post-graduate programme accepts graduates or higher institution diplomas. The programme is offered in Greek.
The knowledge of a foreign language and good computer-Internet skills would be useful for the successful participation in the programme.
Note:
Holders of a degree or diploma of higher education means graduates of Greek Universities or Polytechnics or Higher School of Fine Arts or Higher School of Pedagogical and Technological Education or Higher Technological Educational Institutions (ATEI) or those who hold academically equivalent first cycle degrees from recognized foreign educational institutions with the degrees awarded by the Greek Higher Educational Institutions, in accordance with the provisions of article 304 of Law No. 4957/2022 (Government Gazette 141/21.07.2022, vol.)
Marking:
For the evaluation of the application to the Postgraduate Studies Programme, it will be examined whether the candidate's institution of study is or may be included in the National Register of Recognised Higher Education Institutions of Foreign Countries and whether the candidate's degree is or may be included in the National Register of Types of Degrees of Recognised Institutions of Foreign Countries.
The Hellenic Open University, if the degree is included in the list of article 307 of Law No. 4957/2022, must request a "Certificate of Place of Study", which is issued and sent by the foreign university. If the place of study or part of the studies is confirmed as the Greek territory, the degree is not recognized, unless the part of the studies that took place in the Greek territory is in a public higher education institution or in a recognized foreign educational institution within the meaning of paragraph b) of article 299 of Law No. 4957/2022.
It is clarified that holders of a first degree of Higher Education are accepted in the Postgraduate Program.

Structure

The Post-graduate Programme "M.Sc. in Epidemiology" is structured in three (3) academic semesters, which include six (6) compulsory Modules and the preparation of a Thesis. The minimum duration of study is one and a half (1 1/2) academic years.
In the second semester, the student is obliged to choose one of the three specializations.



	1st Semester	ECTS
EPI 50	Introduction in Epidemiology	(M[1], 10 ECTS)
EPI 51	Statistical methods in Epidemiology	(M, 10 ECTS)
EPI 52	Epidemiology of communicable and non-communicable diseases	(M, 10 ECTS)
	2nd Semester	
EPI 60	Global Health, Health Promotion and Bioethics	(M, 10 ECTS)
	2nd Semester[2]	
	Specialization 1: Clinical Epidemiology	
EPI 61	Clinical Epidemiology	(M, 10 ECTS)
EPI 62	Epidemiology and - Omics	(M, 10 ECTS)
	Specialization 2: Environmental Epidemiology	
EPI 63	Environmental Epidemiology	(M, 10 ECTS)
EPI 64	Risk assessment in Public Health	(M, 10 ECTS)
	Specialization 3: Social Epidemiology	
EPI 65	Social Epidemiology	(M, 10 ECTS)
EPI 66	Nutrition Epidemiology	(M, 10 ECTS)
	3rd Semester	
EPI DE	Thesis	(M, 30 ECTS)
	Total	**90 ECTS**

Notes:

M[1]: *Mandatory*

2nd Semester[2]: *Choose one of the three Specializations*

Instructions for the selection of Modules

You can choose from one (1) to three (3) CMs per semester (30 ECTS).

The selection of the modules is made in the order that the programme structure follows.

For example, in the first semester, if you wish to choose one (1) module, you must enroll in EPI50. If you wish to select two (2) modules, you must enroll on EPI50 and EPI51. If you wish to select three (3) modules, you must select EPI50, EPI51 and EPI52.

During the module enrollment process, the module of the previous semester must be completed first and then the modules of the next semester should be selected.

In the second semester, you must choose one of the three specializations and select modules according to the order of the programme structure respectively.
The preparation of the Thesis (EPIDE) presupposes the successful attendance of all six (6) modules.
The viva examination of the Thesis presupposes the successful completion of all Modules of the Programme.
In order to obtain the Master's degree, the successful completion of six (6) modules, as well as the successful completion and presentation of the Thesis, is mandatory.

Module Evaluation:

a1*. Two (2) Short Written Assignments (SWA) that contribute to the final grade with a weight equal to 10% each of them.*
a2*. One (1) Written Assignment (WA) which contributes to the final grade with a weight equal to 20%.*
The grade of the written assignments (SWA & WA) is secured when a grade equal to or above the passing grade (≥5) in the final exam or resit is achieved only.
a3. *Final exam or resit (FE) contribute to the final grade with a weight equal to 60%.*
The **Final Grade** of each Module on the scale of 1 to 10 is calculated as:
Final Grade = (SWA×0,1) + (SWA×0,1) + (WA×0,2) + (FE×0,6)

Establishment of participation right in the final exam:

Participation in the final examination will be allowed, if:

1. the sum of the grades of the aforementioned assignments (see a1 and a2) is equal to, or greater than 50% of the assigned grading scale, i.e. at least 20 points out of 100, based on the weights mentioned in points a1 and a2,
2. at least 2 of the 3 Assignments should be submitted.

SWA & WA grade on the scale of 1 to 100			
SWA1 (10%)	SWA2 (10%)	WA (20%)	Minimum grade that is required for participation in final exams
SWA1 × 1	SWA2 × 1	WA × 2	20/100

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Information about the Course Modules

EPI50 Introduction in Epidemiology
Code TU: EPI50
ECTS: 10
Type of TU: Mandatory
Semester offered: First (1st)
Teaching Language: Greek

Purpose: Epidemiology studies the frequency and distribution of diseases and morbid conditions in the human population, as well as the factors that form this distribution. The purpose of Epidemiology is the control and prevention of diseases, through the recording and evaluation of their distribution and development in the community, as well as the factors that shape and influence diseases.

The aim of the course is to develop the concept of Epidemiology, as a science necessary for the comprehensive assessment of the health of the community / population, in the framework of which preventive and therapeutic medicine is practiced. The analytical presentation of the methods of epidemiology, the ways of measuring and mapping the health, morbidity, mortality of the population aim at acquiring skills in the use and evaluation of biostatic data, acquiring the ability to plan and execute epidemiological research, as well as the possibility of development Health Policy proposals.

Learning outcomes:

After the successful completion of the thematic unit the students are expected to:

- They have substantial knowledge of the role and contribution of epidemiology to other health-related disciplines
- Describe the types of epidemiological studies and their usefulness in the clinical diagnosis and monitoring of a disease
- Manage epidemiological data and perform appropriate statistical analyses
- Evaluate the results of epidemiological studies (their own or those of other researchers), including critical evaluation of the study in question, study design, methods and conduct, statistical analyzes and interpretation
- They understand specific examples of the use of Epidemiological studies in Public Health

Cognitive subjects:

- Basic Epidemiology
- Measurements of disease
- Types of epidemiological studies
- Design and sampling
- Epidemiological models

Prerequisites: There are no prerequisites

Teaching Method: distance using the EAP Distance Learning Platform and conducting Group Counseling Meetings (tele-OSS).

EPI51 Statistical methods in Epidemiology

Code TU: EPI51

ECTS: 10

Type of TU: Mandatory

Semester offered: First (1st)

Teaching Language: Greek

Purpose: This Thematic Unit aims at the knowledge and understanding of the basic concepts and procedures of data analysis, resulting from epidemiological research, in order to draw correct conclusions. During the course, students will learn how to collect, manage, and present different types of data, to understand basic biostatistical concepts, such as probability

distributions, estimates and confidence intervals, hypotheses testing, regression and apply appropriate statistical methods. The basic concepts of Descriptive Statistics are described, the correct bases are laid for the design of studies and data collection. The methodologies applied in Inferential Statistics and the drawing of correct conclusions are presented. Trials and hypothesis testing are investigated. The relationship estimators between the variables are defined (correlation, agreement). Dependency relationships are explained and linear and logistic regression models are described. Survival analysis, systematic review and meta-analysis methodologies are presented.

Learning results:

Upon successful completion of T.U. EPI51 "Statistical methods in Epidemiology", students will have developed skills of knowledge, understanding and critical ability related to the statistical methods applied in epidemiology, i.e. they will be able to:

- Identify the different data structures (e.g. types of variables and measurement levels) and the distribution characteristics of the variables and distinguish between descriptive and inferential statistics.
- Perform the appropriate statistical analysis using statistical programs (software), to interpret and present the results in a scientific way.
- Select and apply appropriate statistical methods for managing (analyzing and explaining) common data types
- Interpret the results of descriptive statistics, regression models and survival analysis
- Evaluate the accuracy of the various statistical tests required depending on the type of study

Cognitive subjects:

- Level of statistical significance
- Epidemiological Data analysis with statistical methods
- Analytical Statistical methods and use
- Survival analysis
- Introduction to computational statistics
- Methods in computational statistics
- Computer packages and epidemiology
- Method R
- Case studies and computer packages

Prerequisites: There are no prerequisites

Teaching Method: distance using the EAP Distance Learning Platform and conducting Group Counseling Meetings (tele-OSS).

EPI52 Epidemiology of communicable and non-communicable diseases

Code: EPI52

ECTS Credits: 10

Type of TH: Mandatory

Semester offered: First (1st)

Language of instruction: Greek

Purpose of thematic unit: This module aims to provide students with a in-depth knowledge of important concepts in the field of epidemiology of communicable and non-communicable diseases, and many of the skills used in these concepts in practice.

Learning results:

By the end of this module, students should be able to:

- identify the factors that suggest that the disease is caused by a microorganism
- describe the factors that determine the spatial, temporal and social distribution of communicable diseases,
- explain how the transmission of infections is recorded,
- explain the design, conduct, analysis, interpretation, and report of an outbreak investigation,
- explain the principles governing mathematical models of communicable diseases,
- demonstrate practical applications of epidemiological methods through the study of research on specific diseases,
- evaluate the key epidemiological concepts in the study of the most significant communicative and non-communicative diseases of Global health
- understand the principles of molecular epidemiology of infectious diseases

With the completion of T.U. students must be able to:

- define the scope of epidemiology in non-communicable diseases and assess the importance of
- understand the ways in which it is global in nature as well as shaping the distribution of risk factors and the occurrence of the disease
- approach the etiology of non-communicable diseases
- make a critical analysis of the relationship between socioeconomic status and non-communicable diseases
- understand the use and limitations of molecular biomarkers for measuring exposure, susceptibility and disease of non-communicable disease outcomes
- consider that genetic diversity associated with environmental exposure or disease risk factors may provide causal estimates
- assess the geographical trends of non-communicable diseases (cardiovascular diseases & diabetes, cancers, chronic respiratory diseases, mental health), the causes of these trends and their contribution to the overall presence of the disease

Cognitive subjects:

- Definition and concepts in infectious diseases
- Types of epidemiological studies in infectious diseases
- Case studies in the epidemiology of infectious disease
- Epidemiology of non-communicable diseases
- Cancer epidemiology
- Metabolic syndromes
- Diabetes and hypertension
- Impact of urbanization, environment, culture on Public Health
- Impact of globalization on Public Health

Teaching Method: Distance using the EAP Distance Learning Platform and conducting Group Counseling Meetings (tele-OSS).

EPI60 Global Health, Health Promotion and Bioethics

Code TU: EPI60

ECTS Credits: 10

Type of TH: Mandatory

Semester offered: Second (2nd)

Language of instruction: Greek

Purpose:

Section I: **Global Public Health.**

Thematic Unit I offers a comprehensive and comprehensive perspective on the broad needs and priorities of Global Public Health in modern healthcare, health promotion and bioethics. It is divided into three parts: In the 1st, the "Scope of Global Public Health" which lists the determinants of Global Public Health and Disease, public health policies. In the 2nd, the methods of World Public Health cover the main science behind the industry - epidemiology. Specific public health issues and prevention, health promotion and control options are also addressed. In addition to identifying these issues by system or disease, there is also awareness of the unique needs of specific population groups. Topic 3 includes topics such as climate change, genetic testing and new methods of measuring disease weight, life course approaches to epidemiology, behavioral economics and physical activity, health and wellness.

Section II: Bioethics

The protection of public health responds to many political and ethical challenges, giving priority to community and prosperity. Disasters, epidemics, wars and other health emergencies are particularly burdensome for healthcare systems and medical professionals. Bioethical principles help ensure patient safety, human rights, and citizen participation are respected during the stages of public preparedness, communication, mobilization, treatment and recovery.

Particular attention is paid to clinical ethics, bioethics principles, pandemic ethics and vulnerable populations, vaccine and drug trials, research ethics and patients' rights, justice, healthcare distribution, health monitoring and more.

Learning results:

After the successful completion of the Thematic Unit the trainees are expected to:

- Recognize the role of Global Public Health and Bioethics in Public Health
- Describe the rules of bioethics and their usefulness in medicine
- They report specific examples of the use of Epidemiological studies in Public Health
- Describe the research process for the discovery of studies in clinical practice

Cognitive subjects:

- Introduction to Global Public Health
- Bioethics

Teaching Method: distance using the EAP Distance Learning Platform and conducting Group Counseling Meetings (tele-OSS).

EPI61 Clinical epidemiology

Code: EPI61

ECTS Credits: 10

Specialization: Clinical epidemiology

Type: Mandatory
Semester offered: Second (2nd)
Language of instruction: Greek
Purpose of TU: In clinical epidemiology, research focuses on issues of diagnosis, prognosis, treatment and etiology. To address these issues, there are several research options available, including intervention trials and control patient studies using data obtained in a clinical setting. During, the principles and practice of clinical epidemiology should be considered and examples from the literature should be discussed. The aim is to provide participants with the knowledge to evaluate and judge applied clinical research and clinical data analysis and to provide an adequate scientific and methodological background to actively participate in clinical trials.
Topics of the unit are: the principles of applied clinical research, the design of a study and the analysis of diagnostic and prognostic research, the design of a study and the analysis of comparative results of experimental data and studies.
Learning results:
Upon successful completion of the Thematic Unit students will be able to:

- Explain and apply basic terminology and principles in clinical epidemiology
- Distinguish between the various aspects of clinical epidemiological research (diagnostic / etiological / prognostic / therapeutic)
- Build a clinical trial that includes the outcome, determinants and type
- They have different designs for data collection used in clinical epidemiology
- They are planning a clinical epidemiological study
- Identify the data analysis techniques used for the various types of clinical epidemiological studies
- Interpret the results of the basic data of analyzes of clinical epidemiological study
- Explain the concepts of prejudice as well as issues related to confusion and prejudice
- Read and explain clinical epidemiological scientific work and determine the design of data collection and analysis

Cognitive subjects:

- Basic principles in clinical epidemiology
- Risk: From disease to exposure
- Prognosis and diagnosis of diseases
- Treatment and prevention of diseases
- Disease prevention
- Design of clinical trials

Teaching Method: distance using the EAP Distance Learning Platform and conducting Group Counseling Meetings (tele-OSS).

EPI62 Epidemiology and -Omics

Code: EPI62
ECTS Credits: 10
Specialization: Clinical epidemiology
Type of TU: Mandatory
Semester offered: Second (2nd)
Language of instruction: Greek

Purpose of TH: The rapid development of advanced methods of Molecular Biology has contributed to the understanding of the epidemiology of infectious diseases. The section presents the basic tools of molecular structure, but also sequence analysis and will illustrate the applications of these tools in epidemiological studies.
There will be examples of the use of molecular epidemiology in epidemic analyzes. Examples of use of the genome at the level of correlation studies. Microbiome studies will be presented. The application of mathematical models to the evolution of pathogens will be discussed and epidemiology.

Learning results:

This section will provide an overview of the applications of "-omics" data in epidemiology and public health for communicable and non-communicable diseases.
Upon successful completion of the module, the student will be able to:

- Explain the importance of "-omics" technologies in public health and epidemiology
- To have knowledge and understanding of the vocabulary used in large-scale, data-rich studies of "-omics"
- Apply basic epidemiological principles to the critical interpretation of '-omics' studies when they are used for research issues of epidemiological importance

Cognitive subjects:

- Basic concepts of molecular biology and evolution in epidemiology
- Application of "-omics" data in public health research and practice
- The use of "-omics" data to characterize epidemiological reports or results
- Epidemiological and statistical pitfalls in the use of -omics
- The ethics of using -omics data

Prerequisites: There are no prerequisites

Teaching Method: distance using the EAP Distance Learning Platform and conducting Group Counseling Meetings (tele-OSS).

EPI63 Environmental Epidemiology

Code: EPI63

ECTS Credits: 10

Specialization: Environmental Epidemiology

Type of TU: Mandatory

Semester offered: Second (2nd)

Language of instruction: Greek

Purpose: The Thematic Unit deals with the study of exposure to environmental factors and the consequent health effects and development of disease, at the population level. The objective of the thematic unit is the development and understanding of the methodologies applied in Environmental Epidemiology, while emphasis is given on the various methodological approaches and their correct application. The TU outlines the basic principles of Epidemiology and Environmental Health and describes in detail the assessment of environmental exposure and the associated effects on the population health. The design of specific environmental epidemiological studies is presented. Practical issues are analyzed for conducting Environmental Epidemiology research, to guide students in field research and data analysis. Bioethics issues are discussed and the role of Environmental Epidemiology in policy making is described. Particular emphasis is given to the study of relevant research articles

published in reputable scientific journals, so that students can understand the practical application of the principles and methodologies of Environmental Epidemiology.

Learning results:

Upon successful completion of T.U. EPI63 "Environmental Epidemiology", students will be able to:

- Apply research designs that are specifically used in environmental epidemiology
- Understand the strategies for environmental exposure assessment and health outcomes
- Evaluate the effect of measurement error on exposure, impact assessment and use of correction methods
- Critically interpret research in the field of Environmental Epidemiology and understand the questions that could be answered through Environmental Epidemiology
- Plan and implement an environmental epidemiological study to investigate health problems arising from exposure to environmental risk factors and to assess the overall burden on the population from these exposures.

Cognitive subjects:

- Definition and concept in environmental epidemiology
- Exposure evaluation of environmental factors
- Health impact assessment
- Analysis and interpretation of studies in environmental epidemiology
- Environmental epidemiology in Public Health practice
- Environmental Epidemiology in politics and management

Prerequisites: There are no prerequisites

Teaching Method: distance using the EAP Distance Learning Platform and conducting Group Counseling Meetings (tele-OSS).

EPI64 Risk assessment in Public Health

Code: EPI64

ECTS Credits: 10

Specialization: Environmental Epidemiology

Type of TU: Mandatory

Semester offered: Second (2nd)

Language of instruction: Greek

Purpose: This Thematic Unit deals with the assessment of the risk to human health, related to the environmental exposure to dangerous toxic chemicals and infectious microbial agents. Risk assessment serves as a tool that can be used to organize, structure and gather scientific information to identify existing dangerous situations or problems, anticipate potential problems, prioritize and provide a basis for regulatory controls and / or corrective actions. The general methodology for environmental health risk assessment is presented, focusing on chemical, physical and microbiological risks. The design and development of risk models in practice are studied. The TH offers a simplified and systematic presentation of public health risk assessment methods and enforcement tools.

Learning results:

Upon successful completion of the Thematic Unit students will be able to:

- recognize the conditions for the need to carry out a public health risk assessment study
- describe and analyze the main stages of the risk assessment
- collect and evaluate risk assessment data
- describe the risk communication methodology in the community
- suggest the necessary risk management measures
- design and carry out public health risk assessment studies, based on exposure to both carcinogenic and / or toxic chemicals and microbiological agents

Cognitive subjects:

- Identification of risks
- Identification and analysis of work risk and events
- Analysis of the probability and severity of risk identification
- Risk monitoring procedures

Prerequisites: There are no prerequisites

Teaching Method: distance using the EAP Distance Learning Platform and conducting Group Counseling Meetings (tele-OSS).

EPI65 Social Epidemiology

Code TU: EPI65

ECTS Credits: 10

Specialization: Social Epidemiology

Type of TU: Mandatory

Semester offered: Second (2nd)

Language of instruction: Greek

Purpose of the Thesis:

This module aims to promote students' understanding of the main topics of social epidemiology, with particular emphasis on research methods, including those of time series and spatial analysis.

Learning results:

Upon successful completion of the Thematic Unit students will be able to:

- describe the main methodological issues related to social epidemiology, in particular those concerning the investigation of the effects of social factors on morbidity
- critically evaluate and interpret scientific data on the potential of social actors in health
- analyze plans and implementation and interpret the initial results regarding possible morbidity of social factors
- Describe the principles of the geographical and time series of studies investigating the health effects of environmental reports, and the role of Geographic Information Systems as a tool for investigating social impacts.
- describe data on the economic crisis and methods of assessing the potential health effects

Cognitive subjects:

- The social determinants of world health
- Inequalities in health during life

- Regression modeling
- Research methods for social epidemiology
- Social Epidemiology: Dimensions of Inequality
- Nationality, Immigration and Health
- Quality of life and Public Health
- Physical and Mental Health

Prerequisites: There are no prerequisites

Teaching Method: distance using the EAP Distance Learning Platform and conducting Group Counseling Meetings (tele-OSS).

EPI66 Nutritional Epidemiology

Code: EPI66

ECTS Credits: 10

Specialization: Social Epidemiology

Type of TH: Mandatory

Semester in which it is offered: Second (2nd)

Language of instruction: Greek

Purpose of the Thesis:

The thematic unit will deal with methodological issues concerning the planning, conducting, analysis and interpretation of epidemiological research on nutrition.

T.U includes:

Intra-atomic variation, error measurement, incorrect classification, Correlation of variables, population homogeneity, nutritional evaluation, validity / repeatability of nutritional evaluation, biomarkers and analysis of issues such as method adaptation

energy and nutritional model analyzes.

Learning results:

Upon successful completion of the Thematic Unit the student will be able to:

- Understands the basic parameters of nutritional epidemiological research.
- Understands the sources of variation in diet
- Understands the different diet methods with their advantages / disadvantages
- Understands the repeatability and validity of different nutritional evaluation methods
- analyze the use of dietary composition tables
- analyzes the use of nutritional biomarkers to assess nutritional exposure.
- explains the different methods for adjusting for energy intake and utilization.
- uses different methods to analyze the dietary pattern
- identify sources of error in the measurement of nutrients and apply different methods to correct errors
- regulates the intake of nutrients for the total energy intake and the performance of nutritional model analyzes.
- plans a nutritional epidemiological study.

Cognitive subjects:

- Introduction to Nutritional Epidemiology
- Methods of food intake
- Statistical Analyzes in Nutritional Value
- Control of total energy intake

- Mediterranean diet and mortality
- Malnutrition
- Obesity
- Eating Disorders
- Nutritional epidemiological studies

Prerequisites: There are no prerequisites

Teaching Method: distance using the EAP Distance Learning Platform and conducting Group Counseling Meetings (tele-OSS).

EPIDE Postgraduate Thesis

Code: EPIDE

ECTS Credits: 30

Type: Mandatory

Semester in which it is offered: Third (3rd)

Language of instruction: Greek

Generally: Diplomas are based on specific data obtained from the experimental act. The content is just as strict in a scientific sense. Postgraduate dissertations often include some practical work by students, who are expected to collect data through experimental activities. For students, the Dissertation is part of a broader research and data collection process.

Content: The research objects utilized in writing a thesis are harmoniously integrated into the main orientations of the program, that is, understanding and implementation of tools, methods of Epidemiology. The director of the program selects groups of related subjects, on the basis of which the prospective students submit a relevant proposal for elaboration. Subsequently, the Board of Directors (as above mentioned) designates the supervising member (First supervisor) and the second member of the Evaluation Committee for each submitted MDE proposal if it meets the basic academic requirements. Then the first Supervisor, in collaboration with the students, finalizes the topic and the basic content of the MDE in the digital education area within the first month of preparation and gives the final approval. The key subjects of the module are: In particular, the General Categories of subjects for the Master's Thesis are, presently, the following:

- Basic Epidemiology
- Infectious Disease Epidemiology
- Clinical Epidemiology
- Risk Assessment in Epidemiology
- Environmental Epidemiology
- Social Epidemiology
- Food microbiology
- Occupational Epidemiology
- Non-infectious Disease Epidemiology
- Cancer Epidemiology

The theory and practice used to further deepen the student's knowledge is based to some extent on the materials modules. However, for further deepening and acquisition of specialized knowledge and skills, the student, in collaboration with the supervisor, studies work from the relevant literature. This process usually takes 2-3 months. Then the thesis prepared and is checked in its stages both by the supervisor and by a second evaluator. Key

subjects of the module is the set of all subjects of individual modules as they are written in the respective outlines

Learning Outcomes:

The students who will successfully complete the Postgraduate Thesis:

- they will have obtained a deep knowledge of the subject of their subject to the extent that they will be able to comfortably and fluently read and acquire information on cutting-edge research topics from publications in research journals of the respective research area.
- they will be able to give high level seminars in which they will be able to explain their subject clearly and to answer related questions from other scientists

For more information regarding the Specifications – Useful Material for writing An MSc Dissertation and submitting it to HOU Repository, please visit the portal **http://courses.eap.gr**. The General Regulation for the presentation of an MSc Dissertation in postgraduate degree programmes organized on a semi-annual basis is available at **https://www.eap.gr/en/semi-annual-programs/**

Prerequisites: The presentation of the Dissertation takes place after successful completion of the program's Modules.

Precision Medicine and Novel Therapies (Joint Degree)

Object – Purpose

"Precision Medicine" is the term that describes the most current perspective on making diagnosis of disease or illness, treatment therapies, and prevention more personalized, predictive, proactive, and precise, with a great emphasis on diseases that are life-threatening.

Precision medicine focus on targeted and personalized care derives from using big data from patients after large-scale analyses. It utilizes a multiparametric approach, which integrates data from a range of different sources, and takes into account individual differences in genes, environments and lifestyles. The overall goal is to allow physicians to select treatments that are most likely to help the individual patient by implementing precise for the person therapies.

Hence the ultimate goal of this post-graduate program "Masters in Precision Medicine and Novel Therapies" is to provide, update and transfer relevant knowledge, as well as to further to further develop the skills of professionals, who are active mainly in the field of health, diagnostics and the pharmaceutical industry. More specifically, the Program is designed such as that trainees will acquire specific scientific and analytical skills in collecting and evaluating laboratory data from disease models and/or patients, in the planning of the ideal treatment in the context of Precision Medicine, in scientific writing and presentation, in experimental/clinical design, as well as in raising awareness on current and important issues in the field of health, such as the implementation of new treatments and the clinical utility of biochemical and genetic analyses in the decisions of personalized pharmacotherapy.

The curriculum "Masters in Precision Medicine and New Therapies" is organized as a set of core modules, focused on the most important aspects of Precision Medicine. It is a highly competitive program, which requires interdisciplinary knowledge at least at a theoretical level. It also includes contemporary cutting-edge topics in the life sciences and medicine, while

concomitantly addresses the new challenges in the fields of diagnostics, genetic analyses and clinical trials.

Learning Outcomes

Upon successful completion of this program students will be able to

- Apply scientific principles, methods and knowledge of Precision Medicine
- Understand the benefits and limitations of implementing new treatments in Precision Medicine
- Process and interpret biomedical and biological data
- Use artificial intelligence algorithms and machine learning techniques in precision medicine
- Study biomarkers and monitor drug design
- Monitor and analyze clinical trial results as part of a clinical trial unit
- Analyze and apply disease prognosis and diagnosis models
- Apply the rules of bioethics and research ethics
- Develop primary scientific research

Skills/Qualifications Acquired

The PMS "Precision Medicine and New Therapies" strengthens the trainees' abilities to:

- Promote health, as well as work effectively and efficiently in a health system
- Select and evaluate laboratory data for the genetic, epigenetic, biochemical background of patients
- Apply proper controls for assessing biomarkers after pharmacotherapy
- Appreciate variability in patient's response to pharmacotherapy
- Participate in the design of a management plan for a patient
- Participate in clinical trials as part of a team of clinicians, scientists and allied health professionals
- Develop new therapeutic approaches
- Build disease prognosis and diagnosis models
- Apply artificial intelligence algorithms and machine learning techniques
- Implement computational approaches to biological data analysis problems
- Write scientific texts
- Conduct a scientific dialogue.

ECTS Credits of the Program

The total sum of ECTS (European Credit Transfer and Accumulation System) required for the completion of this MSc is 120 ECTS.

Duration of Study

The minimum time required for the completion of the MSc is two (2) academic years, or four (4) semesters.

Programme Language

The official language of the Programme is English. The language in which all material content, written assignments and dissertation is English.

Classification according to ISCED-2011 of UNESCO

Based on the level of study: 7

Classification according to ISCED-2013 of UNESCO

Based on the field of Education and Training: 0914 Medical diagnostic and treatment technology

Type of Postgraduate Programme

Master of Science (MSc)

Admission Requirements

The following graduates can be accepted:

1. Schools of Medicine, Pharmacy, Biology, Biochemistry, Biotechnology, Molecular Biology, Genetics, Bioinformatics, and other related departments. In addition, graduates of departments involved in the analysis of human disease data using data mining techniques and development of prediction models
2. Departments of Mechanical Engineering, Computer Engineering and Information Technology, Computer Science, Chemical Engineering, Electrical Engineering, Computer Science with Biomedical Applications and other related departments
3. From all departments of Greek Universities and recognized foreign educational institutions with relevant subjects. The relevance of the subjects is determined by the recommendation of the MSc Committee and the decision of the Senate of the Hellenic Open University.

Graduates of other Departments and Faculties of the Universities, as well as graduates of Higher Technological Educational Institutions, can be admitted by the recommendation of the MSc Committee and the decision of the Senate of the Hellenic Open University.

According to the decision of the Governing Committee of the Hellenic Open University (meeting n° 628/17.07.2024), the following degrees can be accepted:

- Degree in Physics, University of Patras
- Degree in Applied Mathematics, University of Crete
- Degree in Physiological Sciences, University of Dundee, United Kingdom

According to the decision of the Senate of the Hellenic Open University (meeting n° 14/07.03.2025), graduates from Departments of Nursing can be accepted.

Knowledge of English at level C1 and knowledge of Greek at level B2 or any European language at level B2 according to the Common European Framework of Reference for Languages.

(*see Annex*)

Note:

Holders of a degree or diploma of higher education means graduates of Greek Universities or Polytechnics or Higher School of Fine Arts or Higher School of Pedagogical and Technological Education or Higher Technological Educational Institutions (ATEI) or those who hold academically equivalent first cycle degrees from recognized foreign educational institutions

with the degrees awarded by the Greek Higher Educational Institutions, in accordance with the provisions of article 304 of Law No. 4957/2022 (Government Gazette 141/21.07.2022, vol.)

Marking:

For the evaluation of the application to the Postgraduate Studies Programme, it will be examined whether the candidate's institution of study is or may be included in the National Register of Recognised Higher Education Institutions of Foreign Countries and whether the candidate's degree is or may be included in the National Register of Types of Degrees of Recognised Institutions of Foreign Countries.

The Hellenic Open University, if the degree is included in the list of article 307 of Law No. 4957/2022, must request a "Certificate of Place of Study", which is issued and sent by the foreign university. If the place of study or part of the studies is confirmed as the Greek territory, the degree is not recognized, unless the part of the studies that took place in the Greek territory is in a public higher education institution or in a recognized foreign educational institution within the meaning of paragraph b) of article 299 of Law No. 4957/2022.

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Structure

The Master's Study Program (MSc) entitled: "Precision Medicine and Novel Therapies" (PRETH) is structured in two (2) academic years, which include:

- five (5) Modules,
- three (3) Laboratory Modules,
- Laboratory Dissertation (EDi) or Dissertation based on research scientific literature (Di).

The total number of European Credit Transfer and Accumulation System (ECTS) required to obtain the Master's Degree is 120 ECTS.

The MSc "Precision Medicine and New Therapies" follows two distinct structures, which differ in the 2nd year of studies:

(1) The 1st structure includes a Research Dissertation (RDi), which is prepared in the 4th semester of studies and presupposes the selection of the specific laboratory module, PRETH61, of the 3rd semester.

(2) The 2nd structure includes preparation of a Master's Dissertation based on research scientific literature (Di) in the 4th semester of studies.

Course Structure:

1st Academic year

1st Semester

PRETH50	Biomarkers in Precision Medicine	(C[1], 15 ECTS)
PRETH51	Applied Omics	(C, 15 ECTS)

2nd Semester

PRETH52	Computational Biology and Applied Statistics for Precision Medicine	(C, 15 ECTS)

(LM)		
PRETH53	Bioethics and Clinical Trials	(C, 15 ECTS)
	2nd Academic year	
	A' Structure with Research Dissertation (RDi)²	
	3rd Semester	
PRETH60	Novel Therapies towards Clinical Application	(C, 15 ECTS)
PRETH61 (LM)	Biomedical, Clinical and Translational Research	(C, 15 ECTS)
	4nd Semester	
PRETH62	Molecular and Clinical Aspects of Cancers	(C, 15 ECTS)
PRETH RDi	Research dissertation	(C, 15 ECTS)
	B' Structure with Dissertation (Di)	
	3rd Semester	
PRETH60	Novel Therapies towards Clinical Application	(C, 15 ECTS)
PRETH63 (LM)	Bioinformatics for Precision Medicine	(C, 15 ECTS)
	4th Semester	
PRETH62	Molecular and Clinical Aspects of Cancers	(C, 15 ECTS)
PRETH Di	Dissertation	(C, 15 ECTS)

***Note*:**

C[1]: Compulsory

A' Structure with Research Dissertation (RDi)[2]: The 3rd semester's Laboratory Module (PRETH61 LM) is a prerequisite for the 4th semester's RDi. It is attended in hands-on laboratory practice of BRFAA and partner institutions.

Guidelines for Selection of Modules/Laboratory Modules

Students may choose one (1) to two (2) modules per semester (up to 30 ECTS).

Modules must be selected from the Masters' curriculum by following the semesters' structure.

For example, in the 1st semester, the first module to choose is PRETH50 or both PRETH50 and PRETH51 modules of the semester.

During the declaration process of modules, the 1st semesters' modules must be completed before modules of the second semester are selected. The same applies for every next semester.

To conduct a Research Dissertation (RDi) the Laboratory Module PRETH61 of the third semester is a pre-requisite. To conduct a Dissertation based on research scientific literature (Di) students should enroll to the (B') structure of the 2nd year.

Enrollment to the (Laboratory) Dissertation (RDi/Di) presupposes the successful attendance of the six (6) modules of the first three semesters.

To support orally the RDi/Di presupposes the successful completion of all modules and Laboratory modules of the Study Program.

The minimum duration of studies of the Interinstitutional Master's Program PRETH is four (4) academic semesters. For the successful completion of PRETH in four (4) academic semesters, all required modules must be completed.

In order to obtain the MSc title, it is mandatory to successfully complete:
(a.) five (5) modules and two (2) laboratory modules, as well as
(b.) the successful support of the Master's dissertation (Research RDi or Di).

Students' Evaluation

A. Students' Evaluation for the Modules and PRETH52 (LM)

Grade assessment of Modules and PRETH52 (LM)

Student evaluation is defined by performing two (2) written assignments and two (2) educational activities during the academic semester with a value of 40% in the formation of the final module grade. Each written assignment/educational activity is evaluated within the 1-10 scale (10 represents the excellent). More specifically,

a1. Two (2) Written Assignmentσ (W.A.), which contribute equally to the final grade with a value of 30%.

a2. Two (2) Educational Activities (E.A.) which contribute equally to the final grade with a value of 10%.

Educational Activities and Written Assignments' grades are secured and activated in the final or repeat exams with the requirement to either be equal or exceed the passing grade (≥5).

a3. Final or repeat exam (E) contribute to the final grade with a value of 60%.

The **Final Grade** of each Module within scale 1-10 is calculated as:

Final Grade = (WA1×0,15) + (WA2×0,15) + (EA1×0,05) + (EA2×0,05) + (E×0,6).

Note: At the discretion of Teaching Staff Group (T.P.), optional -non-graded- educational activities can potentially be proposed to students that are considered as critical contribution for consolidation of the module study material.

Establishment of student participation in the Final Exams:

Student participation in the final examination is allowed when the below requirements are met:

1. Total student score as a sum of the individual aforementioned assignments and educational activities (see a1 and a2) is at least 20 points out of 100 (100 represents excellent) i.e. in the table below.
2. At least 3 of the 4 Activities/Assignments have been submitted.

EA & WA grade within scale 1-100				
WA1 (15%)	WA2 (15%)	EA1 (5%)	EA2 (5%)	Minimum grade that is required for participation in final exams:
WA1×1,5	WA2×1,5	EA1×0,5	EA2×0,5	20/100

Each student who cannot establish participation in the final written exams, then he/she should re-enroll at the module in the next academic semester with full educational and financial obligations.

B. Students' Evaluation for the Laboratory Modules PRETH61 (LM) & PRETH63 (LM)

Grade assessment of PRETH61 (LM) & PRETH63 (LM)

A. Through the distance learning platforms of HOU

During the semester, students are required to complete two Written Assignments (W.A.). The average score of these assignments contributes to the final score of the module by 30%. Additionally, they successfully finish two (2) sets of Educational Activities (E.A.) throughout

the semester, and the average score from these activities contributes 10% to the final score of the module.

Attendance to hands-on laboratory practice in the Laboratories of the Biomedical Research Foundation of the Academy of Athens (BRFAA), HOU labs or cooperating institutes

- Students attend hands-on laboratory practice between five (5) to seven (7) consecutive days, performing two (2) exercises per day, in order to complete each of the laboratory modules.
- Students are encouraged to complete all exercises of the laboratory module. To successfully complete each laboratory module, the average score of the student in the sum of the laboratory exercises/worksheets must be equal to or exceeding five (≥5.0). The laboratory exercises contribute to the overall grade of the laboratory module with a weightage of 60%.

The Final Grade of each Laboratory Module on the scale of 1 to 10 is calculated as:

Final Grade = (EA×0,1) + (WA1×0,15) + (WA2×0,15) + (hands-on laboratory practice ×0,6)

Establishment of participation right in the hands-on laboratory practice:

Participation in the hands-on laboratory practice will be allowed, if:

3. the sum of the grades of the aforementioned assignments (see a1 and a2) is equal to, or greater than 50% of the assigned grading scale, i.e. at least 20 points out of 100, based on the weights mentioned in the points above, as shown at the following table;
4. at least 3 of the 4 Activities and Assignments should be submitted.

EA & WA grade on the scale of 1 to 100			
EA (10%)	WA1 (15%)	WA2 (15%)	Minimum grade that is required for participation in the hands-on laboratory practice
EA × 1	WA1 × 1.5	WA2 × 1.5	20/100

In case students don't qualify for participation in hands-on laboratory practice (as described in the previous paragraph), they will need to re-enroll at the laboratory module in the next semester, fulfilling all educational and financial responsibilities.

Informations about the Modules and Laboratory Modules

PRETH50 Biomarkers in Precision Medicine

Code: PRETH50

ECTS: 15

Type: Compulsory

Semester offered: 1st semester

Teaching Language: English

Purpose - Description: The role of biomarkers in the development of precision medicine provides a strategic opportunity for technological developments to improve human health and reduce health-care cost. Precision medicine as a concept concerns the adjustment of treatments to individual or subgroups of patients based on the use of disease specific biomarkers. The overall success of this personalized process is to identify actionable molecular targets to pinpoint therapies. Experimental approaches so far have resulted in the development and use of specific biomarkers and therapies to promote precision medicine. In this module the ongoing development and application of biomarkers will be illustrated for both clinical use and treatment monitoring.

Learning outcomes:

The trainees are expected to:

- Recognize the usefulness of biomarkers serving the concept of Precision Medicine

- Describe specific types of biomarkers and their usefulness in clinical diagnosis and treatment monitoring
- They report specific examples of biomarkers utilization in clinical practice
- Describe the research process for the discovery and integration of new biomarkers in clinical practice

Subjects:

- Diagnostic biomarkers
- Susceptibility/risk biomarkers
- Monitoring a disease
- Prognostic/predictive biomarkers
- Response and toxicity to a given treatment
- Pharmacodynamic biomarkers
- Surrogate end point biomarkers. The clinical benefit/survival of a disease.
- Biomarker Discovery and Clinical Trial Design

Prerequisite: No prerequisites

Teaching Method: Distance using the HOU Distance Learning Platform and conducting Group Counseling Meetings (tele-OSS).

PRETH51 Applied Omics

Code: PRETH51

ECTS: 15

Type: Compulsory

Semester offered: 1st semester

Teaching Language: English

Purpose - Description: Applied “Omics” is the term describing the next generation of laboratory tools, which open new windows into the molecular signature of an individual. They are powerful contributors to our knowledge network and our ability to prevent and treat disease across lifespan.

Basic categories of “Omics”:

- The epigenome, affecting the gene expression and treatment response
- Genome expression studied via transcriptomics
- Proteomics studying the products of mRNA
- Metabolomics, which is the study of metabolites
- DNA-based tools can also detect bacteria, parasites and viruses (microbiome) that coexist in our bodies through metagenomics
- Inflamomics, lipidomics, glycomics, and other large molecular data sets can be used to diagnose and predict disease

This module explores the “Omics” technology that provides researchers and clinicians clear answers to rare or undiagnosed conditions and indicates the most effective treatment plan.

Learning outcomes:

The trainees are expected to:

- Describe the categories of applied "Omics" that currently serve the initiative of Precision Medicine
- Distinguish the laboratory technology that is utilized for each category of "Omics"

- Describe the results of “Omics” methods and their evaluation
- They report examples of the use of "Omics" in clinical practice

Subjects:

- Applied genomics
- Epigenomics
- Proteomics
- Transcriptomics
- Metabolomics
- Phenomics
- Microbiome

Prerequisite: No prerequisites

Teaching Method: Distance using the HOU Distance Learning Platform and conducting Group Counseling Meetings (tele-OSS).

PRETH52 LM: Computational Biology and Applied Statistics for Precision Medicine

Code: PRETH52 LM

ECTS: 15

Type of LM: Compulsory

Semester offered: 2nd semester

Teaching Language: English

Purpose - Description: "Precision Medicine" is the emerging model of medicine that uses basic principles from personalized medicine by taking into account the individual’s environment, response to a treatment, in addition to his/hers genetic profile. The rapid advancement of sciences leads to a continuous increase of the volume of data and their heterogeneity. As a result, Precision Medicine allows for more targeted strategies in terms of prevention, diagnosis and treatment. This is achievable by considering computational biology approach and the application of statistical methods for or the design, the study and the analysis of the big data. Through traditional and modern methods of statistical analysis significant knowledge is obtained/ extracted, while appropriate “tools” are provided to the clinician, researcher, physician, aiming for the better understanding of the results.

Moreover, mathematical modelling can help in the study and the refinement of the treatment modalities at all phases of either drug research or development, and in routine patient care.

Students will be familiar with Precision Medicine and will understand basic statistical methods for designing the study and analyzing data from medical precision experiments. They will be able to set up a mathematical model and deeply understand and interpret various biological processes and complex diseases in a medical precision experiment under study.

Learning outcomes:

The trainees are expected to:

- Describe and use appropriate statistical methods for the analyzing medical data,
- Solve problems arising in precision medicine through classical and modern statistical methods
- Interpret and validate the obtained results using statistical analysis
- Use Statistical methods and mathematical models and methods for estimating adaptive treatment strategies

Subjects:

- Systems biology
- Algorithms of molecular biology
- Statistical analysis (methods, models)
- Applications of Statistics software in precision medicine (e.g. R, GALAXY)
- Mathematical modelling

Prerequisite: No prerequisites

Teaching Method: Distance using the HOU Distance Learning Platform and conducting Group Counseling Meetings (tele-OSS).

Use of Information and Communication Technologies: Use of statistical and programming software language, e.g., R/Rstudio, Bioconductor and related software packages for applications, e.g., GALAXY.

PRETH53 Bioethics and Clinical Trials

Code: PRETH53

ECTS: 15

Type: Compulsory

Semester offered: 2nd semester

Teaching Language: English

Purpose - Description: The aim of clinical research is to develop knowledge and improve human health. Researchers who participate in clinical research must be sensitive to ethical concerns. Guidelines that did not previously exist have been recently well-established. However, ethical values change over time, and it is important to continuously upgrade, there is not always consensus on what counts as ethical research and finally, multiple interests — medical, personal, political, military, and commercial — have led researchers to conduct transgressive studies so far. This module focuses in influential codes of ethics and regulations that guide ethical clinical research, such as Declaration of Helsinki (2000), CIOMS (2002) etc. Comprehensive sources of ethical guidance main principles will be described as guiding for the performance of ethical research. Reference will also be made to the regulations governing the clinical trials taking place.

Learning outcomes:

The trainees are expected to:

- Describe main principles for guiding the conduct of ethical research and clinical trials
- Refer to the social and clinical value of exposing human subjects to the risk and burden of research
- Describe the potential conflicts of interest of a study
- Describe the process of Informed consent for participants in a study
- Refer to the respecting rules for potential and enrolled subjects

Subjects:

- Bioethics
- Clinical trials legislation, registration procedures etc
- Clinical trials design and implementation
- Adaptive designs: i.e. basket, umbrella, e-trials
- Investigator Sponsoring Clinical Trials

- Non interventional clinical studies
- Biomarkers-based population clinical studies
- Real World Data studies

Prerequisite: No prerequisites

Teaching Method: Distance using the HOU Distance Learning Platform and conducting Group Counseling Meetings (tele-OSS).

PRETH60 Novel Therapies towards Clinical Application

Code: PRETH60

ECTS: 15

Type: Compulsory

Semester offered: 3rd semester

Teaching Language: English

Purpose - Description: Precision Medicine employs individual analysis of the patient's unique biology, in order both to select more efficacious diagnostic methods and to suggest clinical treatments. Most pathologies arise from cellular damage, hence, cell therapy is key to mitigation of cell and/or tissue damage and often to repair. Stem cell therapy is a promising treatment that may be tailored to a specific illness and also to an individual patient. Autologous cell sources are the first priority for cell therapy since they are safe, do not violate ethical perspectives, and do not provoke immunogenic responses. There are various autologous cell sources, as well as heterologous, naive or technologically edited cells, all of which show great potential for therapy applications. For example, DNA editing technology through CRISPR/Cas systems is used for targeted intervention in the cell genome, while chimeric CAR-T cells provide new possibilities in immunotherapy. In addition, RNA technologies have opened new avenues for therapeutic interventions and for vaccine production. This module focuses on cell repair or substitution systems, most often through genetic engineering, all of which are essential for the future of personal health.

Learning outcomes:

The trainees are expected to:

- Recite the regenerative possibilities with the use of stem cells
- Describe sources of regenerative cells for cell and tissue therapy applications
- Indicate the parameters for the successful and effective editing and modification of genomic DNA
- Describe the principles and applications of RNAi (interference) technology
- Describe the principle of RNA/DNA-based vaccine production
- Name examples of beneficial novel therapies in Precision Medicine

Subjects:

- Cell therapies
- CAR-T cells
- Aptamer design
- CRIPSR/Cas systems for genome editing
- Gene therapy
- RNAi (interference) technology
- New vaccines

Prerequisite: No prerequisites
Teaching Method: Distance using the HOU Distance Learning Platform and conducting Group Counseling Meetings (tele-OSS).

PRETH61 LM: Biomedical, Clinical and Translational Research

Code: PRETH61 LM
ECTS: 15
Type: Compulsory
Semester offered: 3rd semester
Teaching Language: English
Purpose - Description: This laboratory module focuses on the interface between basic science and clinical medicine, the end point of which, is the production of promising new treatments for clinical applications. The knowledge on disease mechanisms gained in the laboratory is translated into the development of new methods for diagnosis, therapy, and disease prevention.
The use of modern research advances brings new insights into the study of disease in the human populations. Understanding the fundamental causes of diseases at their earliest molecular stage can reliably predict how and when a disease will develop. The opportunity is expanding our vision beyond the curative model and intervening earlier in the treatment process.
Learning outcomes:
The trainees are expected to:

- Produce and analyse experimental data on modern fields of biomedical science
- Translate experimental results into potential biomarkers or novel clinical therapies
- Describe the process of disease-oriented research in the laboratory or in preclinical studies that will have an impact on human health
- Recognize the applications of discoveries generated during research in the laboratory, and in preclinical studies, to the development of clinical trials and studies in humans

Subjects:

- Basic research in Biomedical field
- Systems biology
- Preclinical and Translational research
- Omics

Prerequisite: No prerequisites
Teaching Method: Distance using the HOU Distance Learning Platform and hands-on laboratory practice.
Use of Information and Communication Technologies: Use of laboratory equipment of BRFAA.
Workshop Facilities: Biomedical Research Foundation of the Academy of Athens (BRFAA).

PRETH62 Molecular and Clinical Aspects of Cancers

Code: PRETH62
ECTS: 15
Type: Compulsory

Semester offered: 4th semester
Teaching Language: English
Purpose - Description: Cancer is a devastating disease with prevalent heterogeneity among patients, due to different underlying biological and environmental causes. This inherent variability of cancer lends itself to the growing field of precision medicine. There are many ongoing efforts to acquire significant biological data and characterize molecular differences between tumors aiming to link these differences to effective therapies. Research in this field is intense and constantly expands our understanding of the biological complexity of cancer and its treatments. The field of Precision Medicine was designed to develop therapies for a group of patients based on data that captures current and past physical health and environmental exposure. This module focuses on examples of the Precision Medicine approach to determine genetic predisposition to cancer and identify patient groups that are more likely to respond well to specific therapeutic interventions.
Learning outcomes:
The trainees are expected to:

- Describe genetic and environmental parameters that lead to malignant mutation of cells
- Report application of specific tests by which the evaluation of cancer staging and prognosis of the clinical course are estimated
- Report biomarkers that guide to treatment decisions and/or evaluation of patient's response
- Describe the available current treatments for cancer in the frame of Precision Medicine initiative

Subjects:

- Cancer epidemiology and trends
- Hereditary cancers
- Cancer screening in the community and in biomarkers-selected populations
- Principals of pathology: specimen management, diagnosis, staging and grading
- Principals of Systemic anti-Cancer treatments
- Approved treatments with companion diagnostics
- Supportive and palliative treatment

Prerequisite: No prerequisites
Teaching Method: Distance using the HOU Distance Learning Platform and conducting Group Counseling Meetings (tele-OSS).

PRETH63 LM: Bioinformatics for Precision Medicine

Code: PRETH63 LM
ECTS: 15
Type of LM: Compulsory
Semester offered: 3rd semester
Teaching Language: English
Purpose - Description: Bioinformatics, the unification of the two important scientific fields of Molecular Biology and Informatics and it has a rapid development in recent decades. Modern approaches in the field of Bioinformatics include data mining, artificial intelligence and machine learning methods, as well as data optimization methods.

Students should be familiar with the principles of Bioinformatics and understand basic algorithms of artificial intelligence, machine learning and data optimization that are directly applicable in the field of Bioinformatics.

Learning outcomes:

The trainees are expected to:

- Describe fundamental principles of Bioinformatics
- implement suitable artificial intelligence, machine learning and optimization algorithms
- solve Bioinformatics problems that focus on knowledge extraction, (e.g.DBMS, OLAP),
- translate the artificial intelligence and machine learning results into the field of Bioinformatics

Subjects:

- Introduction to bioinformatics
- Big data analytics for Precision Medicine
- AI algorithms and machine learning techniques in precision medicine
- Pattern recognition
- Genome sequencing, analysis, transcription profiling, protein structure - RNA sequencing

Prerequisite: No prerequisites

Teaching Method: Distance using the HOU Distance Learning Platform and hands-on laboratory practice.

Use of Information and Communication Technologies: Use of High-Performance Computing HPC- system of the Laboratory of Applied Mathematics of the School of Science and Technology (SST) of HOU and similar equipment of BRFAA.

Workshop Facilities: Laboratory of Applied Mathematics of the SST, HOU, Patras and the Biomedical Research Foundation of the Academy of Athens (BRFAA).

PRETH RDi Research dissertation

Code: PRETH RDi

ECTS: 15

Type: Compulsory

Semester offered: 4th semester

Teaching Language: English

Content: Completion of the research protocol and familiarization with laboratory equipment and data analysis, for which a corresponding certificate from the supervisor of the MSc is provided. This is conditional on the successful completion of the ECE course PRETH61 in the 3rd semester, during which the practical (laboratory) part of the MSc has been conducted in person.

For more information regarding the Specifications – Useful Material for writing Master's Theses and uploading a Thesis at the H.O.U. Repository, you can go to the Digital Training Area http://courses.eap.gr and especially to the Program of Studies section. General Regulation for the Preparation of Master's Theses in postgraduate programmes with a six-month duration

Learning outcomes:

Upon successful completion of the Dissertation, students will have

- Attained knowledge in generating experimental data within the modern realms of biomedical sciences.

- Mastered the translation of experimental outcomes into potential biomarkers or groundbreaking clinical therapies.
- Enhanced their critical thinking capabilities.
- Acquired the proficiency to devise a research plan and formulate appropriate methodologies for investigating a research topic.
- Developed skills in composing a scientific text and delivering a presentation on a scientific subject.
- Clearly presented their conclusions, supported by the knowledge and reasoning behind them, effectively delivering a comprehensive presentation through information and communication technology (ICT)
- Gained practical experience in articulating and defending their scientific arguments.

Prerequisite: The Laboratory Module (PRETH61 LM) of the 3rd semester is a prerequisite for the preparation of the RDi of the 4th semester. To support orally the RDi presupposes the successful completion of all modules and Laboratory modules of the Study Program.

PRETH Di Dissertation

Code: PRETH Di

ECTS: 15

Type: Compulsory

Semester offered: 4th semester

Teaching Language: English

Content: Review of the literature on selected contemporary topics related to the subjects covered in the MSc program. It may also serve as a brief research project.

For more information regarding the Specifications – Useful Material for writing Master's Theses and uploading a Thesis at the H.O.U. Repository, you can go to the Digital Training Area http://courses.eap.gr and especially to the Program of Studies section. General Regulation for the Preparation of Master's Theses in postgraduate programmes with a six-month duration

Learning outcomes:

Upon successful completion of the dissertation, students will have accomplished the following:

- Conducted in-depth studies on a specific scientific topic within the program's scope.
- Enhanced their compositional abilities.
- Conducted thorough searches for relevant scientific information in the corresponding literature.
- Designed a research plan and formulated an appropriate methodology for investigating the selected topic.
- Acquired skills in composing a scientific text.
- Developed skills in organizing and orally presenting scientific content.
- Clearly presented their conclusions, supported by the knowledge and reasoning behind them, effectively delivering a comprehensive presentation through information and communication technology (ICT).
- Evaluated the proposed approach/solution by comparing it with analogous one, available in the National and international literature.

- Provided commentary on the relative advantages and disadvantages, substantiating their opinions and choices.

Prerequisite: To support orally the Di presupposes the successful completion of all modules and Laboratory modules of the Study Program.

Annex

Certification of English competency at level B2

English competency (level B2) is proven according to article 10, Presidential Decree 85/2022 “Determination of qualifications for appointment in the public sector (Qualification-Department)" (A΄ 232), in combination with Part C΄ and namely "LANGUAGE CERTIFICATES" of no. 20/01.02.2023 "Amendment of no. 94/20.6.2022 of the decision of the SUPREME COUNCIL FOR CIVIL PERSONNEL SELECTION (ASEP)"Procedure for determining the fixed parts of the content of staff selection announcements based on predetermined and objective criteria (Articles 28 - 30 of Law 4765/2021) (B' 3614)" (B' 594) with language proficiency certificates.

Language Certificates

The table below shows the language certificates - level (B2) of English Competency that are accepted as well as the issuing body.

Certification of English competency at level B2 can be proved as follows:

- AIM Awards Level 1 Certificate in ESOL International (B2) (Listening, Reading, Writing, Speaking)
- AIM Qualifications Level 1 Certificate in ESOL International (B2) (Anglia Advanced) (Listening, Reading, Writing, Speaking)
- Ascentis Level 1 Certificate in ESOL International (CEF B2)
- Assessment Board for Language Examinations: Level B2 (ABLE B2) Hellenic American University (Nashua, New Hampshire, USA)
- BULATS English Language Test, overall score 60-74, CAMBRIDGE UNIVERSITY or CAMBRIDGE ASSESSMENT ENGLISH (For certificates issued by 19.11.2019)
- BUSINESS ENGLISH CERTIFICATE – VANTAGE (BEC VANTAGE) University of Cambridge Local Examinations Syndicate (UCLES) or CAMBRIDGE ASSESSMENT ENGLISH
- BUSINESS ENGLISH CERTIFICATE PRELIMINARY CAMBRIDGE ASSESSMENT ENGLISH overall score 160-170
- BUSINESS ENGLISH CERTIFICATE VANTAGE CAMBRIDGE ASSESSMENT ENGLISH overall score 160-179
- CERTIFICATE IN ADVANCED ENGLISH CAMBRIDGE ASSESSMENT ENGLISH overall score 160-179
- FIRST CERTIFICATE IN ENGLISH CAMBRIDGE UNIVERSITY or CAMBRIDGE ASSESSMENT ENGLISH
- FIRST CERTIFICATE IN ENGLISH CAMBRIDGE ASSESSMENT ENGLISH overall score 160-179
- CERTIFICATE IN INTEGRATED SKILLS IN ENGLISH ISE II TRINITY COLLEGE LONDON
- CITY & GUILDS LEVEL 1 CERTIFICATE IN ESOL INTERNATIONAL (reading, writing and listening) - COMMUNICATOR - **and** CITY & GUILDS LEVEL 1 CERTIFICATE IN ESOL INTERNATIONAL (Spoken) - COMMUNICATOR - (They are cumulatively submitted to demonstrate good language proficiency)
- CITY & GUILDS CERTIFICATE IN INTERNATIONAL ESOL - COMMUNICATOR - **and** CITY & GUILDS CERTIFICATE IN INTERNATIONAL SPOKEN ESOL - COMMUNICATOR - (They are cumulatively submitted to demonstrate good language proficiency)

- (ECCE)- CERTIFICATE OF COMPETENCY IN ENGLISH MICHIGAN UNIVERSITY (ENGLISH LANGUAGE INSTITUTE or Cambridge Michigan Language Assessments - CaMLA or Michigan Language Assessment)
- EDI Level 1 Certificate in ESOL International JETSET Level 5 (CEF B2)
- ESB Level 1 Certificate in ESOL International All Modes (Council of Europe Level B2)
- INTERNATIONAL ENGLISH LANGUAGE TESTING SYSTEM (IELTS) from University of Cambridge Local Examinations Syndicate (UCLES) or CAMBRIDGE ASSESSMENT ENGLISH – The British Council – IDP Education Australia IELTS Australia (with score 5,5- 6,5)
- GA Level 1 Certificate in ESOL International – CEFR: B2
- GA Level 1 Certificate in ESOL International (Classic B2)
- B2- LanguageCert Level 1 Certificate in ESOL International (Listening, Reading, Writing) (Communicator B2) **and** B2– LanguageCert Level 1 Certificate in ESOL International (Speaking) (Communicator B2) (They are cumulatively submitted to demonstrate good language proficiency)
- LanguageCert Test of English (LTE) - LanguageCert Level 1 Certificate in ESOL International (Listening, Reading) (LanguageCert Test of English B2) (issued by 30.06.2024)
- LanguageCert Level 1 Certificate in ESOL International (Listening, Reading, Writing, Speaking) (LanguageCert Test of English B2)
- LanguageCert Level 1 Certificate in ESOL International (Listening, Reading, Writing, Speaking) (LanguageCert Academic B2)
- LanguageCert Level 1 Certificate in ESOL (Listening, Reading, Writing, Speaking) (LanguageCert General B2)
- LONDON TESTS OF ENGLISH LEVEL 3 - UPPER INTERMEDIATE COMMUNICATION-EDEXCEL
- EDEXCEL LEVEL I CERTIFICATE IN ESOL INTERNATIONAL (CEF B2)
- LRN Level 1 Certificate in ESOL International (CEF B2)
- MET – MICHIGAN ENGLISH TEST (Listening, Reading, Speaking) score from 157 -189 from Michigan Language Assessment or CAMBRIDGE MICHIGAN LANGUAGE ASSESSMENTS-CaMLA (issued by 30.06.2024)
- MET - MICHIGAN ENGLISH TEST (Listening, Reading issued by 30.06.2024 or Listening, Reading, Speaking, Writing) score from 53- 63 του Michigan Language Assessment
- MICHIGAN ENGLISH LANGUAGE ASSESSMENT BATTERY (MELAB) score 80-90, CAMBRIDGE MICHIGAN LANGUAGE ASSESSMENTS or MICHIGAN LANGUAGE ASSESSMENT
- Michigan State University – Certificate of English Language Competency (MSU – CELC): CEF B2
- NOCN Level 1 Certificate in ESOL International (B2)
- NYLC –NEW YORK LANGUAGE CENTER CERTIFICATE Level B2
- OCNLR Level 1 Certificate in ESOL International (CEFR B2)
- OCNW Certificate in ESOL International at Level 1 (Common European Framework equivalent level B2) (by 31/8/2009)
- Open College Network West Midlands Level 1 Certificate in ESOL International (CEFR B2)
- PEARSON EDI Level 1 Certificate in ESOL International (CEF B2)
- PEARSON LCCI LEVEL 1 CERTIFICATE IN ESOL INTERNATIONAL (CEFR B2)
- ESOL INTERNATIONAL (CEFR B2)
- PEARSON TEST OF ENGLISH GENERAL LEVEL 3 UPPER- INTERMEDIATE COMMUNICATION - EDEXCEL

- PEARSON EDEXCEL LEVEL I CERTIFICATE IN ESOL INTERNATIONAL (CEF B2) (ENGLISH INTERNATIONAL CERTIFICATE)
- PEARSON LCCI EFB LEVEL 3 (Units: Reading, Writing, Listening, Speaking, in case one of those is graded as "Pass")
- PEARSON LCCI EFB LEVEL 2 (Units: Reading, Writing, Listening, Speaking, "Distinction" or "Credit")
- PRELIMINARY ENGLISH TEST, CAMBRIDGE ASSESSMENT ENGLISH overall score 160-170
- SEG AWARDS Level 1 Certificate in ESOL International (CEF B2) SKILLS & EDUCATION GROUP AWARDS
- TEST OF ENGLISH FOR INTERNATIONAL COMMUNICATION (TOEIC Listening, Reading) EDUCATIONAL TESTING SERVICE/ CHAUNCEY, USA, score 505 – 780 issued by 30.06.2024
- TEST OF ENGLISH FOR INTERNATIONAL COMMUNICATION -TOEIC 4-Skills (Listening, Reading, Speaking, Writing) EDUCATIONAL TESTING SERVICE (ETS), Level B2
- Test of Interactive English, B2 Level (ACELS)
- Test of Interactive English, B2 Level (Gatehouse Awards)
- Test of Interactive English, B2 + Level (ACELS)
- The British Council Aptis ESOL International Certificate Level 1 (Aptis ESOL Advanced or Aptis ESOL General)
- VTCT (ITEC) Level 1 Certificate in ESOL International (B2) or VTCT Skills (ITEC) Level 1 Certificate in ESOL International (B2)
- National Foreign Language Exam System (KPG) equivalent level of Law 2740/1999, as replaced by paragraph 19, Article 13, of Law 3149/2003.

English competency (level B2) is also proven with certificates of other institutions (not limited to universities) of an equivalent level, irrespective of their legal form, provided they are certified or recognized by the competent authority of the country concerned for conducting examinations and issuing certificates of proficiency in English at the appropriate level. These certificates must be accompanied by a proof document from the issuing body that both the issuing body and the language certificate competency are certified by the competent national authority and also and that the certification also concerns the evaluation of basic communication skills (written language production, oral language production, written language comprehension and oral language comprehension).

If there is no certification or recognition body in the country concerned, a certificate from the relevant Ministry or Embassy of Greece is required, confirming that the certificates issued by the above bodies to third parties for whom English is not a native language are accepted in public services of that country as valid evidence of English at the appropriate level according to the Common European Framework of Reference for Languages (CEFR). The competent regulatory authority for Great Britain is the Office of Qualifications and Examinations Regulation (Ofqual).

General notes:

- Advanced level foreign language certificates also prove knowledge of a lower (required) level of the foreign language.
- Foreign Language Teaching Certification does not prove the competence in a foreign language. In order to prove their competence in the foreign language, candidates who

hold the relevant certification must provide the foreign language certificates as provided for in this Annex where applicable

- All foreign language degrees must be accompanied by their official translation into the Greek language, except the above English language proficiency certificates, which are accepted without requiring any translation and validation.

Certification of English competency at level C1

English competency (level C1) is proven according to article 10, Presidential Decree 85/2022 “Determination of qualifications for appointment in the public sector (Qualification-Department)" (A΄ 232), in combination with Part C΄ and namely "LANGUAGE CERTIFICATES " of no. 20/01.02.2023 "Amendment of no. 94/20.6.2022 of the decision of the SUPREME COUNCIL FOR CIVIL PERSONNEL SELECTION (ASEP)"Procedure for determining the fixed parts of the content of staff selection announcements based on predetermined and objective criteria (Articles 28 - 30 of Law 4765/2021) (B' 3614)" (B' 594).

Language Certificates

The table below shows the language certificates -level (C1) of English Competency- that are accepted as well as the issuing body.

Certification of English competency at level C1 can be proved as follows:

- AIM Awards Level 2 Certificate in ESOL International (C1) (Units: Listening, Reading, Writing, Speaking)
- AIM Qualifications Level 2 Certificate in ESOL International (C1) (Anglia Proficiency) (Units: Listening, Reading, Writing, Speaking)
- Ascentis Level 2 Certificate in ESOL International (CEF C1)
- ADVANCED LEVEL CERTIFICATE IN ENGLISH (ALCE) by 31/12/2021 or ADVANCED LEVEL CERTIFICATE IN ENGLISH (ALCE) overall score 55-73 from 1/1/2022 HELLENIC AMERICAN UNIVERSITY (Nashua, New Hampshire, USA)
- ADVANCED LEVEL CERTIFICATE IN ENGLISH (ALCE), Hellenic American Union issued by 31/01/2005 or Hellenic American University and Hellenic American Union from 01/02/2005 to 31/12/2010 or Hellenic American University from 01/01/2011 to 31/12/2021 or Hellenic American University (Nashua, New Hampshire, USA) overall score 55-73 from 01/01/2022
- BULATS English Language Test, overall score 75-89, CAMBRIDGE UNIVERSITY or CAMBRIDGE ASSESSMENT ENGLISH (For certificates issued by 19.11.2019)
- BUSINESS ENGLISH CERTIFICATE – HIGHER (BEC HIGHER) University of Cambridge Local Examinations Syndicate (UCLES) or CAMBRIDGE ASSESSMENT ENGLISH
- BUSINESS ENGLISH CERTIFICATE HIGHER CAMBRIDGE ASSESSMENT ENGLISH overall score 180-199
- BUSINESS ENGLISH CERTIFICATE VANTAGE CAMBRIDGE ASSESSMENT ENGLISH overall score 180-190
- CERTIFICATE IN ADVANCED ENGLISH CAMBRIDGE ASSESSMENT ENGLISH overall score 180-199
- CERTIFICATE OF PROFICIENCY IN ENGLISH CAMBRIDGE ASSESSMENT ENGLISH overall score 180-199
- CERTIFICATE IN ADVANCED ENGLISH CAMBRIDGE UNIVERSITY or CAMBRIDGE ASSESSMENT ENGLISH
- FIRST CERTIFICATE IN ENGLISH CAMBRIDGE ASSESSMENT ENGLISH overall score 180-190

- CERTIFICATE IN INTEGRATED SKILLS IN ENGLISH ISE III TRINITY COLLEGE LONDON
- CITY & GUILDS LEVEL 2 CERTIFICATE IN ESOL INTERNATIONAL (reading, writing and listening) - EXPERT - **and** CITY & GUILDS LEVEL 2 CERTIFICATE IN ESOL INTERNATIONAL (Spoken) - EXPERT - (They are cumulatively submitted to demonstrate very good language proficiency)
- CITY & GUILDS CERTIFICATE IN INTERNATIONAL ESOL - EXPERT - **and** CITY & GUILDS CERTIFICATE IN INTERNATIONAL SPOKEN ESOL - EXPERT - (They are cumulatively submitted to demonstrate very good language proficiency)
- EDI Level 2 Certificate in ESOL International JETSET Level 6 (CEF C1)
- ESB Level 2 Certificate in ESOL International All Modes (Council of Europe Level C1)
- INTERNATIONAL ENGLISH LANGUAGE TESTING SYSTEM (IELTS) from University of Cambridge Local Examinations Syndicate (UCLES) or CAMBRIDGE ASSESSMENT ENGLISH – The British Council – IDP Education Australia IELTS Australia (with score 7- 8)
- GA Level 2 Certificate in ESOL International – CEFR: C1
- GA Level 2 Certificate in ESOL International (Classic C1)
- C1 - LanguageCert Level 2 Certificate in ESOL International (Listening, Reading, Writing) (Expert C1) **and** C1– LanguageCert Level 2 Certificate in ESOL International (Speaking) (Expert C1) (They are cumulatively submitted to demonstrate very good language proficiency)
- LanguageCert Test of English (LTE) - LanguageCert Level 2 Certificate in ESOL International (Listening, Reading) (LanguageCert Test of English C1) (issued by 30.06.2024)
- LanguageCert Level 2 Certificate in ESOL International (Listening, Reading, Writing, Speaking) (LanguageCert Test of English C1)
- LanguageCert Level 2 Certificate in ESOL International (Listening, Reading, Writing, Speaking) (LanguageCert Academic C1)
- LanguageCert Level 2 Certificate in ESOL International (Listening, Reading, Writing, Speaking) (LanguageCert General C1)
- LONDON TESTS OF ENGLISH LEVEL 4 - ADVANCED COMMUNICATION- EDEXCEL
- EDEXCEL LEVEL 2 CERTIFICATE IN ESOL INTERNATIONAL (CEF C1)
- LRN Level 2 Certificate in ESOL International (CEF C1)
- MET – MICHIGAN ENGLISH TEST (Units: Listening, Reading, Speaking) score 190-240 Michigan Language Assessment or CAMBRIDGE MICHIGAN LANGUAGE ASSESSMENTS-CaMLA (issued by 30.06.2024)
- MET - MICHIGAN ENGLISH TEST (Units: Listening, Reading issued by 30.06.2024 or Listening, Reading, Speaking, Writing) score 64-80 Michigan Language Assessment
- MICHIGAN ENGLISH LANGUAGE ASSESSMENT BATTERY (MELAB) score 91-99, CAMBRIDGE MICHIGAN LANGUAGE ASSESSMENTS (CaMLA) or MICHIGAN LANGUAGE ASSESSMENT
- NOCN Level 2 Certificate in ESOL International (C1)
- NYLC –NEW YORK LANGUAGE CENTER CERTIFICATE Level C1
- OCNLR Level 2 Certificate in ESOL International (CEFR C1)

- OCNW Certificate in ESOL International at Level 2 (Common European Framework equivalent level C1) (by 31/8/2009)
- Open College Network West Midlands Level 2 Certificate in ESOL International (CEFR C1)
- PEARSON EDI Level 2 Certificate in ESOL International (CEF C1)
- PEARSON LCCI LEVEL 2 CERTIFICATE IN ESOL INTERNATIONAL (CEFR C1)
- ESOL INTERNATIONAL (CEFR C1)
- PEARSON TEST OF ENGLISH GENERAL LEVEL 4 - ADVANCED COMMUNICATION - EDEXCEL
- PEARSON EDEXCEL LEVEL 2 CERTIFICATE IN ESOL INTERNATIONAL (CEF C1) (ENGLISH INTERNATIONAL CERTIFICATE)
- PEARSON LCCI EFB LEVEL 4 (Units: Reading, Writing, Listening, Speaking, in case one of those is graded as "Pass")
- PEARSON LCCI EFB LEVEL 3 (Units: Reading, Writing, Listening, Speaking, graded as"Distinction" or "Credit")
- SEG AWARDS Level 2 Certificate in ESOL International (CEF C1) του SKILLS & EDUCATION GROUP AWARDS
- TEST OF ENGLISH FOR INTERNATIONAL COMMUNICATION (TOEIC Listening, Reading) EDUCATIONAL TESTING SERVICE/ CHAUNCEY, USA, score 785-900 and from 1/12/2019 score 785-920 (issued by 30.06.2024)
- TEST OF ENGLISH FOR INTERNATIONAL COMMUNICATION -TOEIC 4-Skills (Listening, Reading, Speaking, Writing) του EDUCATIONAL TESTING SERVICE (ETS), Level C1
- Test of Interactive English, C1 Level (ACELS)
- Test of Interactive English, C1 Level (Gatehouse Awards)
- Test of Interactive English, C1 + Level (ACELS)
- The British Council Aptis ESOL International Certificate Level 2 (Aptis ESOL Advanced ή Aptis ESOL General)
- VTCT (ITEC) Level 2 Certificate in ESOL International (C1) or VTCT Skills (ITEC) Level 2 Certificate in ESOL International (C1)
- National Foreign Language Exam System (KPG) level C1 of Law 2740/1999, as replaced by paragraph 19, Article 13, of Law 3149/2003.

English competency (level C1) is also proven with certificates of other institutions (not limited to universities) of an equivalent level, irrespective of their legal form, provided they are certified or recognized by the competent authority of the country concerned for conducting examinations and issuing certificates of proficiency in English at the appropriate level. These certificates must be accompanied by a proof document from the issuing body that both the issuing body and the language certificate competency are certified by the competent national authority and that the certification also concerns the evaluation of basic communication skills (written language production, oral language production, written language comprehension and oral language comprehension).

If there is no certification or recognition body in the country concerned, a certificate from the relevant Ministry or Embassy of the country in Greece is required, confirming that the certificates issued by the above bodies to third parties for whom English is not a native

language are accepted in public services of that country as valid evidence of English at the appropriate level according to the Common European Framework of Reference for Languages (CEFR). The competent regulatory authority for Great Britain is the Office of Qualifications and Examinations Regulation (Ofqual).

General notes:

- Advanced level foreign language certificates also prove knowledge of a lower (required) level of the foreign language.
- Foreign Language Teaching Certification does not prove the competence in a foreign language. In order to prove their competence in the foreign language, candidates who hold the relevant certification must provide the foreign language certificates as provided for in this Annex where applicable.
- All foreign language degrees must be accompanied by their official translation into the Greek language, except the above English language proficiency certificates, which are accepted without requiring any translation and validation.