DEMOCRITUS UNIVERSITY OF THRACE

DEPARTMENT OF PHYSICS

Guide to Undergraduate Studies 2025-2026

KAVALA 2026

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KAVALA 2026

POSTAL ADDRESS

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Academic Calendar 2025 -2026

Fall Term	
Commencement of Lectures	29/09/2025
Conclusion of Lectures	16/01/2026
Spring Term	
Commencement of Lectures	09/02/2026
Conclusion of Lectures	29/05/2026

Official Holidays – Suspension of Educational Activities

No classes, labs, or exams held on the following dates:

Fall Term	
October 28th	National Anniversary
November 17th	Polytechnic Uprising Anniversary
24/12/2025 to 6/1/2026	Christmas Recess

Spring Term	
February 3rd	Shrove (Clean) Monday
March 25th	National Anniversary
06/4/2026 to 17/4/2026	Easter Recess
May 1st	Labour Day
June 1st	Holy Spirit Monday

Liberation of Kavala: July 9th 1913.

PART I
GENERAL INFORMATION

Democritus University of Thrace

A Comprehensive University

Established in 1973, the Democritus University of Thrace (DUTh) was named in honour of the philosopher Democritus (460-370 BC), a native of Abdera, Thrace, renowned for his formulation of the atomic theory. The University commenced its operations during the 1974-1975 academic year, marked by the inaugural student enrolment in the Department of Civil Engineering in Xanthi and the Department of Law in Komotini. Today, DUTh stands as one of the largest higher education institutions in Greece—the sole university in the Region of Eastern Macedonia and Thrace—comprising 28 Departments across seven cities: Drama, Kavala, Xanthi, Komotini, Alexandroupoli, Didymoteicho, and Orestiada.

DUTh academic programmes encompass the full spectrum of sciences—natural, technological, humanities, social, and health sciences— offering students an educational environment that fosters interdisciplinarity, innovation, and collaboration. The multi-thematic nature of studies at DUTh establishes the foundations for a holistic and cross-disciplinary approach to knowledge, underpinning academic and research excellence. The University's faculty consists of more than 650 professors, educating more than 30.000 active undergraduate and postgraduate students. Beyond its quantifiable achievements, throughout its 50 years of operation, DUTh has made a profound impact on society, enhancing the lives of thousands of graduates and positively influencing countless others through its diverse educational, cultural, and social activities.

Bridging Theory and Practice

Students at DUTh are afforded the opportunity to complement their theoretical foundation with hands-on experience through internship programmes. Such initiatives facilitate substantive engagement with the labour market and effectively preparing students for their practical exigencies of their respective professional fields.

Life Skills Development

DUTh is committed to empowering scientists who are mindful of their societal impact. Through a diverse range of educational activities, students develop the capacity for independent, creative, and critical thought, enabling them to resolve complex challenges and communicate with empathy in professional settings. This holistic approach enhances their future prospects and ensures the acquisition of professional qualifications that are recognised worldwide.

Values and Social Responsibility

DUTh strives to be a fair, inclusive, and socially responsible University promoting justice and equality by ensuring equal opportunities for all. It fosters solidarity and inclusion through a commitment to collaboration and respect for diversity. Furthermore, it demonstrates social responsibility by actively pursuing social progress through research and education. DUTh operates with transparency, ensuring open procedures and access to information, and with accountability, encouraging responsibility, collective participation, and continuous improvement.

Innovation & Entrepreneurship

DUTh actively supports creativity and entrepreneurial culture. By organising innovation and entrepreneurship seminars and workshops, the University provides students with the opportunity to translate conceptual ideas into tangible outcomes through collaboration with industry experts.

A Supportive Academic Community

At DUTh, students are far more than an enrolment number; they are integral members of a vibrant student community founded on mutual support and collaboration. The University places significant emphasis on student welfare through its dedicated services and facilities. Personal interaction with the Academic Adviser ensures continuous guidance throughout the duration of studies, while institutional bodies—such as the Student Ombudsman, the Committee for Gender Equality and Combating Discrimination, and the Ethics Committee—facilitate the resolution of any issues through established procedures.

Activities at DUTh

Upon enrolment at DUTh, students are offered the opportunity to participate in a wide array of activities organised by various student groups, including theatre, sports, cinema, and volunteering, tailored to individual interests.

A Unique Life Experience in Eastern Macedonia and Thrace

Student life across the host cities of DUTh offers an experience that combines cultural diversity and natural beauty with an affordable cost of living. The University maintains a strong connection with the local community, fostering a vibrant and integrated academic environment.

A Global Perspective

DUTh is a founding member of the **EMERGE** European University Alliance (Empowering the Margins of Europe through Regional and Global Engagement). This alliance brings together universities from the European periphery, developing a unified European higher education and research area. Through EMERGE, students are afforded the opportunity to participate in national and international mobility programmes, as well as joint initiatives in education, research, culture, and volunteering.

Democritus University of Thrace is a leading academic destination. With its modern programmes of study, extensive internship opportunities, emphasis on innovation, and active participation in the EMERGE European University Alliance, DUTh adheres to a student-centred philosophy. It does not merely prepare students for a profession; it prepares them for life.

Schools & Departments

Duth consists of the following Schools and Departments:

School Of Health Science

- Department of Medicine
- Department of Molecular Biology and Genetics
- Department of Nursing

School of Education

- Department of Primary Education
- Department of Education Sciences in Early Childhood
- Department of Psychology

School of Law

- Department of Law

School of Humanities

- Department of Humanities

School of Social, Political and Economic Sciences

- Department of Social Work
- Department of Social Policy
- Department of Economics
- Department of Political Science

School of Agricultural and Forestry Sciences

- Department of Agricultural Development
- Department of Forestry and Management of the Environment and Natural Resources
- Department of Viticulture and Oenology
- Department of Natural Environment and Climate Resilience

School of Engineering

- Department of Architectural Engineering
- Department of Electrical and Computer Engineering
- Department of Production and Management Engineering
- Department of Environmental Engineering
- Department of Civil Engineering

School of Physical Education Sport Science and Occupational Therapy

- Department of Physical Education and Sport Science
- Department of Occupational Therapy

School of Management Science and Accounting

- Department of Management Science and Technology
- Department of Accounting and Finance

School of Sciences

- Department of Informatics
- Department of Physics
- Department of Chemistry

DUTh's Governance

In accordance with Law 4957/2022, the governance of each Higher Education Institution (HEI) is exercised by the Rector, the Governing Council, and the Senate.

Rector

Fotios Maris
Professor, Department of Civil Engineering

Vice Rector for Academic Affairs, Student Affairs & Lifelong

Maria Grigoriou
Professor, Department of Molecular Biology & Genetics

Vice Rector for Finance, Planning & Development

Konstantinos Chalioris
Professor, Department of Civil Engineering

Vice Rector for Research & Innovation

Georgios Broufas
Professor, Department of Agricultural Development

Vice Rector for Administrative Affairs

Vasileios Gourgoulis
Professor, Department of Physical Education & Sport Science

Governing Council

The Governing Council of DUTh is composed of eleven (11) members, six of whom are internal and five external. The Council exercises the powers defined by national legislation and the Internal Regulations of DUTh.

Internal Members of the Governing Council

Fotios Maris	Professor, Department of Civil Engineering
Alexandra Yiatromanolaki	Professor, Department of Medicine
Alkiviadis Dervitsiotis	Professor, Department of Law
Evangelos Drympetas	Professor, Department of Economics
Maria Michalopoulou	Professor, Department of Physical Education and Sport Science
Georgios Tsomis	Professor, Department of Greek Philology

External Members of the Governing Council

Andreas Demetriou	Emeritus Professor, University of Cyprus and Universi of Nicosia
Georgios Kapsalis	Emeritus Professor, University of Ioannina
Ioannis Kevrekidis	Professor, Johns Hopkins University
Spyridon Kollias	Professor, Zurich University

Andreas Matzarakis Researcher/Professor, University of Freiburg

Senate

In accordance with the provisions of Law 4957/2022, the Senate is composed of:

a) The Rector;

b) The Deans of the Schools;

c) The Heads of the Departments;

d) One (1) representative from each category of the following personnel: Special Teaching Staff (EEP), Laboratory Teaching Staff (EDIP), and Specialised Technical and Laboratory Staff (ETEP) of the Institution, provided such categories are currently serving;

e) Student representatives, accounting for ten per cent (10%) of the total number of Senate members listed in cases (a) to (c). Should this percentage result in a decimal higher than 0.5, it is rounded up to the nearest whole number, ensuring that each cycle of studies is represented by at least one (1) student. Student representatives are appointed by the Student Council.

The Senate is legally constituted and operational even if representatives of students, EEP, EDIP, ETEP, or administrative staff have not yet been elected.

School of Science

The School of Sciences is located at the University Campus in Kavala.

The School comprises three (3) Departments:

1. **Department of Physics**, operating since 2019 in the city of Kavala.
2. **Department of Chemistry**, operating since 2019 in the city of Kavala.
3. **Department of Computer Science**, operating since 2019 in the city of Kavala.

The School is governed by the Dean and the School Board.

The School Board is composed of:

Dean

Konstantinos Tarchanidis
Professor, Department of ChemistryT

School Board

Nikolaos Vordos, Professor, Head of Department of Physics
Georgios Kyzas, Professor, Head of Department of Chemistry
Georgios Papakostas, Professor, Head of Department of Informatics
Maria Roussi, Special Teaching Staff (EEP) Representative
Kokkoni Karakosta, Laboratory Teaching Staff (EDIP) Representative
Georgios Vythoulkas, Specialised Technical and Laboratory Staff (ETEP) Representative

Secretariat: Athanasia Soutloglou (secr [at] sci.duth [dot] gr)

External members of the Board of Directors

Andreas Demetriou Professor Emeritus, University of Cyprus and Nicosia

George Kapsalis Professor Emeritus, University of Ioannina

Ioannis Kevrekidis Professor, John Hopkins University

Spyridon Kollias Professor, Zurich University

Andreas Matzarakis Researcher/Professor, University of Freiburg, Germany

Senate

In accordance with the provisions of Law 4957/21-07-2022, the Senate consists of:

a) the Rector,

b) the Deans of the Faculties,

c) the Chairs of the Departments,

d) one (1) representative from each category of members of Special Educational Staff (EEP), Laboratory Teaching Staff (EDIP), and Special Technical Laboratory Staff (ETEP) of the Higher Educational Institution, provided that corresponding categories of personnel serve in it.

e) student representatives at a rate of ten percent (10%) of all members of the Senate in cases a) to c). If, based on the above percentage, a decimal number is obtained that is greater than 0.5, it is rounded to the next largest integer unit, with the obligation to represent each cycle of studies by at least one (1) student. Student representatives are nominated by the Student Council.

The Senate is formed as a body and operates legally even if representatives of students, members of the EEP, EDIP, ETEP and administrative employees have not been elected.

School of Sciences

The School of Sciences, centrally located on the Kavala Campus, serves as the foundation for its academic departments.

The School of Sciences consists of three departments: Physics, Chemistry, and Informatics, each operating in Kavala since 2019.

Oversight of the School is provided by the Dean and the Dean's Office, ensuring cohesive management across departments.

The Deanship is composed of:

Dean Konstantinos Tarchanidis, Professor in the Department of Chemistry

Deanship

Nikolaos Vordos, Associate Professor, Chair of the Department of Physics.

George Kyzas, Professor, Chair of the Department of Chemistry.

George Papakostas, Professor, Chair of the Department of Informatics.

Maria Roussi, Representative of EEP.

Kokkoni Karakosta, Representative of EDIP.

George Vythoulkas, Representative ETEP.

Secretary of the Deanship: Athanasia Soutloglou (secr@sci.duth.gr).

The Department of Physics

History, Physiognomy & Professional Rights The Department of Physics at the Democritus University of Thrace, founded in 2019, offers a dynamic education spanning basic and applied Physics, from Quantum and Astrophysics to Nuclear, Particle, and Condensed Matter Physics, with applications in telecommunications, biomedicine, microelectronics, computers, nanotechnology, and emerging technologies. The Department features specialized staff, modern infrastructure, and a research-driven learning model that prepares students for an in-depth understanding of Physics.

Description Graduates can be employed professionally in any employment relationship, as well as in the form of providing services as specialist scientists, consultants, or experts, individually or in collaboration with scientists of other specialties, or self-employed in any field of the science of Physics and its applications.

The sectors in which a graduate of the Department is employed in Greece are:

A) In education, in public and private educational institutions of all levels, with the subject of teaching Physics as well as any other subject related directly or indirectly to Physics and its applications.

B) Research in any field related to the subject of Theoretical, Experimental, and Applied Physics, whether it has a purely theoretical - scientific direction, or is intended for industrial application. This may be carried out on the initiative and with funding from public or private bodies, in research centers/institutes, foundations, and laboratories owned by the public or private sector, as well as in competent directorates, sub-directorates, or departments of national, European, or international public organizations and private enterprises.

C) In the Public and Private Sector, as: Radiation Physicists - Radiophysicists, Medical Physicists - Health Physics, Nuclear Physicists, High Energy Physicists, Theoretical Physicists, Meteorological Physicists, Environmental Physicists, Energy Physicists, Renewable Energy Sources Physicists, Electronic Physicists, Telecommunications Physicists, Automation and Control Systems Physicists, Materials Science and Technology Physicists, Astrophysicists, Geophysicists, Biophysicists, Molecular and Atomic Physicists, as well as with subjects such as: Computational Physics, Applications of Solid State Physics, Imaging Physics, Radiodiagnostics and Nuclear Medicine, Production, Management and/or Energy Saving, Acoustics Applications, Micro- and Nanotechnology, Electronics, Microelectronics and Nanoelectronics, Applications of Signal, Systems and Information Science, Multimedia Applications, Microwaves and Microwave Devices, Atmospheric Physics, Oceanography, Climate and Climate Change, Environmental Impacts and Environmental Protection.

Also, the graduated Physicist can engage in:

(a) Theoretical Studies and Practical Applications in all branches of Theoretical, Experimental and Applied Physics such as: Mechanics and Properties of Matter, Condensed Matter Physics, Physics and Mechanics of Materials, Waves, Acoustics, Electricity, Magnetism, Electronic Physics, Optics, Optoelectronics, Micro- and Nano-electronics, Atomic and Molecular Physics, Nuclear Physics, High Energy Physics, Biophysics, Radioactivity, Astrophysics and Space Physics, Emission and Reception of Electromagnetic Waves, as well as Physics and technology of signals, systems and information,

(b) the study and development of accelerated systems of charged particles and detection systems for ionizing radiation for research use and applications of Nuclear Physics and radioactivity in industry, the environment, agriculture, and medicine,

(c) by the development and use of computer codes and programs (software) for the analysis, study, and solution of problems in the fields of Theoretical, Experimental, and Applied Physics,

(d) by the study, evaluation, and standardization of electronic, microwave, optical, optoelectronic, photonic, and laser devices, in related applications in industry, telecommunications, biomedicine, the environment, and space,

(e) by the study of the structure and physical and mechanical properties of a wide range of materials of scientific and technological interest,

(f) by the study and analysis of physical systems, such as solids, fluids, gases, and plasma,

(g) as a consultant and analyst in Radiodiagnostics, Radiotherapy, and Nuclear Medicine units,

(h) as a specialist scientist, consultant or expert in the study of problems and applications of Computational and Theoretical Physics and Mechanics, Nuclear Physics, Elementary Particles, Physical and Mechanical Properties of Materials, Electronics, Micro- and Nanoelectronics, Optoelectronics and Lasers, Ionizing and Non-Ionizing Radiation, Microwave Devices and Applications, Wired and Wireless Telecommunications and Telecommunications Networks and Applications, Space Physics and Technology, as well as Atmospheric and Oceanic Physics, Environmental Physics and Climate Physics, and Atmospheric and Water Pollution Physics.

Administration of the Department of Physics

The Department is governed by the Head and the Department Assembly.

Chairman Nikolaos Vordos, Associate Professor,

Members of the Physics Assembly

1. Vordos Nikolaos, Associate Professor, Chairman of the Assembly, Head of Department
2. Karakoulides Konstantinos, Associate Professor, Deputy Chairman
3. Bandekas Dimitrios, Professor, Member
4. Stavrinidis Stavros, Professor, Member
5. Tsiantos Vasilios, Professor, Member
6. Chanias Michael, Professor, Member
7. Papadopoulou Panagiota, Associate Professor, Member
8. Fantidis Iakovos, Associate Professor, Member

9. Antoniadou Kyriaki, Assistant Professor, Member

10. Kogias Panagiotis, Assistant Professor, Member

11. Maaita Tzamal Odysseas, Assistant Professor, Member

12. Maragakis Michael, Assistant Professor, Member

13. Tziaferi Irini, Assistant Professor, Member

14. Kogia Fotini, Lecturer, Member

15. Tramantzas Konstantinos, EDIP, EDIP Representative

16. Bereri Efstathia, ETEP, ETEP Representative

Department of Physics Secretariat

Deputy Head of Secretariat

Bethlehem Anagnostaki

Tel. 2510 462141 email: banagnost@admin.duth.gr

Secretariat Staff

Anna Moshou

Tel. 2510 462142 email: anmoshou@admin.duth.gr

Name	Cognitive Object	Telephone(2510)	email (@physics.duth.gr)
Antoniadou Kyriaki	Dynamics- Celestial Mechanics	462275	kantonia
Vordos Nikolaos	Simulation of Hybrid Systems and Biomechanical Characterization of Nanostructured Materials	462276	nvordos
Dermentzoglou Ioannis	Mathematical Development-Simulation of Electromechanical Systems for Electrical Energy Production and Motion	462260	dermentz
Karakoulides Konstantinos	Electrical Machines and Their Thermographic Inspection	462273	karakoul
Kogia Fotini	Physics	462164	fkogia
Kogias Panagiotis	Control of Terrestrial Digital Communication Systems	462246	kogias
Maaita Tzamal Odysseas	ΝανοδιατάξειςChaotic Electronic Circuits and Nanodevices	462608	tmaaita
Maragakis Michael	Computational Solid State Physics	462262	mmara
Bandekas Dimitrios	Modeling and Control of Energy Systems and Measurement Systems	462132	dbandek

Papadopoulou Panagiota	Physics with Emphasis on Microelectronic Device Technology	462165	ppapado
Stavrinidis Stavros	Nonlinear dynamics of electronic circuit elements and their interdisciplinary applications	462266	sstravin
Tziaferi Irene	High Energies – Elementary Particles	462125	etziaferi
Tsiantos Vasilios	Mathematics with Emphasis on Mathematical Analysis and Applied Mathematics	462242	tsianto
Fantidis Iakovos	Non-destructive testing in energy systems	462274	ifantidi
Chania Michael	Nonlinear Properties of Semiconductors, Semiconductor Devices, Circuits and Economic Systems	462265	mhanias

Laboratory Teaching Staff of the Department of Physics (EDIP)

Name	Cognitive Object	Telephone (2510)	email (@physics.duth.gr)
Kazolis Dimitrios	EDIP	462324	dkazolis
Tramantzas Konstantinos	EDIP	462166	ktraman

Special Technical Laboratory Staff of the Department of Physics (ETEP)

Name	Cognitive Object	Telephone (2510)	email (@physics.duth.gr)
Bereri Efstathia	ETEP	462274	ebereri

Physics Department Laboratories

The following institutional Laboratories operate in the Physics Department:

Laboratory of Solid State Physics, Electronics, Nanotechnology and Complex Systems (2025, ΦΕΚ 1377/21.03.2025), ΦΕΚ1377/21.03.2025)
Applied Physics Laboratory (2020, ΦΕΚ 4160/28-09-2020)
Laboratory of Didactics, Computers and Applied Mathematics and Micromagnetism (2020, ΦΕΚ 4280/2.10.2020)
Biophysics Laboratory (2020, ΦΕΚ 4110/24.09.2020)

Physics Department Committees

Internal Evaluation Team

• Michael Chanias, Professor

• Konstantinos Karakoulides, Associate Professor

• Panagiota Papadopoulou, Associate Professor

Practical Training Committee

• Konstantinos Karakoulides, Associate Professor

• Iakovos Fantidis, Associate Professor

• Panagiotis Kogias, Assistant Professor

ERASMUS+ Committee/Coordinator

• Panagiotis Kogias, Assistant Professor

Educational Activities Recognition Committee

• Kyriaki Antoniadou, Assistant Professor

• Iakovos Fantidis, Associate Professor

• Dimitris Kazolis, EDIP

PART II

UNDERGRADUATE STUDIES IN THE DEPARTMENT OF PHYSICS

Organization & Operation of the Undergraduate Study Program (USP) Objectives

The Department of Physics provides a first-cycle study program, which is part of the Department's development plan and the strategic plan of the Democritus University of Thrace, aiming to promote knowledge, maintain scientific coherence, and meet requirements that guarantee a high level of studies. The “Physics” USP is certified by the National Higher Education Authority (NHEAE) periodically every five (5) years in the framework of the Department's evaluation.

The objectives of the “Physics” USP are to provide students with:

• a wide range of career options

• to equip them with skills and confidence by understanding the role that Physics plays in cutting-edge research so that they can become creative scientists.

Learning outcomes

Upon completing their studies in the “Physics” program, graduates will be able to:

• have a deep, solid, and multidimensional scientific background in Physics, which is the foundation of many modern sciences and technological fields

• be able to apply their knowledge and skills in different scientific and professional environments, demonstrating adaptability and analytical thinking.

Internal Regulation and Operating Regulation of the Department of Physics

The Internal Operating Regulation of the Democritus University of Thrace determines issues that regulate the internal operation of the Institution such as the organization of the curricula of all cycles (first, second and third), the examination and evaluation process of students, the degrees awarded, the oath-taking process, the conditions for participation in examination periods, the re-examination process and the ratio between compulsory and elective courses, while determining the rights and obligations of students, their advisory support, as well as special arrangements for students with disabilities or educational needs. It also includes provisions for student evaluation of teaching work, the terms and conditions for the classification of graduates based on examination rankings, the recognition of credit units from other study programs, and the procedure for participating in mobility actions. In addition, issues concerning the operation of the Foundation's administrative bodies and services, the preparation of annual reports, the awarding of honorary academic titles, and the rules of ritual and public relations are regulated. The Regulation also includes regulations for the operation of libraries, laboratories, clinics, museums and other research or academic units, the conditions for granting scholarships with social or academic criteria, security and security issues at the Foundation, the organization and operation of collective and single-member bodies and committees, as well as issues concerning the selection and employment of temporary teaching staff, the awarding of titles of Emeritus and Honorary Professor, as well as issues of service status, selection, rights and obligations of teaching, research and other staff. The Operating Regulations of the Undergraduate Program "Physics Program" file regulates all issues specifically related to the operation of the Undergraduate Program.

Admission to the Undergraduate Program

Admission to the Undergraduate Program "Physics Program" is carried out:

a) with the currently applicable system of Panhellenic entrance exams of the competent ministry (for high school graduates or those falling under special categories),

b) with qualifying exams with the currently applicable system (for graduates of other Departments or Schools).

c) with a percentage of 5% in addition to the places of admission, without exams, for those suffering from serious illnesses, in accordance with the applicable legislation.

d) by decision of the Board of Directors, following a proposal from the Rector and the opinion of the Dean of the School of Sciences, foreign-alien students from third countries may enroll in the USP.

Registration in the USP

• Studying in the USP "Physics" begins with the student's first registration. The registration of admitted students is carried out at the beginning of the winter semester by the Ministry of Education, Religious Affairs, and Sports through the electronic application https://eregister.it.minedu.gov.gr/, on dates announced and applicable to all Universities.

• The registration of students belonging to special categories (transfers, placements, etc.) takes place under special conditions, upon presentation of the supporting documents required by the corresponding provisions and within deadlines announced in good time.

• The status of a student is acquired upon registration at the University, as provided for in the provisions in force at that time.

• By registering at the USP, the student accepts the Internal Regulation of the USP and the Internal Regulation of the Democritus University of Thrace and all relevant regulations. Violation of the Internal Regulation of the Institution, the Program Regulation, as well as any Regulation governing student attendance and academic life in general, constitutes a disciplinary offense.

Conducting courses

The courses are held in person. The organization of the educational process with distance learning methods is possible in the following cases:

a) provision of teaching work in the PPS by Professors from foreign institutions, other Institutions in Greece or Collaborating Professors,
b) provision of legal work within the framework of joint study programs with foreign institutions,
c) provision of teaching work within the framework of interdepartmental or interinstitutional first-cycle programmes, for the part of the teaching work provided under the responsibility of the collaborating Departments, provided that the headquarters of the collaborating Departments are in a different city,

d) Organization of in-depth courses and tutorial exercises, beyond the mandatory teaching hours per course.
e) Following a decision by the Senate noticing force majeure or extraordinary circumstances where in-person conduct of the educational process or use of DUTH infrastructure for educational, research, and other activities is not possible, according to a decision by the Department (or other competent body).

- For every educational activity, a Responsible Instructor is appointed by decision of the General Assembly. In the case of co-teaching, one of the instructors is appointed as the Responsible person. The person Responsible for the educational activity is responsible for its smooth conduct (scheduling, posting the Course Outline on the Institution's electronic platforms, communicating with students, etc.). In cases of co-teaching, the Course Responsible also has the responsibility of coordinating the instructors.
- **The course responsible must post the Course Outline, the detailed schedule of activities for the 13 weeks, and any other information or material deemed appropriate on the e-Class platform for students enrolled in the course at the start of the semester.**
- The timetable includes the distribution of teaching hours for the Undergraduate Program's educational activities across the five (5) working days of the week, the instructors, and the classrooms. Educational activities for each semester are distributed over the five (5) working days of the week. In exceptional cases, and if deemed absolutely necessary, educational activities may be held on weekends.
- Each course is taught on the days and at the times scheduled in the official timetable. In cases where teaching hours (lectures/labs, etc.) are lost due to holidays or other unforeseen circumstances, replacement sessions are scheduled so as to ensure full coverage of both the prescribed course material and the total number of teaching hours corresponding to the thirteen full weeks of teaching.
- Auditoriums, classrooms, and the building and other infrastructure of the Department, the School, and the Institution in general support its educational process. The infrastructures are available for the implementation of educational work from 08:00 to 21:00.
- All matters regarding the organization, implementation, and monitoring of the Undergraduate Program are described in the Undergraduate Studies Regulations which constitute an Annex of the DUTH Internal Regulation.

Textbooks

- Students have the right to select and receive one (1) free textbook for each mandatory or elective course required for their degree. The provision of textbooks for the undergraduate students is carried out according to applicable provisions.
- Eligible students receive free textbooks until they complete the minimum number of semesters required for the degree plus four (4) additional semesters, or as defined in the applicable legislation, provided they haven't received a free textbook for the same course in the past.
- Textbook declarations for all courses are made via the "EUDOXUS" Electronic Service for the Integrated Management of Academic Textbook (https://eudoxus.gr/). The deadline for textbook declarations of each semester is decided by the Department Assembly and cannot exceed the period announced by "EUDOXUS." Students must have a DUTH telematics account to declare textbooks, which is received upon first-year registration.
- The textbook list is compiled annually by the Department Assembly following a recommendation by the Course Responsible and includes, for every course, whether mandatory or elective, all recommended textbooks that satisfactorily cover the course syllabus.

eClass

The teaching of each course is supported by the asynchronous e-learning platform – e-Class – through which there is two-way communication between students and professor, exchange of materials, and the conduct of tests/progress exams.

Examinations and Grading

➢ **There are three exam periods: January-February, June, and September, each lasting three weeks.** In January-February exam period only winter semester courses are examined. In June exam period spring semester courses are examined. 4th-year students may examine courses from both semesters during this period. In September exam period, all courses from both semesters are examined. For laboratory courses, participation in exams is allowed only if the student has successfully completed the laboratory part.

➢ By decision of the Department Assembly, the Final Examination Schedule and the Invigilation Schedule for the exam periods are compiled in accordance with the academic calendar determined by the Senate. During the preparation of the Examination Schedule, care is taken to ensure a rational distribution of courses (e.g., ensuring that the examination of mandatory courses for the semester is evenly distributed throughout the exam period, avoiding empty days, etc.). **The exam schedule of the winter semester exam period is approved by the Department Assembly and is announced to the students no later than November 30th; for the spring semester exam period, no later than April 15th; and for the September repeat exam period, no later than July 15th.** It is posted on the Department website immediately after approval. In exceptional cases and if necessary reasons arise, the exam schedule may be approved or modified by a decision of the Department Head, which is then ratified by the Department Assembly.

➢ For every independent educational activity (e.g., course, undergraduate thesis, etc.) included in a Curriculum, the assessment is assigned numerically (grade) with a value ranging from zero (0) to ten (10). A passing grade is any grade equal to or greater than 5.00 (five). The final grade for each independent educational activity may be the result of either a comprehensive final examination or the combined consideration of individual assessments (of equal or varying weight). The final grade, as well as the individual assessments, may result from written or oral examinations, practical exercises, or the student's performance and participation in the educational process, particularly from the preparation and presentation of assignments, or a combination of the above. In cases of reports, practical exercises, or assignments, a brief descriptive evaluation is provided in addition to the numerical grade.

➢ For independent educational activities in which the student did not receive a passing final grade and where attendance in them or part of them is deemed insufficient, the student is required to repeat them in whole or in part, as specified in the Regulations of the Program of Studies. **The grades are submitted by the Course Responsible within 20 days of the examination date and, in any case, no later than 20 days after the end of the examination period.** If the Course Responsible cannot meet the twenty-day deadline due to a large number of exam papers, they may submit a request to the Assembly for an extension of the grade submission period, and the Assembly shall decide accordingly. All information regarding examination matters is included in the Examination Regulations, which constitutes an Appendix to the Internal Regulations of DUTH**.**

Completion of Studies

Students complete their studies and are awarded a study certificate or a degree once they have completed the minimum required number of semesters for obtaining a degree or diploma, have successfully passed the courses prescribed by the study program under the terms and conditions defined therein, and have accumulated the required number of credits.

To obtain the degree, a period of study of 8 semesters is required, along with the accumulation of a total of at least 240 credits (ECTS), depending on the duration of the Undergraduate Program (UP).

More specifically, a student of the Undergraduate Program (UP) is required to meet the following conditions to obtain a degree:

- Successful completion of the Mandatory Courses of the UP.
- Successful completion of the Elective Courses of the UP.
- Successful completion of every other educational activity provided for by the UP (e.g., undergraduate thesis)

For the award of the degree, in addition to the aforementioned requirements, it is essential to settle all pending obligations with the University Services, specifically:

- Any borrowed books must be returned to the DUTH Library, and the undergraduate thesis must be submitted in digital format.
- In the case of residence in an Institution dormitory, the room handover procedure prescribed in the Student Dormitory Regulations must be followed, and the room key must be returned.
- Any technical equipment, books, or other borrowed educational material must be returned to the Laboratories of the Department/School or the Institution.
- The academic identity card (student ID) must be returned to the Department Secretariat.
- It must be ensured that there are no outstanding financial obligations to any Service of the Institution (e.g., refund of a paid Erasmus+ grant, etc.).

Calculation of Final Degree Grade

In the calculation of the degree grade, the grades of the courses are taken into account. The degree grade is calculated as the weighted average grade of the individual courses (WAGC), in accordance with the provisions of Ministerial Decisions Φ141/Β3/2166/1987 and Φ141/Β3/2457/1988.

Specifically, the grade of each course is multiplied by a coefficient, called the "weighting factor" of the course; the sum of the individual products is then divided by the sum of the weighting factors of all courses.

The degree grade is calculated as follows:

- **For those completing an Undergraduate Thesis (30 ECTS)**, the following formula applies – Degree Grade:
  0,80 x WAGC + 0,2 x Undergraduate Thesis Grade
- **For those not completing an Undergraduate Thesis**, the following formula applies – Degree Grade: WAGC

Based on its value, the degree grade is accompanied by a classification as follows:

- "Good" (Καλώς) characterizes grades from 5.00 up to and including 6.49.
- "Very Good" (Λίαν καλώς) characterizes grades from 6.50 up to and including 8.49.
- "Excellent" (Άριστα) characterizes grades from 8.50 to 10.

Diploma Supplement

The Diploma Supplement certifies the student's performance by providing a detailed record of the courses attended and examined, the teaching and credit units accumulated, the grades received, and the corresponding grades of the European Credit Transfer and Accumulation

System (ECTS). The Diploma Supplement is issued in both Greek and English by the competent ECTS/DS coordinator.

The categorization of the performance of successful students is based on the following relative grading scale of the European Credit Transfer and Accumulation System:

ECTS Grades	Percentage of students who typically achieve the grade
Grade A	For the top 10% of successful students
Grade B	For the next 25% of successful students
Grade C	For the next 30% of successful students
Grade D	For the next 25% of successful students
Grade E	For the next 10% of successful students

The categorization of the performance of failing students is as follows:

ECTS Grades	Percentage of students who do not achieve the grade
Grade FX	Fail - Some more improvements are required for the performance to be considered successful
Grade F	Fail - Significant additional improvements are required

Graduation Ceremony (Oath)

i. To participate in the graduation ceremony, an application must be submitted following an announcement-invitation by the Department Secretariat. The ceremony is conducted in accordance with the provisions of Articles 221 and 224-226 of the DUTH Internal Regulations.
ii. Students must declare to the Secretariat whether they wish to take a religious or a political oath.
iii. The Department holds three graduation ceremonies per year: one after the January exam period, one after the June exam period, and one after the September exam period.

European Credit Transfer and Accumulation System (ECTS)

The ECTS system does not regulate the content, structure, or equivalence of academic programs itself, as these are matters whose quality must be determined by the universities themselves during the drafting of study programs. The credits assigned to each course, internship, or undergraduate thesis express the workload required by each independent educational component to achieve the intended objectives, in relation to the total workload required to complete one academic year of full-time study. The workload required of each student during one academic year of full-time study is estimated at an average of 1500-1800 working hours and is equivalent to 60 ECTS credits.

Undergraduate / Diploma Thesis

A student may undertake their undergraduate thesis in the 8th semester, which can last from 3 to 6 months. Upon its completion, it is mandatory to write the thesis report as well as to conduct a public presentation, which is announced to all members of the Department. The grading of the thesis is performed by a three-member committee of Teaching Staff

(Professors, Lecturers, Laboratory Teaching Staff - EDIP) appointed by the supervisor. The undergraduate thesis may be written in the English language. In this case, an extensive summary in the Greek language must precede the English text. The undergraduate thesis is optional, corresponds to 30 credits (ECTS), and is equivalent to two special elective courses beyond the special electives that the student is required to choose.
All details regarding the undertaking of an Undergraduate Thesis in the Department of Physics are explicitly mentioned in the Undergraduate/Diploma Thesis Regulations.

Internship

Participation in the Internship program for students of the Department of Physics is optional, and they may participate only once during their studies. The Internship has been integrated into the "Free Electives" of the Study Guide for the Undergraduate Program (UP) of the Department of Physics. The total duration of the Internship for the Department of Physics is 2 consecutive months. To participate in the Internship program, students of the Department of Physics must have completed or be currently attending at least their 5th semester of studies.

All matters related to the Internship are mentioned in the Internship Regulations.

Internship Coordinator
Iakovos Fantidis, Associate Professor, ifantidi@physics.duth.gr

Pedagogical & Teaching Adequacy Program

The Department of Physics provides its students with the possibility of obtaining certified pedagogical and teaching adequacy. The Pedagogical and Teaching Adequacy Program includes a series of courses, the successful completion of which ensures the achievement of the objectives developed in Article 1 of the decision on Teaching Adequacy. Through this Program, students are trained in the use and application of the most innovative and creative teaching and learning methods and practices of the modern education system in the field of Natural Sciences.
Students of the Department who wish to obtain the Certificate of Pedagogical and Teaching Adequacy along with their degree must declare, attend, and successfully be examined in **six (6) courses** of the Department's Pedagogical and Teaching Adequacy Program. These courses correspond to **30 ECTS** out of the total 240 ECTS required for the degree.
The six (6) courses for obtaining the Certificate are the following and are distributed, according to Laws 3848/2010 and 4186/2013, into the following three thematic units:
Thematic Unit A: Education and Schooling Issues (UP Elective Courses)

- Semester 4: General Principles of Pedagogy (5 ECTS)
- Semester 6: Educational Psychology (5 ECTS)
- Semester 8: Psychology of Learning (5 ECTS)

Thematic Unit B: Learning and Teaching Issues (Mandatory and Elective)

- Semester 4: Didactics of Physics (4 ECTS)
- Semester 5: New Technologies in Education and Teaching of Online Science Courses (6 ECTS)

Thematic Unit C1: Special Didactics and Practicum

- Semester 7: Physics Microteaching (5 ECTS)

All relevant information is mentioned in the Pedagogical and Teaching Competence regulations.

Student Mobility

Mobility via the ERASMUS+ Program

The ERASMUS+ program offers students the opportunity to spend a period of their studies or carry out an internship in one of the 26 countries of the European Union (excluding Greece), as well as in Iceland, Liechtenstein, Norway, Serbia, North Macedonia, and Turkey, for a duration of 2 to 12 months. The Erasmus+ mobility period is recognized as part of the studies through the award of ECTS credits. All relevant information regarding the process is available in the Program Regulations, which are part of the DUTH Internal Regulations.

Selection of Students for Study Mobility via ERASMUS+

For the selection of undergraduate students who are to move for studies, the Department has established the following evaluation criteria.

Student Selection Criteria:

Prerequisite Qualifications :

No.	**Criterion**	**Description**	**YES / NO**
1	Successful examination in mandatory courses	The student must have successfully passed at least 18 out of the 24 total mandatory courses from the 1st, 2nd, 3rd, and 4th semesters.	
2	English language proficiency	The student must have proven knowledge of English at a minimum level of B2.	

Additional Merits / Weighted Qualifications:

No.	Criterion	Description	Units (Points)
1	Grade Point Average (GPA)	G.P.A. of successfully examined courses (up to the September exam period of the same academic year).	G.P.A. × 5
2	Previous mobility	Completion of a previous mobility period during the last two calls for expression of interest.	-20
3	English language level	Proven knowledge of English: • B2: 10 units • C1: 15 units • C2: 20 units.	Up to 20
4	Host country language level	Proven knowledge of the host country's language: • A1–A2: 5 units • B1–C2: 10 units.	Up to 10

5	Oral interview	In the presence of the Faculty Advisor and member(s) of the Department's Erasmus Committee.	Up to 20

Selection of Students for Internship Mobility via ERASMUS

Regarding the selection of students who will undertake an ERASMUS+ Internship, the selection criteria are defined in the DUTH ERASMUS+ Program Operating Regulations.
Obligations of Students Moving via ERASMUS+
Students moving within the framework of ERASMUS+ have the obligations set out in the DUTH Internal Regulations, the DUTH ERASMUS+ Program Operating Regulations, the Undergraduate Program (UP) Regulations, and the Regulations of the Host Institutions/Organizations.

Department Coordinator for the Erasmus+ Program
Panagiotis Kogias, Assistant Professor, kogias@physics.duth.gr

Internal Mobility

The internal mobility program enables students to spend a period of their studies at another Higher Education Institution (HEI) in Greece. Participation in the internal mobility program provides the possibility for the home Department to recognize the period of study completed in the study program of the host Department/Single-Department School.
Moving students who, during the period of their mobility, have been successfully evaluated in educational activities of the host Department's/Single-Department School's study program, may submit a request for the recognition of the corresponding educational activities (e.g., courses, seminars, laboratories). Applications for mobility are made centrally via a platform of the Ministry of Education, Religious Affairs, and Sports, while the implementation process is described in detail in the Internal Mobility Regulations, which constitute an Appendix to the DUTH Internal Regulations.

Other types of mobility programs

Undergraduate students may move through other mobility programs following a decision by the Department Assembly and based on the terms of each respective program.

Rights and obligations of undergraduate students

1. Undergraduate students are members of the DUTH academic community and enjoy the right to knowledge, freedom of research, and the free expression of ideas within the framework of academic freedom and academic ethics.
   Students of the "Undergraduate Program in Physics":
   a) Enjoy social and other benefits arising from student status in general and DUTH status specifically. Student status is acquired upon enrollment in the Department and is maintained until the degree is obtained. The student has the right to interrupt their studies in accordance with current legislation. During the suspension of studies, student status is revoked and is reacquired upon a new application by the interested party. Students also have the right to apply for part-time study. Specific regulatory provisions of the DUTH Internal Regulations (Annex 10) apply to exceptional cases of exceeding the maximum study duration, interruption

of studies, and part-time enrollment.
b) express their views freely on educational and other matters, within the framework of academic freedom and with respect for the rules of ethics of DUTH.
c) evaluate the work of Faculty members (Faculty) and all categories of educational and specialized staff, as well as the quality and effectiveness of the educational and other work, in accordance with the provisions of the law and the Regulations of the relevant Department and the Institution.
d) receive information from the Department regarding the Program of Studies, their educational obligations, and the rules and conditions for their uninterrupted studies.
e) cooperate with the teaching staff for their educational and examination needs, during the days and hours announced at the beginning of each semester.
f) submit applications to the administrative services of the relevant Department, School, or the Institution and receive timely and efficient service.
g) make use of the facilities, infrastructure, and means of DUTH, in accordance with the regulations of the Institution.
h) benefit from the social and other provisions arising from the status of a student in general and DUTH specifically.
i) submit reports and requests to the competent bodies of the Institution regarding matters related to their education.
j) are represented through their legally appointed representatives in the collective bodies and committees of the Institution and are informed about educational, research, and administrative matters of the Institution that concern them through their representatives.
k) are free to express themselves individually or collectively within the framework of student associations. Matters regarding the election of student association bodies, their meetings, the method of convening their bodies, and any other matter related to their organization and operation are defined in the student association's charter. The election of student association bodies may be conducted electronically, provided this is stipulated in the association's charter.
l) participate in paid activities of DUTH, under the terms and conditions defined by relevant legal provisions.
m) participate in international and European student exchange programs (such as Erasmus+ studies, Erasmus+ placement), according to the criteria and procedures defined by the competent body, the State Scholarships Foundation (IKY), and DUTH.
n) request, by filing a report to the Student Advocate, the investigation of cases regarding the perceived non-compliance with the provisions of the law or the Regulation, the Institution's Code of Ethics, Study Regulations, etc.
2. DUTH students have the following obligations and are required to:
a) respect fellow students, faculty members, and all staff of the Institution.
b) be informed regarding the Internal Regulations of DUTH and the specific operational regulations of the Institution that concern them; they must apply these with consistency and responsibility, acting in a lawful manner during the exercise of their student duties and events that is always compatible with the functioning of the Institution.
c) fulfill their student duties with diligence and responsibility, and specifically:
ca) stay updated on the curriculum they are following and the academic calendar, ensuring they understand and keep track of the educational process through the e-Class electronic platform, the official websites of the Departments, the School, and DUTH, as well as through official announcements.

cb) participate in educational activities appropriately and in accordance with their terms of conduct.
cc) contribute to the smooth and effective functioning of all educational activities by refraining from any action or behavior that could negatively impact their conduct.
cd) fulfill the duties they undertake within the framework of participating in educational activities.
ce) comply with the guidelines and recommendations provided by instructors or other competent bodies and services of the Institution.
cf) adhere to research ethics, particularly regarding the protection of intellectual property rights.
cg) participate in examinations orderly and in accordance with the Institution's regulations, refraining from any act or behavior that could obstruct or jeopardize their smooth conduct or lead to disqualification, such as copying or using inappropriate items, documents, or devices during the exam.
ch) participate in the evaluation processes of courses, structures, and services of the Institution by submitting their views in an objective, fair, and impartial manner, with the goal of improving the quality of studies.
d) uphold academic ethics and the principles of academic integrity.
e) respect and protect the University's facilities, surrounding areas, and equipment, and ensure the cleanliness and orderliness of its premises.
f) present their academic identity card (student ID) when requested by members of the teaching staff, administrative staff, or security personnel within the scope of the Institution's operations.
DUTH takes special care to ensure the exercise of rights for Students with Disabilities (SwD) and their equal integration into the University. Specifically, it ensures the implementation of measures that guarantee access to the Institution's premises, provides the necessary infrastructure and support, and ensures the required conditions for their unimpeded participation in the educational process and examinations. Matters regarding the education of students with disabilities and special educational needs or learning difficulties are regulated in accordance with current legislation and international best practices.
Students coming from other domestic Higher Education Institutions (HEIs) or equivalent foreign Institutions who enroll at DUTH as guest students have the same rights and obligations as DUTH students for the duration of their studies at the Institution. Article 185 of the DUTH Internal Regulations details the social and other benefits and opportunities available to students.

Plagiarism

Plagiarism is defined as the copying of another person's work, as well as the use of someone else's work—whether published or unpublished—without proper citation. **The inclusion of any source material in assignments without appropriate reference, including a student's own previous studies (self-plagiarism), is considered a serious academic offense.**
When submitting any assignment or an undergraduate thesis, students are required to declare whether they have utilized the work or ideas of others.
Regarding the detection of plagiarism, DUTH utilizes the Turnitin software program.

Academic Faculty Advisor

The Academic Faculty Advisor (AFA) is assigned to a student upon enrollment and remains the same until the completion of their studies. The AFA is a member of the teaching staff who guides and supports students throughout their academic journey. The AFA serves in a consultative role regarding the student's academic progress and is available for unscheduled meetings to provide assistance. Furthermore, the AFA can redirect students to specialists (such as the Center for Counseling and Psychological Support) in cases of personal problems affecting their studies. The AFA monitors the student's progress and encourages them to achieve their professional goals to the best of their ability.

Communication with the Academic Faculty Advisor

The AFA has access to the telephone numbers and institutional email addresses of the students they support to facilitate communication (whether in person, by phone, or online). Meetings between the AFA and students may be held individually or in groups. Students may also request private meetings with their Advisor. The content of these discussions is confidential, and the student's personal data is protected by the AFA. The Advisor is granted access to the student's personal academic records (e.g., detailed transcripts) only after written consent is provided. Discussions with the AFA are purely advisory and in no way binding. Decisions made by students regarding their academic path or any specific academic issues they face remain exclusively their own choice.

Full details can be found in the **Academic Advisor Regulations**, which constitute an Appendix to the DUTH Internal Regulations.

Performance Awards for Undergraduate Students

DUTH grants annual performance awards to the undergraduate student of each School who, during the previous academic year, met the following criteria:

a) Successfully completed all courses of the previous academic year as prescribed by the Department's indicative curriculum (all three examination periods—January, June, and September—of the year under consideration are taken into account).

b) Achieved the highest grade point average (GPA) across all courses (including the undergraduate or diploma thesis), calculated as a simple average without the use of weighting factors.

The award consists of a special diploma presented during a ceremony held on the feast day of the Three Hierarchs. The names of the award-winning students are published on the official websites of the School, the Department, and the University.

The following are not eligible for a performance award:

a) Students who have not successfully passed all courses prescribed by the indicative curriculum for the academic year under consideration.

b) Students who have exceeded the normal duration of studies (n years).

c) Students who have been admitted via qualifying examinations (entry exams for graduates).

All matters regarding these awards are detailed in the relevant Regulations, which constitute an Appendix to the DUTH Internal Regulations.

PART III

SERVICES & SUPPORT STRUCTURES

Catering

Student restaurants operate in all cities where DUTH is based, providing breakfast, lunch, and dinner. These facilities operate daily, including weekends and public holidays, from September 1st to June 30th of each academic year, except for the Christmas and Easter holidays as defined in the academic calendar.

Applications for free catering are submitted exclusively online through the dedicated information system of the Electronic Student Services System during the periods announced by the Directorate of Academic Affairs. The relevant costs are fully covered by the regular budget of DUTH. Further information can be found in the Detailed Catering Application Guide.

Contact Information:

- **Email:** tfm@kav.duth.gr
- **Tel:** +30 25120 462363, -62, -61
- Details regarding the competent Department can be found at the following link: https://duth.gr/duth-life/sitisi-stegasi/

Housing Allowance

In accordance with current legislation, undergraduate students of Higher Education Institutions and Higher Ecclesiastical Academies who are Greek citizens or citizens of other European Union countries are granted an annual housing allowance. This is subject to the terms and conditions specified in the relevant Joint Ministerial Decisions.

Applications for the housing allowance must be submitted within a designated deadline, typically from **June 1st to June 30th** of each year, unless otherwise specified by a circular from the Ministry of Education, Religious Affairs, and Sports. Applications are submitted via an **Electronic Application,** which provides a detailed description of the terms, conditions, and the submission process.

Contact Information:

- **Email:** tfm@kav.duth.gr
- **Tel:** +30 25120 462363, -62, -61
- Details regarding the competent Department can be found at the following link: https://duth.gr/duth-life/sitisi-stegasi/

Housing

DUTH provides free housing for a specific number of students in each city where it operates. In Alexandroupoli, where there is no permanent student dormitory, the University leases rooms in hotels and apartment complexes through a public tender process.

Applications for free housing are submitted exclusively online via the dedicated information system during the periods announced by the Directorate of Academic Affairs. Detailed information regarding the housing process and conditions can be found in the relevant Regulations in Annex 21, which are part of the DUTH Internal Regulations (Government Gazette 4751/B/20-08-2024).

Contact Information:

- **Email:** tfm@kav.duth.gr
- **Tel:** +30 25120 462363, -62, -61
- Department details are available at: https://duth.gr/duth-life/sitisi-stegasi/

Travel Facilitation

Students are entitled to a discount on tickets for their travel within Alexandroupoli and throughout the country by bus or train. During travel, students are required to present their academic identity card (student ID).

Career and Liaison Office

The Career and Liaison Office of DUTH was established in 1997 within the framework of the Operational Program for Education and Initial Vocational Training. It serves as an information hub for students and graduates, aiming to act as a bridge between the University and the professional community.

The Employment and Career Structure (DASTA) of DUTH was established under the Operational Program for Education and Lifelong Learning of the National Strategic Reference Framework (NSRF) and is operated by the Institution itself. DASTA is responsible for coordinating and implementing the actions of the Liaison Office and the Innovation and Entrepreneurship Unit. Its purpose is to provide stakeholders with the necessary tools for their personal and professional development.

Information:

- **Tel:** +30 25410 79115, +30 25510 30022
- **Email:** career@duth.gr

Library and Information Center (LIC-DUTH)

The Library of the School of Science is located at the Kavala Campus (Library Building).

All members of the University Community have borrowing rights. Books can be borrowed for a period of two weeks. Additionally, the Library is equipped with a photocopying machine, and photocopies are provided free of charge for a limited number of pages of library material.

Further information regarding the organization and operation of the LIC-DUTH can be found in the **Library and Information Center Operating** which constitute an Appendix to the DUTH Internal Regulations.

Librarian in Charge Sultana Dalakou, Administrative Staff, sdalakou@admin.duth.gr

Center for Psychological and Counseling Support (KEPSYSY-DUTH)

The Center for Psychological and Counseling provides psychological and counseling services aimed at the prevention of mental health issues among members of the university community, particularly for students of undergraduate, postgraduate, and doctoral programs.

The Center is staffed by psychologists and social workers. Its headquarters are in Komotini, but it also maintains an office in Alexandroupoli. Its operations are coordinated by a scientific committee consisting of five faculty members specializing in psychiatry, psychology, and social work. Personal data collected and processed by the Center are strictly limited to those necessary for the specific, clearly defined purpose and the respective legal basis.

Center for Psychological and Counseling Support

The Center for Psychological and Counseling Support (KEPSYSY-DUTH) provides psychological and counseling support to prevent mental health problems among members of the university community, in particular for students of the first, second, and third cycles of study programs. Psychologists and social workers staff KEPSYSY-DUTH; it is based in Komotini but also maintains an office in Alexandroupolis. Its operation is coordinated by a scientific committee consisting of five TRS members specializing in psychiatry, psychology, and social workers. The personal data collected and processed by KEPSYSY-DUTH are only those that are necessary for the specific and clearly defined purpose and the specific legal basis.

In this context, the processing that takes place concerns the personal data provided by those served at KEPSYSY-DUTH, by completing an application or registering, such as:

- Identity Data
- Contact Data
- Health Data

In all cases where consent is required, the KEPSYSY-DUTH follows the procedures provided by the Law for obtaining it. The right to withdraw consent is reserved at any time. Your personal data is collected in accordance with the GRPD and applicable national legislation, either at the start of your relationship with KEPSYSY-DUTH or later, and is processed on a legal basis:

- Consent, when the students come for support to KEPSYSY-DUTH.
- The fulfilment of duty for public interest and execution of legal obligation.

Those interested students can be addressed to:

Communication

e-mail: kepsysy@duth.gr

Equal Access Unit

The Equal Access Unit of DUTH (MIP-DUTH) is aimed at students with disabilities and/or other special educational needs, offering targeted services for improving accessibility to the educational process, strengthening skills for personal development, personalized academic support, and strengthening equal participation in all activities and actions of the University and wider community.

Objectives of MIP-DUTH:

- Ensuring equal access for students with different abilities and requirements to academic studies.
- Equal, unrestricted participation in the life of the University Community and in the individual activities that take place within the framework of their studies.

Vision of MIP-DPTH:

- Creating an inclusive academic environment

Services provided by qualified staff

- **Psychosocial Guidance**: Provision of counseling support by specialized psychologists and social workers.
- **Transportation/Moving Service**: Ensuring free movement of students with mobility and other problems from their residences to the University.

- **Digital Accessibility**: Technical support and software that convert educational materials into accessible forms, such as DAISY and EPUB.
- **Support in the Educational Process**: Measures and practices aimed at facilitating the participation of all students, regardless of disabilities or learning difficulties
- **Accessible books** / **Assistive Technologies**: Providing e-books, screen readers, magnifiers, and text-to-speech software.
- **Education/Training**: Educational seminars for students about equal access practices, events to raise awareness among students.

  MIP-DUTH is addressed to every undergraduate and master's degree students with Disabilities and with Special Educational Needs in DUTH, and its services are offered **free.**

Communication:

Tel: +30 25310 39050

email: mip@duth.gr

Student Advocate

The institution of the Student Advocate started at DUTH in 2019 with the aim:

- the mediation between students and professors or the administrative services of the Foundation.
- maintaining legality within the framework of academic freedom.
- addressing instances of maladministration.
- ensuring the proper operation of the Foundation.

  The Student's Advocate, who heads the office of the same name without remuneration, may be a professor or Emeritus professor of the Democritus University of Thrace and is appointed by the Senate, following a proposal by the Rector and the opinion of the Student Welfare Council.

Responsibilities

- Investigates cases, either on its own initiative or following a student's report, and mediates with the competent authorities of the Institution for their resolution.
- He may request from the Foundation's services any information, document, or other evidence relating to the case, interrogate persons, perform an autopsy, and call for expert opinions.
- If he concludes that in a specific case legality has not been followed, that there are instances of maladministration, or that the proper functioning of the Institution has been disrupted, he shall draw up a report which it shall communicate to the professor concerned or the competent administrative department and the student who submitted the report, and shall mediate in any appropriate manner to resolve the problem.
- He may, by his own decision, close a case that is deemed to be manifestly vague, unfounded, or unsubstantiated, while if he considers that there is evidence of a disciplinary offense, he shall refer the case to the competent disciplinary body.
- Provides information to the institution's staff and students about the operation, responsibilities, and mission of the Student Advocate.
- Plans and coordinates training activities for students and staff of the institution, in collaboration with other units of the institution, as well as with external organizations, in

particular with the Ombudsman and the Student Advocate of other universities in Greece and abroad.

- Participates in the formulation of internal policies and the development of tools to enhance integrity and transparency, and cooperates with the competent bodies of the DUTH in drafting the Code of Conduct of the DUTH, the Regulations for the Management of Conflicts of Interest, and protocols for dealing with incidents of fraud and corruption.
- Informs and collaborates with the institution's governing bodies, the Ethics Committee, the Internal Audit Unit, the institution's Integrity Advisor, and the organizational unit responsible for administrative support and human resources issues, for the development and implementation of integrity policies and standards within the institution.

The student's advocate has no authority in matters of exams and students' grades.

The findings of the student's Advocate, as well as a report on his annual activities, are published on the Foundation's website, subject to the provisions of article 130 par.4 , of Law 4957/2022.

The interested students can submit their requests:

- by email at: synigoros@duth.gr
- in person or by post (surname or anonymous) to the address: Democritus University of Thrace, Office of the Student Advocate, Administration Building (Rectorate), Campus, 69100 Komotini.

Student Advocate

Marika Giune, Professor of the Law Department of the School of Law of DUTH.

Gender Equality and Anti-Discrimination Commission

The Committee has nine members and consists of six (6) faculty members, one (1) member of the EEP, EDIP or ETEP, one (1) member of the administrative staff and one (1) student/three.

The Committee for Gender Equality and Anti-Discrimination of the Democritus University of Thrace (EIFKD-DUTH) is an advisory body to the University and its administrative bodies. The Committee's mission is to promote gender equality and combat discrimination based on gender, racial or ethnic origin, religion or beliefs, health/disability status, age, or sexual orientation at all levels of operation and in all procedures and activities of academic life. The Committee contributes to the prevention and combating of all forms of discrimination and to the prevention and combating of sexism, sexual harassment, and all forms of harassing behavior within the institution.

The Committee has nine members and consists of six (6) faculty members, one (1) member of SSS, LTS, or STS, one (1) member of the Administrative Staff, and one (1) student.

The EIFKD-DUTH has the following responsibilities:

a) prepares and revises action plans for the promotion and assurance of substantive equality and the fight against discrimination in the educational, research and administrative procedures of the Foundation, which are approved by the Senate and prepares an annual report which it submits to the Senate and the Board of Directors,

b) recommends to the competent bodies measures to promote equality and combat discrimination, to deal with sexual harassment and any kind of harassing behavior,

c) monitors and evaluates the course of implementation of the above measures and their results, and recommends their modification, revision, or addition of them,

d) provides information and training to the members of the academic community in matters of its competence,

e) promotes the development of study programs and the organization of seminars and lectures focusing on issues within its remit,

f) promotes the preparation of studies and research on issues related to its competence,

g) records reports and complaints about incidents of discriminatory and sexual or gender-based harassment and forwards them to the competent bodies, in accordance with the University's Internal Regulations and the applicable legislative provisions,

h) assists victims of discrimination, sexual harassment, and harassing behavior when reporting discrimination or harassment.

The students of DUTH also have the right to report incidents of negative discrimination to the Gender Equality and Anti-Discrimination Committee. A report can be filed either by the alleged victim himself, or by a person/s who have witnessed incidents of negative discrimination. Reports are either named or anonymous.

Communication with the Equality Commission at e-mail: genderequality@duth.gr

Submission of Complaints and Appeals

To ensure, through an appropriate management mechanism, the improvement of the quality of services provided by the Academic Departments of Democritus University of Thrace to all students, procedures have been established that provide reliable, systematic, continuously improving, and impartial recording and addressing of any problems encountered by students during their studies. For this reason, students are given the right to submit complaints or appeals regarding any problems or in relation to the services provided. The complaints and appeals management policy applies to the entire active student population of the three cycles of study of the Institution's Academic Departments. Students are required, before submitting their complaint or objection, to study the Guides and the general and specific Study Regulations of the Study Programs in which they are enrolled, as well as the general Operating Regulations of the Institution, to be aware of their rights and obligations. The Regulation for the Management of Complaints and Appeals (RFMOCA) aims to ensure, through an appropriate management mechanism, the quality of services provided by the Academic Departments of the Democritus University of Thrace to all students participating in its Study Programs. RFMOCA establishes and defines procedures that provide reliable, systematic, continuously improved, and impartial recording and handling of malfunctions encountered by students during their studies.

Students at the Democritus University of Thrace may also use the following means and methods to submit complaints:

Questionnaires: Use of questionnaires compiled by MODIP-DUTH, which anonymously evaluate:

a) the educational process

b) food and accommodation services

c) digital services

d) available infrastructure

e) administrative procedures provided.

Student Ombudsman: Operating Regulations of the Student Ombudsman, **Student Ombudsman**: The Operating Regulations of the Student Ombudsman, which are included in the Internal Regulations of the Institution, detail his responsibilities and describe the procedure for submitting complaints and appeals that fall within his remit.

Gender Equality and Anti-Discrimination Committee: The Foundation's Internal Regulations set out in detail the responsibilities of the Gender Equality and Anti-Discrimination Committee and describe the procedure for submitting complaints and appeals that fall within its remit.

Ethics Committee: Code of Ethics and Good Practice **Ethics Committee :** The Code of Ethics and Good Practice, included in the Foundation's Internal Regulations, sets out in detail the responsibilities of the Ethics Committee and describes the procedure for submitting complaints and appeals that fall within its remit.

Other services

Philological editing of texts

The electronic platform Philologus provides language correction and philological editing to texts written in the Greek language by members of the University Community of DUTH.

Technical Support

The Computerization Department operates a University Technical Support Service (helpdesk) to provide assistance with requests/problems relating to the services it supports. The Technical Support Service (helpdesk) receives and forwards requests regarding the services provided for processing. At the same time, it monitors and provides updates on the progress of resolving any reported problems.

The service handles requests or issues related to:

- electronic secretarial services
- electronic protocol service
- services through collaborating agencies (Eudoxus, Academic Identity, etc.)
- use of applications installed on the service computers of administrative staff
- preparation of technical specifications
- issuance and use of digital certificates

Applications can be submitted via the helpdesk.duth.gr platform or by telephone.

Useful Links

Members of the academic community of the Democritus University of Thrace can access the following software:

MATLAB is an environment that offers capabilities for numerical calculations, data analysis, graphical representations, algorithm development, simulation, and system modeling in combination with a high-level programming language.

ArcGIS is a comprehensive collection of software products for Geographic Information Systems (GIS). It is used in a wide variety of applications, including design, analysis,

management, and recording of geographic systems, environmental management, land records management, land planning, vehicle tracking, and more.

IBM® SPSS® Statistics is a powerful statistical software platform. It provides a powerful set of functions that allows the extraction of active information from data.

The Microsoft 365 Education is a powerful program to which various services that can be utilized by academic communities are added/removed. For instance, it offers Windows 10/Windows 11 operating systems, 1 TB of available storage space through OneDrive for Business, Office 365 applications (Word, Excel, PowerPoint, OneNote, etc.), MS Teams, and other applications.

The Microsoft Azure Dev Tools provides members of the university community with free Microsoft® software for educational purposes.

Useful Documents

- Internal Regulations of the Democritus University of Thrace - with all Annexes
- Undergraduate Studies Regulations
- Educational Visits Regulations
- Examination Regulations
- Internship Regulations
- Internal Regulations for the Operation of the Erasmus Program
- Regulation of procedures and issues related to exceeding the maximum duration of study
- Regulations for Internal Student Mobility
- Regulations for Academic Advisors
- Regulations for the operation of the Student Ombudsman
- Regulations for student residences
- Regulations for student achievement awards
- Regulations for the Management of Complaints and Appeals
- Code of Conduct for Good Practice
- Study Regulations
- Department Internship Regulations

PART IV

STUDY PROGRAM

Summary of the UNDERGRADUATE STUDY PROGRAM (USP)

Elective courses are highlighted in gray.

For students admitted in 2024 and 2025, who are in their first and second years, the information is based on the new USP.

For the 3rd and 4th years, the information is based on the old USP, with the new USP, which applies to students admitted from 2024 onwards, shown in parentheses.

1st Year							
First semester	**THEORETICAL PART (hours**	**LABORATORY (hours)**	**TUTORIAL (hours)**	**LABORATORIES / TUTORIALS / CLINICALS (Total hours)**	**TEACHING HOURS (Total)**	**TEACHING UNITS (TU)**	**ECTSUNITS**
General Physics I	5	0	0	0	5	5	8
Differential Calculus I	5	0	0	0	5	5	6
Vector Calculus - Algebra	5	0	0	0	5	5	6
Computer Science Laboratory for Physicists	0	5	0	5	5	2	5
Chemistry	4	0	0	0	4	4	5
TOTAL FOR THE SEMESTER	**17**	**5**	**0**	**4**	**24**	**21**	**30**

Secont semester	THEORETICAL PART (hours)	LABORATORY (hours)	TUTORIAL (hours)	LABORATORIES / TUTORIALS/ CLINICALS (Total hours)	TEACHING HOURS (Total)	TEACHING UNITS (TU)	ECTSUNITS
General Physics II	5	0	0	0	5	5	8
Differential Calculus II	4	0	0	0	4	4	5
General Physics Laboratory	0	4	0	4	4	2	5
Algorithms and computer programming	4	0	0	0	4	4	6
Transformations and Fourier Analysis	4	0	0	0	4	4	6
TOTAL FOR THE SEMESTER	**18**	**4**	**20**	**4**	**21**	**19**	**30**

2nd Year							
Third semester	**THEORETICAL PART (hours)**	**LABORATORY (hours)**	**TUTORIAL (hours)**	**LABORATORIES / TUTORIALS/ CLINICALS (Total hours)**	**TEACHING HOURS (Total)**	**TEACHING UNITS (TU)**	**ECTSUNITS**

Differential Equations	5	0	0	0	5	5	8
Electromagnetism I	5	0	0	0	5	5	6
Thermodynamics	4	0	0	0	4	4	6
Atomic Molecular Physics	4	0	0	0	4	4	5
Mathematical Methods in Physics	4	0	0	0	4	4	5
TOTAL FOR THE SEMESTER	**22**	**0**	**0**	**0**	**22**	**322**	**30**

Fourth semester	**THEORETICAL PART (hours)**	**LABORATORY (hours)**	**TUTORIAL (hours)**	**LABORATORIES / TUTORIALS/ CLINICALS (Total hours)**	**TEACHING HOURS (Total)**	**TEACHING UNITS (TU)**	**ECTSUNITS**
Electrical Circuit Laboratories	0	4	0	4	4	2	4
Wave - Optics	4	0	0	0	4	4	5
Electromagnetism II	4	0	0	0	4	4	5
Electronics	4	0	0	0	4	4	4
Environmental Physics	4	0	0	0	4	3	3
Physics Teaching	3	0	0	0	3	3	4 ECTS (In the old USP), they do not count towards the total ECTS

General Principles of Pedagogy	3	0	0	0	3	3	5
History and Evolution of Ideas in Physics	3	0	0	0	3	3	4 ECTS (In the old USP), they do not count towards the total.
Research Methodology	3	0	0	0	3	3	4
Foreign Language (ENGLISH / FRENCH)	3	0	0	0	3	3	4
TOTAL FOR THE SEMESTER	**22**	**4**	**0**	**4**	**26**	**23**	**30**

3rd Year

Fifth semester	**THEORETICAL PART (hours)**	**LABORATORY (hours)**	**TUTORIAL (hours)**	**LABORATORIES / TUTORIALS / CLINICALS (Total hours)**	**TEACHING HOURS (Total)**	**TEACHING UNITS (TU)**	**ECTSUNITS**
Theoretical Mechanics I	3 (4)	0	0	0	3 (4)	3 (4)	5
Laboratory of Electronics	0	3	0	3	3	2	4
Optics Laboratory	0	3	0	3	3	2	4

Quantum Mechanics I	4	0	0	0	4	3	5
Solid State Physics	4	0	0	0	4	3	6
Basic Telemetry Applications	3	0	0	0	3	3	3
New Technologies in Education and Teaching Online Courses in Physical Sciences	(4)	(1)	0	(1)	(5)	(5)	(6)
Philosophy and Physics	3	0	0	0	3	3	3
TOTAL FOR THE SEMESTER	**14 (16)**	**6**	**0**	**6**	**20 (22)**	**19 (21)**	**30 (30)**

Sixth semester	**THEORETICAL PART (hours)**	**LABORATORY (hours)**	**TUTORIAL (hours)**	**LABORATORIES / TUTORIALS / CLINICALS (Total hours)**	**TEACHING HOURS (Total)**	**TEACHING UNITS (TU)**	**ECTSUNITS**
Nuclear Physics	4	0	0	0	4	4	6 (5)
Physics of	4 (0)	0	0	0	4 (0)	4 (0)	6 (0)

Economics							
Materials Science and Technology	4	0	0	0	4	4	6 (5)
Statistical Physics	4	0	0	0	4	4	6 (5)
Theoretical Mechanics II – Relativity (Theoretical Mechanics II)	4	0	0	0	4	4	6 (5)
Educational Psychology	3 (4)	0	0	0	3 (4)	3 (4)	6 (5) (4 ECTS (In the old USP), they do not count towards the total.ECTS
Complexity and Data Analysis	(4)	0	0	0	(4)	(4)	(5)
Foreign Language	(4)	0	0	0	(4)	(4)	(5)
TOTAL FOR THE SEMESTER	**23 (24)**	**0**	**0**	**0**	**23 (24)**	**23 (24)**	**30 (30)**

4th Year							
Seventh semester	**THEORETICAL PART (hours)**	**LABORATORY (hours)**	**TUTORIAL (hours)**	**LABORATORIES / TUTORIALS/ CLINICALS (Total hours)**	**TEACHING HOURS (Total)**	**TEACHING UNITS (TU)**	**ECTSUNITS**
Astronomy - Astrophysics	4	0	0	0	4	7.0	7 (5)
Atomic-Nuclear Physics Laboratory	0	4	0	0	4	5.0	5
Quantum Mechanics II	3	0	0	0	3	6	6 (5)
Electronic Circuits	3 (4)	0	0	0	3 (4)	3 (4)	6 (5)
Nanomaterials and Applications	3 (0)	0	0	0	3 (0)	3 (0)	6 (0)
Materials Characterization	3 (4)	0	0	0	3 (4)	3 (4)	6 (5)
Physics and Technology of Thin Films	3 (4)	0	0	0	3 (4)	3 (4)	6 (5)
Nonlinear Circuits and Systems	3 (0)	0	0	0	3 (0)	3 (4)	6 (5)
Nonlinear Dynamics – Chaos Theory	3 (4)	0	0	0	3 (4)	3 (4)	6 (5)

Introduction to Neural Networks	3 (4)	0	0	0	3 (4)	3 (4)	6 (5)
Computational Physics and Applications	3 (4)	0	0	0	3 (4)	3 (4)	6 (5)
Network and Graph Theory	3 (4)	0	0	0	3 (4)	3 (4)	6 (5)
Renewable Energy Sources	3 (4)	0	0	0	3 (4)	3 (4)	6 (5)
Nuclear Technology	3 (4)	0	0	0	3 (4)	3 (4)	6 (5)
Energy Systems Modeling	3 (0)	0	0	0	3 (0)	3 (0)	6 (0)
Applied Physics	3 (4)	0	0	0	3 (4)	3 (4)	6 (5)
Particle Physics	3 (4)	0	0	0	3 (4)	3 (4)	6 (5)
Biomechanics	3 (4)	0	0	0	3 (4)	3 (4)	6 (5)
Relativity	4	0	0	0	4	4	5
Metrology and Measurement Systems	3	0	0	0	4	4	5
Practical training and/or Microteaching in Physics (5 ECTS)	4	0	0	0	4	4	5
TOTAL FOR THE SEMESTER		**0**	**0**	**0**			**30 (30)**

8th semester	THEORETICAL PART (hours)	LABORATORY (hours)	TUTORIAL (hours)	LABORATORIES / TUTORIALS/ CLINICALS (Total hours)	TEACHING HOURS (Total)	TEACHING UNITS (TU)	ECTSUNITS
Degree Thesis							12(15)
Nanoelectronics	3 (4)	0	0	0	3	3 (4)	6 (5)
Design of New Materials and Devices	3 (4)	0	0	0	3	3 (4)	6 (5)
Special Topics in Optics	3 (4)	0	0	0	3	3 (4)	6 (5)
Electronic Circuits and Digital Systems Laboratory	0	3	0	0	3 (4)	3 (4)	6 (5)
Digital Circuits and Systems	3 (4)	0	0	0	3 (4)	3 (4)	6 (5)
Chaotic Systems Evaluation	3 (4)	0	0	0	3 (4)	3 (4)	6 (5)
Data Analysis	3 (4)	0	0	0	3 (4)	3 (4)	6 (5)
Advanced Programming Languages	4 (2)	0 (2)	0	0 (2)	4 (4)	3 (4)	6 (5)
Quantum Information Theory	3 (4)	0	0	0	3 (4)	3 (4)	6 (5)
Telecommunications Systems	3 (4)	0	0	0	3 (4)	3 (4)	6 (5)
Physics of the Atmosphere	3 (4)	0	0	0	3 (4)	3 (4)	6 (5)
Medical Physics	3 (4)	0	0	0	3 (4)	3 (4)	6 (5)

Applications of Radiation, Dosimetry, and Radiation Protection	3 (0)	0	0	0	3 (0)	3 (0)	6 (0)
Meteorology	3 (4)	0	0	0	3 (4)	3 (4)	6 (5)
Energy Production	3 (4)	0	0	0	3 (4)	3 (4)	6 (5)
Psychology of Learning	(4)	0	0	0	(4)	(4)	(5)
TOTAL FOR THE SEMESTER		**3**	**0**	**3**			**30 (30)**

Note: The thesis corresponds to two (2 x 6 = 12 ECTS) courses in the old **USP** and three (3 x 5 = 15 ECTS) courses in the new **USP**.

COURSE OUTLINE

1. GENERAL

SCHOOL			
DEPARTMENT	DEPARTMENT OF PHYSICS		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE	Y101-2023	**SEMESTER**	1st Semester
COURSE TITLE	Physics I		

TEACHING ACTIVITIES If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
	5	8.0

COURSETYPE Background, General Knowledge, Scientific Area, Skill Development	General Knowledge
PREREQUISITES	
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS166/

2. LEARNING OUTCOMES

Learning Outcomes
Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

The course includes the material of mechanics, oscillations and mechanical waves, at a level higher than the level of secondary education. The study is based on infinite calculus and simple differential equations. Emphasis is placed on understanding the principles and physical laws of a) Mechanics of material point and solid body b) Harmonic oscillator and Mechanical waves.
Upon successful completion of the course, the student will have acquired:
• Ability to demonstrate in-depth knowledge and understanding of key concepts, principles and laws related to Point Material Mechanics, Solid State Mechanics, Harmonic Oscillator and Mechanical Waves.
• Ability to apply this knowledge in solving related complex problems.
• Critical thinking ability to be able to evaluate, analyze and relate this knowledge.
• Ability to interpret phenomena of everyday life.
• Ability to develop cooperation with other fellow students to solve problems related to this course.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use,Adaptation to new situations,
Decision making,
Autonomous work,
Teamwork,
Working in an international environment,
Working in an interdisciplinary environment, Production of new research ideas
Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking
Promoting free, creative and inductive reasoning

Search, analysis and synthesis of data and information, ICT Use
Autonomous work
Critical thinking
Promoting free, creative and inductive reasoning

3. COURSE CONTENT

Introductory concepts Systems of Units. Dimensional analysis. Vectors Kinematics. Dynamics. Reference systems. Energy. Momentum. Angular Momentum or Rotation Dynamics of Solids. Harmonic Oscillator. Mechanical waves.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD
Face to face, Distance learning, etc.

Face to face

USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT)
Use of ICT in Teaching, in Laboratory Education, in Communication with students

Use of ICT in Teaching
Use of ICT in Communication with students

TEACHING ORGANIZATION
The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research& analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.

The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards

Activity	Workload/semester
Lectures	125
Tutoring	75
Total	**200**

STUDENT EVALUATION
Description of the evaluation process

Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a

Student evaluation languages
Greek

Method (Formative or Concluding)
Formative

Student evaluation methods	Rate
Written Exam with Problem Solving	90
Written Assignment	10

patient, Artistic interpretation, Other/Others Please indicate all relevant information about the course assessment and how students are informed	

5. Suggested Bibliography

? ΦΥΣΙΚΗ ΓΙΑ ΕΠΙΣΤΗΜΟΝΕΣ ΚΑΙ ΜΗΧΑΝΙΚΟΥΣ ΤΟΜΟΣ Α’, Giancoli C. Douglas. Εκδόσεις Τζιόλα
? Serway/Jewett: "ΦΥΣΙΚΗ ΓΙΑ ΕΠΙΣΤΗΜΟΝΕΣ ΚΑΙ ΜΗΧΑΝΙΚΟΥΣ" Μηχανική -Ταλαντώσεις και Μηχανικά Κύματα- Θερμοδυναμική- Σχετικότητα Εκδόσεις Κλειδάριθμος.
? Halliday, Resnick, Krane: "ΦΥΣΙΚΗ" Τόμος 1, Εκδόσεις Α.Γ. Πνευματικός

Eudoxus

? ΦΥΣΙΚΗ ΓΙΑ ΕΠΙΣΤΗΜΟΝΕΣ ΚΑΙ ΜΗΧΑΝΙΚΟΥΣ ΤΟΜΟΣ Α’, Giancoli C. Douglas. Εκδόσεις Τζιόλα
? Serway/Jewett: "ΦΥΣΙΚΗ ΓΙΑ ΕΠΙΣΤΗΜΟΝΕΣ ΚΑΙ ΜΗΧΑΝΙΚΟΥΣ" Μηχανική -Ταλαντώσεις και Μηχανικά Κύματα- Θερμοδυναμική- Σχετικότητα Εκδόσεις Κλειδάριθμος.
? Halliday, Resnick, Krane: "ΦΥΣΙΚΗ" Τόμος 1, Εκδόσεις Α.Γ. Πνευματικός

COURSE OUTLINE

1. GENERAL

SCHOOL			
DEPARTMENT	DEPARTMENT OF PHYSICS UNDEGRADUATE STUDY PROGRAM: PHYSICS		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE	Y102-2023	**SEMESTER**	1st Semester
COURSE TITLE	Calculus I		

TEACHING ACTIVITIES If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
	4	6.0

COURSETYPE Background, General Knowledge, Scientific Area, Skill Development	Background
PREREQUISITES	None
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS168/

2. LEARNING OUTCOMES

Learning Outcomes
Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

The course covers the following general topics:
- Functions
- Limits
- Derivatives - Applications of derivatives
- Some derivatives - applications
- Integrals
- Integration techniques
- Multiple integrals (simple reference)
- Sequences – Series
- Taylor–Maclaurin series

and general applications of these to physics problems, in order for the student to build the required mathematical background for the next semesters of studies.

General Skills	
Name the desirable general skills upon successful completion of the module	
Search, analysis and synthesis of data and information, ICT Use,Adaptation to new situations, Decision making, Autonomous work, Teamwork, Working in an international environment, Working in an interdisciplinary environment, Production of new research ideas	Project design and management Equity and Inclusion Respect for the natural environment Sustainability Demonstration of social, professional and moral responsibility and sensitivity to gender issues Critical thinking Promoting free, creative and inductive reasoning
Decision making Autonomous work Promoting free, creative and inductive reasoning	

3. COURSE CONTENT

Functions
Limits
Derivatives - Applications of derivatives
Some derivatives - applications
Integrals
Integration techniques
Multiple integrals (simple reference)
Sequences – Series
Taylor–Maclaurin series

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD Face to face, Distance learning, etc.	Face to face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) Use of ICT in Teaching, in Laboratory Education, in Communication with students	Use of ICT in Teaching Use of ICT in Communication with students
TEACHING ORGANIZATION The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research& analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc. The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards	

Activity	Workload/semester
Lectures	52
Writing project	30
Bibliographic research & analysis	70
Tutoring	26
Total	**178**

STUDENT EVALUATION Description of the evaluation process Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others Please indicate all relevant information about the course assessment and how students are informed	**Student evaluation languages** Greek **Method (Formative or Concluding)** Formative **Student evaluation methods** — **Rate** Written Exam with Problem Solving — 60 Written Assignment — 40

5. Suggested Bibliography

THOMAS ΑΠΕΙΡΟΣΤΙΚΟΣ ΛΟΓΙΣΜΟΣ, [George B. Thomas], Jr., Joel Hass, Christopher Heil, Maurice D. Weir
Απειροστικός και Διανυσματικός Λογισμός, Adams R.A., Essex C.
Ανώτερα Μαθηματικά, 3η Έκδοση, Wrede Robert C.,Spiegel Murray R.
Λογισμός συναρτήσεων μιας μεταβλητής με στοιχεία διανυσματικής και γραμμικής άλγεβρας, ΤΕΡΖΙΔΗΣ ΧΑΡΑΛΑΜΠΟΣ
Ανώτερα Μαθηματικά, ΜΩΥΣΙΑΔΗΣ ΧΡΟΝΗΣ

Eudoxus

THOMAS ΑΠΕΙΡΟΣΤΙΚΟΣ ΛΟΓΙΣΜΟΣ, [George B. Thomas], Jr., Joel Hass, Christopher Heil, Maurice D. Weir
Απειροστικός και Διανυσματικός Λογισμός, Adams R.A., Essex C.
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Ανώτερα Μαθηματικά, ΜΩΥΣΙΑΔΗΣ ΧΡΟΝΗΣ

COURSE OUTLINE

1. GENERAL

SCHOOL	OF SCIENCES		
DEPARTMENT	OF PHYSICS		
LEVEL OF STUDIES	Level 6		
COURSE CODE		**SEMESTER**	2ο
COURSE TITLE	Vector Calculus – Linear Algebra		

TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
LECTURES	5	6
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	Scientific Area
PREREQUISITES:	-
TEACHING & EXAMINATION LANGUAGE:	GREEK
COURSE OFFERED TO ERASMUS STUDENTS:	YES
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS224/

2. LEARNING OUTCOMES

Learning Outcomes

Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

This course aims to introduce students to vector analysis, the fundamental elements of analytic geometry, and linear algebra.

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

- Perform basic vector algebra operations.
- Understand the gradient of a scalar field, as well as the divergence and curl of a vector field, and be able to compute these quantities.
- Understand the concepts of vector calculus and apply them to compute particle motion and rotation.
- Solve systems of first-degree linear equations.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use
Adaptation to new situations
Decision making
Autonomous work
Teamwork
Working in an international environment
Working in an interdisciplinary environment
Production of new research ideas
Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking
Promoting free, creative and inductive reasoning

- *Search for, analysis and synthesis of data and information, with the use of the necessary technology*
- *Decision-making*
- *Working independently*
- *Working in an international environment*
- *Production of new research ideas*

3. COURSE CONTENT

Basic vector algebra. Matrices, determinants, and the solution of linear systems. Eigenvalues, eigenvectors, and diagonalization of matrices with examples from physics. Complex number algebra, Euler's formula, extraction of roots, and applications. Vector representation in Cartesian, cylindrical, and spherical coordinates. Vector transformation under rotations of coordinate axes. Vector products and vector identities. Planar motion of a material point. Differential calculus of scalar and vector fields: directional derivative, gradient (in Cartesian, cylindrical, and spherical coordinates), del operator, divergence, curl, Laplacian, and product rules. Basic concepts of analytic geometry in Cartesian and polar coordinates. Equations of lines, conic sections, planes, and spheres. Second-degree equations in the plane and in three-dimensional space. Solution of first-degree linear systems.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face to Face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Course material is organized and presented in PowerPoint slides. Support of the learning process through the electronic platform (e-class). Communication with students via email.
TEACHING ORGANIZATION *The ways and methods of teaching are described in detail.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.* *The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.*	

Activity	*Workload/semester*
Lectures	50
Preparation and writing of short papers or reports.	10
Study and analysis of relevant literature.	90
Course total (25 hours / ECTS)	**150**

STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report,Clinical examination of a patient,Artistic interpretation, Other/Others*	**Student Assessment Languages** Greek **Methods (Formative or Concluding)** Concluding

Student Assessment Methods	**Percentage**
Written examination with problem-solving:	90
Written assignments / coursework:	10
Total:	100

Please indicate all relevant information about the course assessment and how students are informed	

5. SUGGESTED BIBLIOGRAPHY

- Suggested bibliography:

Tsiantos, Vasilis, Advanced Mathematics for Engineers, Eudoxus Book Code: 18548878, 1st edition, 2005, ISBN: 9604180592, A. Tziola & Sons Publishers.
Sourlas, Dimitris, Vector Analysis, Eudoxus Book Code: 94689233, 1st edition, 2020, University of Patras Property Management and Utilization Company.

COURSE OUTLINE

1. GENERAL

SCHOOL			
DEPARTMENT	DEPARTMENT OF PHYSICS		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE	Y104-2023	**SEMESTER**	1st Semester
COURSE TITLE	Computer Science Laboratory for Physicists		

TEACHING ACTIVITIES If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
	5	5.0

COURSETYPE Background, General Knowledge, Scientific Area, Skill Development	Scientific Area
PREREQUISITES	
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS187/

2. LEARNING OUTCOMES

Learning Outcomes Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.
null

General Skills	
Name the desirable general skills upon successful completion of the module	
Search, analysis and synthesis of data and information, ICT Use,Adaptation to new situations, Decision making, Autonomous work, Teamwork, Working in an international environment, Working in an interdisciplinary environment, Production of new research ideas	Project design and management Equity and Inclusion Respect for the natural environment Sustainability Demonstration of social, professional and moral responsibility and sensitivity to gender issues Critical thinking Promoting free, creative and inductive reasoning
Adaptation to new situations Decision making Autonomous work	

3. COURSE CONTENT

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD Face to face, Distance learning, etc.	Face to face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) Use of ICT in Teaching, in Laboratory Education, in Communication with students	Use of ICT in Teaching Use of ICT in Laboratory Education
TEACHING ORGANIZATION The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research& analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc. The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards	

Activity	Workload/semester
Laboratory Exercise	100
Writing project	30
Bibliographic research & analysis	20
Total	**150**

STUDENT EVALUATION Description of the evaluation process Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others	**Student evaluation languages** Greek **Method (Formative or Concluding)** Formative

Student evaluation methods	Rate
Written Exam with Problem Solving	70
Written Assignment	30

Please indicate all relevant information about the course assessment and how students are informed	

5. Suggested Bibliography

Eudoxus

-Βιβλίο [50656000]: Εισαγωγή στην Χρήση των Η/Υ, Δαγδιλέλης Β., Ευαγγελίδης Γ., Σατρατζέμη Μ., Ν. Φαχαντίδης Βιβλίο [102071693]: Εισαγωγή στην Πληροφορική και τις Εφαρμογές της, Παπάζογλου Παναγιώτης
Πρόσθετη Προτεινόμενη Βιβλιογραφία
Βιβλίο [50656000]: Εισαγωγή στην Χρήση των Η/Υ, Δαγδιλέλης Β., Ευαγγελίδης Γ., Σατρατζέμη Μ., Ν. Φαχαντίδης Βιβλίο [102071693]: Εισαγωγή στην Πληροφορική και τις Εφαρμογές της, Παπάζογλου Παναγιώτης

COURSE OUTLINE: CHEMISTRY

1. **GENERAL**

SCHOOL	OF SCIENCES		
DEPARTMENT	OF PHYSICS		
LEVEL OF STUDIES	Level 6		
COURSE CODE	Y105-2023	**SEMESTER**	1rst
COURSE TITLE	CHEMISTRY		
TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*		**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
LECTURES		4	5
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.			
COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	Scientific Area (Special Background)		
PREREQUISITES:	-		
TEACHING & EXAMINATION LANGUAGE:	Greek		
COURSE OFFERED TO ERASMUS STUDENTS:	No		
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS164/		

2. **LEARNING OUTCOMES**

Learning Outcomes *Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.*
The purpose of this course is for the student to handle chemical formulas and chemical equations, to write down chemical reactions and calculate stoichiometries, to calculate the concentrations and molar fractions of solution components, to calculate the average rate of a reaction, to recognize the chemical species that are acids and bases, salts, to calculate the pH of solutions, and to understand the basic principles of Organic Chemistry. Upon successful completion of the course, the student will be able to: • Solve simple and complex stoichiometric problems. • Easily apply simple physical chemistry relations connected to heat and the rate of chemical reactions. • Determine the pH value of a solution if they know the type and concentration of the dissolved substances.

General Skills	
Name the desirable general skills upon successful completion of the module	
Search, analysis and synthesis of data and information, *ICT Use* *Adaptation to new situations* *Decision making* *Autonomous work* *Teamwork* *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*	*Project design and management* *Equity and Inclusion* *Respect for the natural environment* *Sustainability* *Demonstration of social, professional and moral responsibility and sensitivity to gender issues* *Critical thinking* *Promoting free, creative and inductive reasoning*

- Search, analysis and synthesis of data and information, with the use of the necessary technologies.
- Autonomous work.
- Teamwork.
- Exercise of criticism and self-criticism.
- Promotion of free, creative and inductive thinking.

3. COURSE CONTENT

Structure of atoms – Periodicity of properties (atomic radii, ionic radii, ionization energy, electron affinity, electronegativity) and classification of elements in the Periodic Table of Elements. Atomic Orbitals – Electronic structure of the atom. Chemical Bonding (Ionic, Covalent, Hydrogen Bond). Types of chemical reactions (acid-base, redox, precipitation). Reaction Stoichiometry – Calculations. The gaseous state (Ideal gas laws, Equation of state, Kinetic Theory, Molecular velocities, Diffusion, Effusion). Thermochemistry (Heat of reaction, Thermochemical equations, Application of stoichiometry to heats of reactions, Measurement of the heat of a reaction, Hess's Law, Standard enthalpies of formation). Solutions (Classification of solutions, % Concentrations, Molarity, Molality, Dilution and Mixing of solutions, Solubility). Colligative properties of solutions (vapor pressure lowering, boiling point elevation, freezing point depression, osmotic pressure). van't Hoff factor. Chemical equilibrium and its laws. Chemical Kinetics (Reaction rate, Rate law, Experimental determination of the rate, Effect of temperature on the reaction rate, Collision and transition state theories, Arrhenius equation). Acids and Bases, Theories of acids and bases, Strength of acids and bases, Autoionization of water, pH. Ionization equilibria of acids and bases, Dissociation constant of acids and bases, Common ion effect, Buffer solutions. Oxidation, reduction, redox systems. Chemistry of the elements of the Main Groups of the Periodic Table (IA, IIA, IVA, VA, VIA, VIIA, VIIIA, Hydrogen).

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face-to-face.
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT)	Use of ICT in Teaching.

<table>
<tr><td>Use of ICT in Teaching, in Laboratory Education, in Communication with students</td><td>Use of ICT in Communication with students.</td></tr>
<tr><td>TEACHING ORGANIZATION
The ways and methods of teaching are described in detail.
Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.

The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.</td><td><table>
<tr><th>Activity</th><th>Workload/semester</th></tr>
<tr><td>Lectures</td><td>90</td></tr>
<tr><td>Self-study</td><td>35</td></tr>
<tr><td>Course total (25 hours / ECTS)</td><td>125</td></tr>
</table></td></tr>
<tr><td>STUDENT EVALUATION
Description of the evaluation process

Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report,Clinical examination of a patient,Artistic interpretation, Other/Others

Please indicate all relevant information about the course assessment and how students are informed</td><td>Student Assessment Languages
Greek

Methods (Formative or Concluding)
Concluding

<table>
<tr><th>Student Assessment Methods</th><th>Percentage</th></tr>
<tr><td>Written Exam with Problem Solving</td><td>100%</td></tr>
</table></td></tr>
</table>

5. SUGGESTED BIBLIOGRAPHY

- Γ. Μανουσάκης, «Γενική και Ανόργανη Χημεία», Εκδόσεις: ΚΥΡΙΑΚΙΔΗ ΜΟΝΟΠΡΟΣΩΠΗ ΙΚΕ, 2015.
- P. Atkins, L. Jones, L. Laverman (Επιμέλεια Π. Κουτσούκος), «Αρχές Χημείας», 7η Αμερικάνικη 1η Ελληνική Έκδοση, Εκδόσεις UTOPIA, 2018.
- D.D Ebbing, S.D. Gammon (Μετάφραση: Ν.Δ. Κλούρας), «Σύγχρονη Γενική Χημεία», Εκδόσεις ΤΡΑΥΛΟΣ, 2013.
- J. K. Robinson, J. E. McMurry, R. C. Fay, «ΓΕΝΙΚΗ ΧΗΜΕΙΑ», Εκδόσεις ΚΡΙΤΙΚΗ ΑΕ, 2022.
- D. Ebbing, S. Gammon, «ΣΥΓΧΡΟΝΗ ΓΕΝΙΚΗ ΚΑΙ ΑΝΟΡΓΑΝΗ ΧΗΜΕΙΑ», Εκδόσεις ΤΡΑΥΛΟΣ & ΣΙΑ ΟΕ, 2023.
- K. Timberlake, «ΧΗΜΕΙΑ: ΕΙΣΑΓΩΓΗ ΣΤΗ ΓΕΝΙΚΗ, ΟΡΓΑΝΙΚΗ ΚΑΙ ΒΙΟΛΟΓΙΚΗ ΧΗΜΕΙΑ», Εκδόσεις ΚΛΕΙΔΑΡΙΘΜΟΣ ΕΠΕ, 2023.

COURSE OUTLINE

1. GENERAL

SCHOOL			
DEPARTMENT	DEPARTMENT OF PHYSICS		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE	Y201-2023	**SEMESTER**	1st Semester
COURSE TITLE	Physics II		

TEACHING ACTIVITIES If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
	5	8.0

COURSETYPE Background, General Knowledge, Scientific Area, Skill Development	Background
PREREQUISITES	
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS192/

2. LEARNING OUTCOMES

Learning Outcomes
Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

The aim and objective of the course is to enable students to understand the basic concepts and basic laws of Electricity such as the electric field, Gauss's law in electricity, Magnetism such as the magnetic field and magnetic induction, as well as the Biot-Savart laws, Gauss's law in magnetism and Faraday's law.Also, students will know and study electrical circuits and their basic laws of analysis such as Kirchhoff's laws. Through this course they will learn about the Nature and Propagation of Light, the characteristics, properties and basic principles of propagation of electromagnetic waves in various media, as well as basic concepts of Optics such as Contribution and Diffraction.Finally, they will learn basic concepts of Atomic and Nuclear Physics such as the atomic model of Hydrogen, the spin of electrons, the structure of materials, properties of nuclei, stability and radioactivity, nuclear reactions, nuclear fission.
Upon successful completion of the course, the student will have acquired:
• Ability to demonstrate in-depth knowledge and understanding of the basic concepts, principles and laws related to Electricity and Magnetism, basic laws for the analysis of electrical circuits, as well as basic concepts of Optics and Wave Physics in general, as well as Atomic and Nuclear Physics.
• Ability to apply this knowledge to solve related complex problems.

• Critical thinking skills so that they can evaluate, analyze and correlate this knowledge. • Ability to interpret everyday life phenomena. • Ability to develop collaboration with other students to solve problems related to this course.
General Skills Name the desirable general skills upon successful completion of the module Search, analysis and synthesis of data and information, ICT Use,Adaptation to new situations, Decision making, Autonomous work, Teamwork, Working in an international environment, Working in an interdisciplinary environment, Production of new research ideas Project design and management Equity and Inclusion Respect for the natural environment Sustainability Demonstration of social, professional and moral responsibility and sensitivity to gender issues Critical thinking Promoting free, creative and inductive reasoning
Search, analysis and synthesis of data and information, ICT Use Autonomous work Teamwork Critical thinking

3. COURSE CONTENT

1. Electric Charge, Coulomb's Law, 2. Electric Field, Gauss's Law, Electric Potential 3. Capacitors and R-C Dielectric Circuits 4. Magnetic Fields and Magnetic Forces, 5. Magnetic Field Sources, Ampere's Law, 6. Electromagnetic Induction, Faraday's Law, 7. Lenz's Law, Induced Electric Fields 8. R-L, R-C, R-L-C Circuits, Kirchhoff's Laws, 9. Alternating Current, Power in AC Circuits. 10. Nature and Propagation of Light, 11. Reflection, Refraction, Polarization, Interference and Diffraction 12. Structure of Atoms, Molecules and Matter, Properties of Nuclei, 13. Radioactivity, Nuclear Reactions, Nuclear Fission and Fusion.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD Face to face, Distance learning, etc.	Face to face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) Use of ICT in Teaching, in Laboratory Education, in Communication with students	Use of ICT in Teaching Use of ICT in Communication with students

TEACHING ORGANIZATION
The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research& analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.

The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards

Activity	Workload/semester
Lectures	65
Writing project	7
Bibliographic research & analysis	65
Total	**137**

STUDENT EVALUATION
Description of the evaluation process

Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others

Please indicate all relevant information about the course assessment and how students are informed

Student evaluation languages
Greek

Method (Formative or Concluding)
Formative

Student evaluation methods	Rate
Written Exam with Problem Solving	100

5. Suggested Bibliography

C. Giancoli, Φυσική για Επιστήμονες και Μηχανικούς, τόμ. 2, Α. Ζαχαριάδου, Α. Κεχαγιάς, Ι. Ρέκανος, και Γ. Τσιπολίτης, Επιμ., 5η έκδ. ΕΚΔΟΣΕΙΣ Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε., 2025.
R. SERWAY και J. JEWETT, ΦΥΣΙΚΗ ΓΙΑ ΕΠΙΣΤΗΜΟΝΕΣ ΚΑΙ ΜΗΧΑΝΙΚΟΥΣ: ΗΛΕΚΤΡΙΣΜΟΣ ΚΑΙ ΜΑΓΝΗΤΙΣΜΟΣ, ΦΩΣ ΚΑΙ ΟΠΤΙΚΗ, ΣΥΓΧΡΟΝΗ ΦΥΣΙΚΗ, τόμ. 2, 8η έκδ. ΕΚΔΟΣΕΙΣ ΚΛΕΙΔΑΡΙΘΜΟΣ ΕΠΕ, 2013.
D. HALLIDAY, και R. RESNICK, ΦΥΣΙΚΗ, τόμ. 2, 4η έκδ. ΕΠΙΣΤΗΜΟΝΙΚΕΣ ΚΑΙ ΤΕΧΝΟΛΟΓΙΚΕΣ ΕΚΔΟΣΕΙΣ Α.Γ.ΠΝΕΥΜΑΤΙΚΟΣ, 2009.

Eudoxus

C. Giancoli, Φυσική για Επιστήμονες και Μηχανικούς, τόμ. 2, Α. Ζαχαριάδου, Α. Κεχαγιάς, Ι. Ρέκανος, και Γ. Τσιπολίτης, Επιμ., 5η έκδ. ΕΚΔΟΣΕΙΣ Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε., 2025.
R. SERWAY και J. JEWETT, ΦΥΣΙΚΗ ΓΙΑ ΕΠΙΣΤΗΜΟΝΕΣ ΚΑΙ ΜΗΧΑΝΙΚΟΥΣ: ΗΛΕΚΤΡΙΣΜΟΣ ΚΑΙ ΜΑΓΝΗΤΙΣΜΟΣ, ΦΩΣ ΚΑΙ ΟΠΤΙΚΗ, ΣΥΓΧΡΟΝΗ ΦΥΣΙΚΗ, τόμ. 2, 8η έκδ. ΕΚΔΟΣΕΙΣ ΚΛΕΙΔΑΡΙΘΜΟΣ ΕΠΕ, 2013.
D. HALLIDAY, και R. RESNICK, ΦΥΣΙΚΗ, τόμ. 2, 4η έκδ. ΕΠΙΣΤΗΜΟΝΙΚΕΣ ΚΑΙ ΤΕΧΝΟΛΟΓΙΚΕΣ ΕΚΔΟΣΕΙΣ Α.Γ.ΠΝΕΥΜΑΤΙΚΟΣ, 2009.

COURSE OUTLINE

1. GENERAL

SCHOOL	OF SCIENCES		
DEPARTMENT	OF PHYSICS		
LEVEL OF STUDIES	Level 6		
COURSE CODE		**SEMESTER**	2ο
COURSE TITLE	Calcullus II		

TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
LECTURES	5	6
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	Scientific Area
PREREQUISITES:	-
TEACHING & EXAMINATION LANGUAGE:	GREEK
COURSE OFFERED TO ERASMUS STUDENTS:	YES
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS224/

2. LEARNING OUTCOMES

Learning Outcomes

Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

This course aims to introduce students to the fundamental concepts of differential calculus.

- Describe graphs and compute level curves and level surfaces of multivariable functions, performing basic vector algebra operations.
- Determine the arc length and curvature of space curves, including the use of unit tangent and unit normal vectors.
- Identify and interpret the tangential and normal components of acceleration.
- Compute partial derivatives, directional derivatives, and gradients, and apply them to solve applied problems.
- Compute differentials of multivariable functions and use them in solving practical problems.
- Find equations of tangent planes and normal lines to surfaces given either implicitly or parametrically.
- Apply the chain rule to functions of several variables, including cases involving implicit differentiation.
- Evaluate multiple integrals in appropriate coordinate systems—rectangular, polar, cylindrical, and spherical—and apply them to compute quantities such as volume, surface area, mass, moments, and centroids.
- Use Jacobians to perform change of variables in multiple integrals.
- Evaluate line and surface integrals; determine when a line integral is path-independent and use the Fundamental Theorem of Line Integrals to solve applied problems.
- Identify conservative vector fields.
- Introduce and apply Green's Theorem, the Divergence Theorem (Gauss), and Stokes' Theorem.

- Introduce the basic ideas of parametric equations, particularly polar coordinates and functions expressed in polar form.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use
Adaptation to new situations
Decision making
Autonomous work
Teamwork
Working in an international environment
Working in an interdisciplinary environment
Production of new research ideas
Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking
Promoting free, creative and inductive reasoning

- *Search for, analysis and synthesis of data and information, with the use of the necessary technology*
- *Decision-making*
- *Working independently*
- *Working in an international environment*
- *Production of new research ideas*

3. COURSE CONTENT

Double and triple integrals and their applications. Change of variables and the Jacobian determinant. Line and surface integrals. Green's Theorem – potential functions and rotational (curl) fields in the plane – line integrals in multiply connected regions. Gauss's and Stokes' Theorems. Introduction to improper integrals: types of improper integrals and their applications.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face to Face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Course material is organized and presented in PowerPoint slides. Support of the learning process through the electronic platform (e-class). Communication with students via email.
TEACHING ORGANIZATION *The ways and methods of teaching are described in detail.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.* *The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.*	
STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Concluding,*	**Student Assessment Languages** Greek **Methods (Formative or Concluding)**

Activity	*Workload/semester*
Lectures	85
Preparation and writing of short papers or reports.	10
Study and analysis of relevant literature.	88
Course total (25 hours / ECTS)	**125**

Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report,Clinical examination of a patient,Artistic interpretation, Other/Others *Please indicate all relevant information about the course assessment and how students are informed*	Concluding **Student Assessment Methods** — **Percentage** Written examination with problem-solving: 90 Written assignments / coursework: 10 Total: 100

5. SUGGESTED BIBLIOGRAPHY

- Suggested bibliography:

Marsden, Jerrold E., Tromba, Anthony J., Vector Calculus, University of Crete Press, Translation: Apostolos Giannopoulos, Scientific Editing: Dimitris Karagiannakis, 1st edition 1992, Current edition 2018. Original title: Vector Calculus, W.H. Freeman & Company, 3rd edition, 1988.

Briggs, William L., Cochran, Lyle, Gillett, Bernard, Calculus, Edited by: Theodoros Chorikis, Translated by: Stamos Tsitsonis, Panagiota Lalou, Miltiadis Chalkias, Print Edition 2018.

Karanikolas, D. Nikolaos, Introduction to Differential Calculus of Multivariable Functions, ZITI Publications.

Kyventidis, Thomas, Integral Calculus of Multivariable Functions, ZITI Publications, ISBN 978-960-456-491-0, Eudoxus Code: 68392615.

Stroud, K.A., Further Engineering Mathematics, 2nd edition, McMillan, 1990.

Athanasiadis, A.G., Applied Mathematics, ZITI Publications, Thessaloniki, 2003.

COURSE OUTLINE

1. GENERAL

SCHOOL			
DEPARTMENT	DEPARTMENT OF PHYSICS		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE	Y203-2023	**SEMESTER**	2nd Semester
COURSE TITLE	General Physics Laboratory		

TEACHING ACTIVITIES If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
	4	5.0

COURSETYPE Background, General Knowledge, Scientific Area, Skill Development	Scientific Area
PREREQUISITES	
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS190/

2. LEARNING OUTCOMES

Learning Outcomes Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.
null

General Skills	
Name the desirable general skills upon successful completion of the module	
Search, analysis and synthesis of data and information, ICT Use,Adaptation to new situations, Decision making, Autonomous work, Teamwork, Working in an international environment, Working in an interdisciplinary environment, Production of new research ideas	Project design and management Equity and Inclusion Respect for the natural environment Sustainability Demonstration of social, professional and moral responsibility and sensitivity to gender issues Critical thinking Promoting free, creative and inductive reasoning
Search, analysis and synthesis of data and information, ICT Use Teamwork	

3. COURSE CONTENT

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD Face to face, Distance learning, etc.	Face to face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) Use of ICT in Teaching, in Laboratory Education, in Communication with students	Use of ICT in Teaching
TEACHING ORGANIZATION The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research& analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc. The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards	

Activity	Workload/semester
Laboratory Exercise	125
Total	**125**

STUDENT EVALUATION Description of the evaluation process Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others	**Student evaluation languages** Greek **Method (Formative or Concluding)** Formative **Student evaluation methods** — **Rate** Oral Exams — 100

Please indicate all relevant information about the course assessment and how students are informed	

5. Suggested Bibliography

Βιβλίο [22908694]: ΕΡΓΑΣΤΗΡΙΑΚΕΣ ΑΣΚΗΣΕΙΣ ΓΕΝΙΚΗΣ ΦΥΣΙΚΗΣ, ΜΕΛΗ ΔΕΠ ΤΟΥ ΤΟΜΕΑ ΦΥΣΙΚΗΣ ΣΤΕΡΑΙΑΣ ΚΑΤΑΣΤΑΣΗΣ ΤΟΥ ΤΜΗΜΑΤΟΣ ΦΥΣΙΚΗΣ ΑΠΘ Λεπτομέρειες
Βιβλίο [49167]: Εργαστηριακές Ασκήσεις Φυσικής, ΤΟΜΟΣ Ι, ΣΥΛΛΟΓΙΚΟ Λεπτομέρειες
Βιβλίο [94644740]: ΕΙΣΑΓΩΓΗ ΣΤΗΝ ΑΝΑΛΥΣΗ ΠΕΙΡΑΜΑΤΙΚΩΝ ΜΕΤΡΗΣΕΩΝ: ΑΠΛΑ ΠΕΙΡΑΜΑΤΑ ΦΥΣΙΚΗΣ, ΜΑΤΘΑΙΟΣ Κ. ΚΑΜΑΡΑΤΟΣ Λεπτομέρειες

Eudoxus

Βιβλίο [22908694]: ΕΡΓΑΣΤΗΡΙΑΚΕΣ ΑΣΚΗΣΕΙΣ ΓΕΝΙΚΗΣ ΦΥΣΙΚΗΣ, ΜΕΛΗ ΔΕΠ ΤΟΥ ΤΟΜΕΑ ΦΥΣΙΚΗΣ ΣΤΕΡΑΙΑΣ ΚΑΤΑΣΤΑΣΗΣ ΤΟΥ ΤΜΗΜΑΤΟΣ ΦΥΣΙΚΗΣ ΑΠΘ Λεπτομέρειες
Βιβλίο [49167]: Εργαστηριακές Ασκήσεις Φυσικής, ΤΟΜΟΣ Ι, ΣΥΛΛΟΓΙΚΟ Λεπτομέρειες
Βιβλίο [94644740]: ΕΙΣΑΓΩΓΗ ΣΤΗΝ ΑΝΑΛΥΣΗ ΠΕΙΡΑΜΑΤΙΚΩΝ ΜΕΤΡΗΣΕΩΝ: ΑΠΛΑ ΠΕΙΡΑΜΑΤΑ ΦΥΣΙΚΗΣ, ΜΑΤΘΑΙΟΣ Κ. ΚΑΜΑΡΑΤΟΣ Λεπτομέρειες

COURSE OUTLINE

1. GENERAL

SCHOOL			
DEPARTMENT	DEPARTMENT OF PHYSICS UNDEGRADUATE STUDY PROGRAM: PHYSICS		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE	Y204-2023	**SEMESTER**	2nd Semester
COURSE TITLE	Algorithms and Computers Programming		

TEACHING ACTIVITIES If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
	4	6.0

COURSETYPE Background, General Knowledge, Scientific Area, Skill Development	Background
PREREQUISITES	None
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	YES
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS159/

2. LEARNING OUTCOMES

Learning Outcomes Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.
The student who succeeds in this course will have understood the logic behind how to solve basic programming problems by selecting the appropriate algorithm in each case. They will be able to approach a problem by breaking it down into the necessary analytical steps, using pseudocode and/or flowcharts. They will then program each individual smaller part and integrate them to solve the overall problem. This course aims to develop digital skills, the ability to analyze problems, collaborative problem-solving strategies, and the ability to search for and utilize relevant information from the internet. It also offers students a first taste of an entire branch of Physics: Computational Physics.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use,Adaptation to new situations,
Decision making,
Autonomous work,
Teamwork,
Working in an international environment,
Working in an interdisciplinary environment, Production of new research ideas
Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking
Promoting free, creative and inductive reasoning

Search, analysis and synthesis of data and information, ICT Use
Adaptation to new situations
Decision making
Autonomous work
Teamwork
Working in an interdisciplinary environment
Promoting free, creative and inductive reasoning

3. COURSE CONTENT

The course aims to teach fundamental concepts related to the logic and use of algorithms, as well as introduce students to basic programming principles. The programming language chosen for this course is Python. Students are expected to understand why it is important to use algorithms in solving programming problems and to be able to choose the appropriate algorithm for each situation. In addition, they will learn only the basic programming commands, while take-home assignments will be used to encourage further independent learning.

Specifically, for the Algorithms section:

- Definition of algorithms. Rules of algorithm design.
- Fundamental concepts of algorithm efficiency analysis. Notation: O, Ω, and Θ.
- Algorithms for:
  - Sorting
  - Searching
  - String manipulation
  - Graph problems
  - Combinatorial problems
  - Geometric problems
  - Numerical problems
- Fundamental algorithmic techniques:
  - Brute force and exhaustive search
  - Decrease and conquer
  - Divide and conquer
  - Transform and conquer
  - Greedy method
  - Dynamic programming
  - Backtracking
  - Branch and bound
  - Recursive algorithms
- Graph algorithms
- The concept of pseudocode

The concept of flowcharts, the rules for creating them, and their practical use
Examples demonstrating how pseudocode and flowcharts are used in problem solving

For the Programming section:
General introduction to Python and its programming environments
Introduction to operators and the syntax structure of Python code (e.g., indentation)
Sequential structure
Conditional structures (if / elif / else)
Looping structures using for
Looping structures using while
Data structures using lists
Data structures using tuples
Data structures using dictionaries
Functions
File handling

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD Face to face, Distance learning, etc.	Face to face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) Use of ICT in Teaching, in Laboratory Education, in Communication with students	Use of ICT in Teaching Use of ICT in Laboratory Education Use of ICT in Communication with students
TEACHING ORGANIZATION The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research& analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc. The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards	

Activity	Workload/semester
Lectures	52
Tutoring	26
Bibliographic research & analysis	100
Total	**178**

STUDENT EVALUATION Description of the evaluation process Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others Please indicate all relevant information about the course assessment and how students are informed	**Student evaluation languages** Greek English **Method (Formative or Concluding)** Summative **Student evaluation methods** — **Rate** Written Exam with Problem Solving — 100

5. Suggested Bibliography

Εισαγωγή στον Υπολογισμό και τον Προγραμματισμό με την Python, 3η έκδοση, Guttag John V.
Python - Προγραμματισμός για Επιστήμες Υπολογιστών και Δεδομένων, Lin Johnny Wei-Bing, Aizenman Hannah, Espinel Erin Manette Cartas, Gunnerson Kim, Liu Joanne, Κατσαούνης Θεόδωρος (Επιστ. Επιμέλεια) PYTHON 3: ΑΛΓΟΡΙΘΜΙΚΗ ΚΑΙ ΠΡΟΓΡΑΜΜΑΤΙΣΜΟΣ, ΑΡΙΣΤΕΙΔΗΣ Σ. ΜΠΟΥΡΑΣ, ΓΙΑΝΝΗΣ Θ. ΚΑΠΠΟΣ
Η ΓΛΩΣΣΑ ΠΡΟΓΡΑΜΜΑΤΙΣΜΟΥ PYTHON, MATTHES ERIC
Ανάλυση και Σχεδίαση Αλγορίθμων, 3η Έκδοση, Levitin Anavy, Μάνος Ρουμελιώτης (επιμέλεια)

Eudoxus

Εισαγωγή στον Υπολογισμό και τον Προγραμματισμό με την Python, 3η έκδοση, Guttag John V.
Python - Προγραμματισμός για Επιστήμες Υπολογιστών και Δεδομένων, Lin Johnny Wei-Bing, Aizenman Hannah, Espinel Erin Manette Cartas, Gunnerson Kim, Liu Joanne, Κατσαούνης Θεόδωρος (Επιστ. Επιμέλεια) PYTHON 3: ΑΛΓΟΡΙΘΜΙΚΗ ΚΑΙ ΠΡΟΓΡΑΜΜΑΤΙΣΜΟΣ, ΑΡΙΣΤΕΙΔΗΣ Σ. ΜΠΟΥΡΑΣ, ΓΙΑΝΝΗΣ Θ. ΚΑΠΠΟΣ
Η ΓΛΩΣΣΑ ΠΡΟΓΡΑΜΜΑΤΙΣΜΟΥ PYTHON, MATTHES ERIC
Ανάλυση και Σχεδίαση Αλγορίθμων, 3η Έκδοση, Levitin Anavy, Μάνος Ρουμελιώτης (επιμέλεια)

COURSE OUTLINE

1. GENERAL

SCHOOL			
DEPARTMENT	DEPARTMENT OF PHYSICS		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE	Y205-2023	**SEMESTER**	2nd Semester
COURSE TITLE	Fourier Transforms and Analysis		

TEACHING ACTIVITIES If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
	4	6.0

COURSETYPE Background, General Knowledge, Scientific Area, Skill Development	Scientific Area
PREREQUISITES	
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	YES
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS160/

2. LEARNING OUTCOMES

Learning Outcomes Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.
To learn the theory of series and Fourier transforms, as well as Laplace transforms, and to be able to apply them to solve physics problems.

General Skills	
Name the desirable general skills upon successful completion of the module	
Search, analysis and synthesis of data and information, ICT Use,Adaptation to new situations, Decision making, Autonomous work, Teamwork, Working in an international environment, Working in an interdisciplinary environment, Production of new research ideas	Project design and management Equity and Inclusion Respect for the natural environment Sustainability Demonstration of social, professional and moral responsibility and sensitivity to gender issues Critical thinking Promoting free, creative and inductive reasoning
Decision making Critical thinking	

3. COURSE CONTENT

Periodic functions. Fourier series. Fourier transforms. Cauchy integral formula. Laurent series. Integral residues and methods of calculating them. Applications of integral residues. Analytic continuity. Fourier integrals. Elements of generalized functions, the distribution δ(x). Laplace transform.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD Face to face, Distance learning, etc.	Face to face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) Use of ICT in Teaching, in Laboratory Education, in Communication with students	Use of ICT in Teaching Use of ICT in Communication with students
TEACHING ORGANIZATION The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research& analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc. The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards	

Activity	Workload/semester
Lectures	52
Tutoring	13
Bibliographic research & analysis	85
Total	**150**

STUDENT EVALUATION Description of the evaluation process Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others	**Student evaluation languages** Greek English **Method (Formative or Concluding)** Summative **Student evaluation methods** — **Rate** Written Exam with Problem Solving — 100

Please indicate all relevant information about the course assessment and how students are informed	

5. Suggested Bibliography

1. Μαθηματικές Μέθοδοι για Φυσικούς, George B. Arfken, Hans J. Weber, Frank E. Harris, εκδόσεις Οδυσσέας, 2024.
2. Διαφορικές Εξισώσεις Μετασχηματισμοί και μιγαδικές συναρτήσεις, Νίκος Μυλωνάς, Χρήστος Σχοινάς, εκδόσεις Τζιόλα, 2024.

Eudoxus

Διαφορικές Εξισώσεις, Μετασχηματισμοί και Μιγαδικές Συναρτήσεις
Κωδικός Βιβλίου στον Εύδοξο: 50655955
Έκδοση: 1η/2015
Συγγραφείς: Μυλωνάς Νίκος - Σχοινάς Χρήστος
ISBN: 9789604185122
Τύπος: Σύγγραμμα
Διαθέτης (Εκδότης): ΕΚΔΟΣΕΙΣ Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε.

COURSE OUTLINE

1. GENERAL

SCHOOL	OF SCIENCES		
DEPARTMENT	OF PHYSICS		
LEVEL OF STUDIES	Level 6		
COURSE CODE	Y301	**SEMESTER**	3rd
COURSE TITLE	Differential Equations		

TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
LECTURES	5	8
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	Area Background
PREREQUISITES:	-
TEACHING & EXAMINATION LANGUAGE:	GREEK
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS257/

2. LEARNING OUTCOMES

Learning Outcomes

Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

The course is aimed at second-year students of the Department of Physics and has as its main objective to introduce them to the basic concepts and techniques of ordinary differential equations and their systems. In particular, to acquire the ability to formulate ordinary differential equations in applications of Physics problems (such as from the fields of Mechanics, Thermodynamics, Electromagnetism, Quantum Mechanics, etc.) and to solve them.
Upon successful completion of the course, the student will be able to:

- Model physical phenomena with ordinary differential equations, partial differential equations and systems of differential equations,
- Solve the above equations using analytical or graphical methods.
- Study systems using ordinary differential equations.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use
Adaptation to new situations
Decision making
Autonomous work
Teamwork
Working in an international environment
Working in an interdisciplinary environment
Production of new research ideas
Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking
Promoting free, creative and inductive reasoning

- Search, analysis and synthesis of data and information

- Autonomous work
- Decision making
- Promoting free, creative and inductive reasoning

3. COURSE CONTENT

I. Basic concepts of Differential Equations (D.E.).
II. Existence and uniqueness of the solution of a D.E. of the 1st order.
III. Differential equations of the 1st order.
IV. Integrating factor
V. Linear D.E. of the nth order.
VI. The Laplace transform and its applications.
VII. Some cases of differential equations.
VIII. Euler equations.
IX. Method of series.
X. Systems of differential equations.
XI. Difference equations.
XII. Applications of differential equations to problems in Mechanics, Electricity, Quantum Mechanics, Waves and Fields.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face to Face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Use of ICT in Teaching Use of ICT in Communication with students
TEACHING ORGANIZATION *The ways and methods of teaching are described in detail.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.* *The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.*	

Activity	*Workload/semester*
Lectures	75
Self study	40
Tutoring	50
Project	10
Course total (25 hours / ECTS)	**200**

STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report,Clinical examination of a patient,Artistic interpretation, Other/Others*	Student Assessment Languages Greek Methods (Formative or Concluding) Concluding Student Assessment Methods — Percentage Written Exam with Problem Solving — 100%

Please indicate all relevant information about the course assessment and how students are informed	

5. SUGGESTED BIBLIOGRAPHY

- Suggested bibliography:
- Related academic journals:

- Γ.Β. Βουγιατζής, Γ.Δ.Μπόζης, Δ.Β. Παπαδόπουλος, *ΔΙΑΦΟΡΙΚΕΣ ΕΞΙΣΩΣΕΙΣ ΚΑΙ ΕΦΑΡΜΟΓΕΣ,* ΕΚΔΟΣΕΙΣ ΚΛΕΙΔΑΡΙΘΜΟΣ ΕΠΕ, 2012.
- Κυβεντίδης Θ. *ΔΙΑΦΟΡΙΚΕΣ ΕΞΙΣΩΣΕΙΣ*, Εκδ. Ζήτη.
- Τραχανάς Στ., *ΔΙΑΦΟΡΙΚΕΣ ΕΞΙΣΩΣΕΙΣ*), Πανεπιστημιακές Εκδόσεις Κρήτης Μπούντης Αναστάσιος, *Μη γραμμικές Διαφορικές Εξισώσεις*, Εκδ. Πνευματικός.
- Τραχανάς Σ., «Συνήθεις Διαφορικές Εξισώσεις», Πανεπιστημιακές Εκδόσεις Κρήτης, Ηράκλειο, 2015.
- Boyce W., DiPrima R., «Στοιχειώδεις Διαφορικές Εξισώσεις και Προβλήματα Συνοριακών Τιμών» ΕΜΠ, 1999.
- Δάσιος, Γ. "Συνήθεις Διαφορικές Εξισώσεις",1983.
- Μπόζη Γ. "Διαφορικές Εξισώσεις και Εφαρμογές", 1982.
- Γεωργίου Δ. Μπόζη και Δημητρίου Β. Παπαδόπουλου, 1999, "Προβλήματα Διαφορικών Εξισώσεων", Εκδόσεις Τζιόλα.
- Richard Bronson, *ΕΙΣΑΓΩΓΗ ΣΤΙΣ ΔΙΑΦΟΡΙΚΕΣ ΕΞΙΣΩΣΕΙΣ*, Schaum's Outline, εκδ. Κλειδάριθμος.
- M. Tenenbaum and H. Pollard, *ORDINARY DIFFERENTIAL EQUATIONS*, Dover.
- Curle N, *Applied Differential Equations*, Van Nostrand Reinhold, 1971.
- Spain B., *Ordinary Differential equations*, Van Nostrand Reinhold, 1969.
- E. Hairer, S.P.Norsett and G.Wanner, *Solving Ordinary Differential Equations*, Springer Verlag, 1980.

Webpages

http://en.wikipedia.org/wiki/Differential_equation

http://ocw.mit.edu/courses/mathematics/18-03-differential-equations-spring-2010/index.htm (M.I.T.)

https://www.khanacademy.org/math/differential-equations (open courses)

http://www.aw-bc.com/ide/ (Interactive Differential Equations)

COURSE OUTLINE

1. GENERAL

SCHOOL	OF SCIENCES		
DEPARTMENT	OF PHYSICS		
LEVEL OF STUDIES	Level 6		
COURSE CODE	Y302-2023	**SEMESTER**	3°
COURSE TITLE	ELECTROMAGNETISM I		

TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
LECTURES	5	6
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	Background
PREREQUISITES:	-
TEACHING & EXAMINATION LANGUAGE:	GREEK
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS188/

2. LEARNING OUTCOMES

Learning Outcomes

Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

The course aims to introduce the fundamental principles of Electromagnetism.

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

- To have understood the concept of the electric and magnetic field as well as the physical quantities that describe it.
- Be able to deal with electrostatics and magnetostatics problems for continuous linear, surface and spatial distributions of charges and currents.
- To be able to calculate the intensity, potential and energy of the system.
- To have understood direct and alternating current.
- To analyze basic and advanced problems and to be able to solve them so that he can clearly predict their outcome. To check its results.
- To identify all the parameters involved in a problem, and above all to prioritize them in terms of gravity, recognizing those that have the most significant contribution.
- To be able to provide a solution to a problem by adopting approaches, adequately documenting the mathematical part.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,	*Project design and management*
ICT Use	*Equity and Inclusion*
Adaptation to new situations	*Respect for the natural environment*
	Sustainability

Decision making *Autonomous work* *Teamwork* *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*	*Demonstration of social, professional and moral responsibility and sensitivity to gender issues* *Critical thinking* *Promoting free, creative and inductive reasoning*

- *Search for, analysis and synthesis of data and information, with the use of the necessary technology*
- *Decision-making*
- *Critical thinking*
- *Promoting free, creative and inductive reasoning*

3. COURSE CONTENT

Mathematical introduction. Electrostatic fields. Gauss Law. Electrical potential. Work and Energy in Electrostatics. Conductors. Laplace's equation. The Method of Images. Separation of Variables. Multipole Expansion. Polarization. The Field of a Polarized Object. The Electric Displacement. Linear Dielectrics. The Lorentz Force Law. The Biot-Savart Law. The Divergence and Curl Of B. Magnetic Vector Potential. Magnetization. The Field of a Magnetized Object. The Auxiliary Field H. Linear and Nonlinear Media.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face to Face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Use of ICT in Teaching Use of ICT in Communication with students
TEACHING ORGANIZATION *The ways and methods of teaching are described in detail.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.* *The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.*	

Activity	*Workload/semester*
Lectures	100
Self study	50
Course total (25 hours / ECTS)	**150**

STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report,Clinical examination of a patient,Artistic*	**Student Assessment Languages** Greek **Methods (Formative or Concluding)** Concluding **Student Assessment Methods** — **Percentage** Written Exam with Problem Solving — 100

interpretation, Other/Others *Please indicate all relevant information about the course assessment and how students are informed*	

5. SUGGESTED BIBLIOGRAPHY

- Suggested bibliography:
- Related academic journals:

- Βασικά Στοιχεία Ηλεκτρομαγνητισμού, Δημήτριος Βλάχος, Σύνδεσμος Ελληνικών Ακαδημαικών Βιβλιοθηκών. 2015.
- Εισαγωγή στην Ηλεκτροδυναμική, D. Griffiths, Ίδρυμα Τεχνολογίας και Έρευνας-Πανεπιστημιακές εκδόσεις Κρήτης 2004.
- Θ. Δ. Τσιμπούκης, Ηλεκτρομαγνητικό Πεδίο (ενιαίος τόμος), Ίδρυμα Τεχνολογίας και Έρευνας - Πανεπιστημιακές Εκδόσεις Κρήτης, Ηράκλειο, 2014.
- J. Kraus, Ηλεκτρομαγνητισμός, 5η εκδοση, Εκδόσεις Α. Τζιόλα & Υιοί Α.Ε., Θεσσαλονίκη, 2011.
- Ι. Λ. Βομβορίδης, Ηλεκτρομαγνητικά Πεδία, Μέρος Β, 2η έκδοση, Εκδότης: Καλαμαρά Έλλη, Αθήνα, 2012.
- ΣΤΟΙΧΕΙΑ ΗΛΕΚΤΡΟΜΑΓΝΗΤΙΣΜΟΥ, 7η διεθνής έκδοση, MATTHEW N. O. SADIKU, SUDARSHAN R. NELATURY, Μετάφραση Χάρης Βάρβογλης, Ομ. Καθηγητής ΑΠΘ, Εκδόσεις ΚΛΕΙΔΑΡΙΘΜΟΣ 2025.

COURSE OUTLINE: THERMODYNAMICS

1. **GENERAL**

SCHOOL	OF SCIENCES		
DEPARTMENT	OF PHYSICS		
LEVEL OF STUDIES	Level 6		
COURSE CODE	Y303-2023	**SEMESTER**	3rd
COURSE TITLE	THERMODYNAMICS		
TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*		**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
LECTURES		4	6
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.			
COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	Scientific Area (Special Background)		
PREREQUISITES:	-		
TEACHING & EXAMINATION LANGUAGE:	Greek		
COURSE OFFERED TO ERASMUS STUDENTS:	No		
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS190/		

2. **LEARNING OUTCOMES**

Learning Outcomes *Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.*
The purpose of the course, which is a continuation of the Thermodynamics units taught in the General Physics I course, is to provide students with general knowledge about the ideal gas and the laws of Thermodynamics (from formulation to mention of reversible and irreversible changes, concepts such as thermal expansion, the Carnot cycle, thermodynamic engines, Fundamental characteristic functions, etc.). An introduction to the concepts of enthalpy and entropy, which will then be studied, will follow. There will be an extensive reference to gas reactions and the thermodynamics of dilute solutions. Applications will be made to the phase equilibrium diagram at the triple point. Upon successful completion of the course, the student will have acquired the ability to: • Understand the concept of ideal gases and real gases and how their laws apply to physical systems other than gases.

- Understand the correlation of concepts such as pressure, temperature, and volume and be able to perform calculations of state variables in thermodynamic systems.
- Understand the concepts of enthalpy and entropy.
- Apply their knowledge to thermodynamics problems involving phase equilibrium diagrams.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use
Adaptation to new situations
Decision making
Autonomous work
Teamwork
Working in an international environment
Working in an interdisciplinary environment
Production of new research ideas
Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking
Promoting free, creative and inductive reasoning

- Search, analysis and synthesis of data and information, using the necessary technologies.
- Decision-making.
- Autonomous work.
- Work in an interdisciplinary environment.
- Generation of new research ideas.
- Exercise of criticism and self-criticism.
- Promotion of free, creative and inductive thinking.

3. COURSE CONTENT

Thermodynamic system, Control volume, Macroscopic perspective, Microscopic perspective, Properties and state of a substance, Processes and cycles, Specific volume and density, Pressure, Energy, Temperature equation, The zeroth law of Thermodynamics, Temperature scales, The pure substance, Phase boundaries, The P-v-T surface, Tables of thermodynamic properties, Two-phase states, States of liquid and solid, States of superheated vapor, States of the ideal gas, The compressibility factor, Equations of state, The energy equation, The first law of Thermodynamics, The definition of work, Work produced or consumed at the moving boundaries of a simple compressible system, Definition of heat, Modes of heat transfer, Internal energy – A thermodynamic property, The thermodynamic property of enthalpy, Specific heat at constant volume and constant pressure, Internal energy, enthalpy, and specific heat of ideal gases, General systems involving work, Thermal engines and refrigerators. The second law of Thermodynamics, The reversible process, Factors that render processes irreversible, The Carnot cycle, Efficiency of a Carnot cycle, The thermodynamic temperature scale, The ideal gas temperature scale, Ideal versus real engines, Clausius

inequality, Entropy – A property of a system, Entropy of a pure substance, Change of entropy in reversible processes, Correlation of thermodynamic properties, Change of entropy of a solid or liquid, Change of entropy of an ideal gas, The reversible polytropic process for an ideal gas, Change of entropy of a control mass during an irreversible process, Entropy generation and the entropy equation, Principle of increase of entropy, The entropy equation for a control volume, Principle of increase of entropy, Conservation of energy and device efficiency, Exergy, reversible work and irreversibility, Efficiency based on the second law of Thermodynamics. Introduction to power systems, The Rankine cycle, Deviation of real from ideal cycles, Introduction to refrigeration systems, The vapor-compression refrigeration cycle, The Brayton cycle, The Otto cycle, The Diesel cycle, The Stirling cycle, The Atkinson and Miller cycles.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face-to-face.
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Use of ICT in Teaching. Use of ICT in Communication with students.
TEACHING ORGANIZATION *The ways and methods of teaching are described in detail.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.* *The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.*	***Activity*** — ***Workload/semester*** Lectures — 120 Self-study — 30 Course total (25 hours / ECTS) — **150**
STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report,Clinical examination of a patient,Artistic interpretation, Other/Others* *Please indicate all relevant information about the course assessment and how students are informed*	**Student Assessment Languages** Greek **Methods (Formative or Concluding)** Concluding **Student Assessment Methods** — **Percentage** Written Exam with Problem Solving — 100

5. SUGGESTED BIBLIOGRAPHY

- M. Zemansky, «Θερμότητα και Θερμοδυναμική», Εκδόσεις Α. Γ. Πνευματικός, Αθήνα, 2015.
- Ι. Γραμματικάκης, «Εισαγωγή στη Θερμότητα και τη Θερμοδυναμική», Εκδόσεις Leader Books, Αθήνα, 2012.
- C. Borgnakke, R. E. Sonntag, «Θερμοδυναμική», Επιστ. Επιμέλεια: Γ. Σκόδρας, Π. Παναγιωτοπούλου, 1η Έκδοση, Εκδόσεις ΚΡΙΤΙΚΗ, 2023.

COURSE OUTLINE

1. GENERAL

SCHOOL			
DEPARTMENT	DEPARTMENT OF PHYSICS		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE	Y304-2023	**SEMESTER**	3rd Semester
COURSE TITLE	Atomic and Molecular Physics		

TEACHING ACTIVITIES If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
	4	5.0

COURSETYPE Background, General Knowledge, Scientific Area, Skill Development	General Knowledge
PREREQUISITES	General Physics I and II
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS192/

2. LEARNING OUTCOMES

Learning Outcomes
Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

The course includes chapters from Atomic and Molecular Physics such as the Photoelectric Effect, the Compton effect, Atomic and Molecular Spectra, X-rays, Masers and Lasers.
Upon successful completion of the course, the student will be able to:
• To understand in depth the basic concepts, principles and laws related to Modern Physics at the atomic and molecular level, X-rays and Lasers.
• Ability to apply this knowledge in solving related complex problems.
• Critical thinking ability to be able to evaluate, analyze and relate this knowledge.
Ability to interpret phenomena of everyday life.
• Ability to develop cooperation with other fellow students to solve problems related to this course.

General Skills	
Name the desirable general skills upon successful completion of the module	
Search, analysis and synthesis of data and information, ICT Use,Adaptation to new situations, Decision making, Autonomous work, Teamwork, Working in an international environment, Working in an interdisciplinary environment, Production of new research ideas	Project design and management Equity and Inclusion Respect for the natural environment Sustainability Demonstration of social, professional and moral responsibility and sensitivity to gender issues Critical thinking Promoting free, creative and inductive reasoning
Search, analysis and synthesis of data and information, ICT Use Autonomous work Production of new research ideas Critical thinking Promoting free, creative and inductive reasoning	

3. COURSE CONTENT

Planck's theory of blackbody radiation. Photons. Photoelectric effect. Compton effect. Create a pair. Atomic spectra. Rutherford scattering. Nuclear dimensions. The Rutherford-Bohr model of the atom. Core movement. Arousal and de-arousal of individuals.Quantum numbers in the hydrogen atom. Torques and magnetic moments. Stern-Gerlach experiment. Transitions. Selection rules. Zeeman effect. Fine texture. Pauli's exclusion principle. X-rays & Auger electrons. Moseley's Law. Molecular Bonds. Molecular spectra. Masers and Lasers

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD Face to face, Distance learning, etc.	Face to face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) Use of ICT in Teaching, in Laboratory Education, in Communication with students	Use of ICT in Teaching Use of ICT in Communication with students
TEACHING ORGANIZATION The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research& analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc. The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards	

Activity	Workload/semester
Bibliographic research & analysis	50
Writing project	23
Lectures	52
Total	**125**

STUDENT EVALUATION Description of the evaluation process Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others Please indicate all relevant information about the course assessment and how students are informed	**Student evaluation languages** Greek **Method (Formative or Concluding)** Formative **Student evaluation methods** — **Rate** Written Exam with Problem Solving — 90 Written Assignment — 10

5. Suggested Bibliography

? ΣΥΓΧΡΟΝΗ ΦΥΣΙΚΗ, A. BEISER, Γ. ?ΑΡ?ΑΝΟΣ - Κ. ?ΑΡ?ΑΝΟΣ Ο.Ε.
? ΣΥΓΧΡΟΝΗ ΦΥΣΙΚΗ, R. SERWAY, C. MOSES, C. MOYER, ΙΤΕ-ΠΑΝΕΠΙΣΤΗΜΙΑΚΕΣ ΕΚ?ΟΣΕΙΣ ΚΡΗΤΗΣ
? Σύγχρονη Φυσική, Krane Kenneth, BROKEN HILL PUBLISHERS LTD

Eudoxus

? ΣΥΓΧΡΟΝΗ ΦΥΣΙΚΗ, A. BEISER, Γ. ?ΑΡ?ΑΝΟΣ - Κ. ?ΑΡ?ΑΝΟΣ Ο.Ε.
? ΣΥΓΧΡΟΝΗ ΦΥΣΙΚΗ, R. SERWAY, C. MOSES, C. MOYER, ΙΤΕ-ΠΑΝΕΠΙΣΤΗΜΙΑΚΕΣ ΕΚ?ΟΣΕΙΣ ΚΡΗΤΗΣ
? Σύγχρονη Φυσική, Krane Kenneth, BROKEN HILL PUBLISHERS LTD

COURSE OUTLINE

1. GENERAL

SCHOOL			
DEPARTMENT	DEPARTMENT OF PHYSICS		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE	Y305-2023	**SEMESTER**	3rd Semester
COURSE TITLE	Mathematical Methods for Physics		

TEACHING ACTIVITIES If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
	4	5.0

COURSETYPE Background, General Knowledge, Scientific Area, Skill Development	General Background
PREREQUISITES	
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS195/

2. LEARNING OUTCOMES

Learning Outcomes Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.
By the end of the course, students will know complex numbers and complex functions and their application to physics problems.

General Skills	
Name the desirable general skills upon successful completion of the module	
Search, analysis and synthesis of data and information, ICT Use,Adaptation to new situations, Decision making, Autonomous work, Teamwork, Working in an international environment, Working in an interdisciplinary environment, Production of new research ideas	Project design and management Equity and Inclusion Respect for the natural environment Sustainability Demonstration of social, professional and moral responsibility and sensitivity to gender issues Critical thinking Promoting free, creative and inductive reasoning
Search, analysis and synthesis of data and information, ICT Use	

3. COURSE CONTENT

Complex numbers: Definition. Algebraic properties. The geometric representation, modulus of a complex number, and the conjugate of a complex number. The triangular inequality. The polar form: argument and primary value of the argument of a complex number. The exponential form:. Powers and roots: de Moivre's formula.

Complex functions. Elementary functions. Exponential formula of Euler, logarithmic, trigonometric, and inverse.

Derivation of complex functions.
Integration of complex functions.

Power series of complex functions.

Applications

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD Face to face, Distance learning, etc.	Face to face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) Use of ICT in Teaching, in Laboratory Education, in Communication with students	Use of ICT in Communication with students
TEACHING ORGANIZATION The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research& analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc. The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards	

Activity	Workload/semester
Lectures	52
Writing project	13
Bibliographic research & analysis	60
Total	**125**

STUDENT EVALUATION Description of the evaluation process Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others Please indicate all relevant information about the course assessment and how students are informed	**Student evaluation languages** Greek **Method (Formative or Concluding)** Summative **Student evaluation methods** **Rate**

5. Suggested Bibliography

Eudoxus

1. Βιβλίο [77108681]: ΜΑΘΗΜΑΤΙΚΕΣ ΜΕΘΟΔΟΙ ΓΙΑ ΦΥΣΙΚΟΥΣ: ΜΙΑ ΠΕΡΙΕΚΤΙΚΗ ΕΙΣΑΓΩΓΗ, TAI L. CHOW
2. Βιβλίο [133040877]: Μαθηματικές Μέθοδοι για Φυσικούς, George B. Arfken, Hans J. Weber, Frank E. Harris
3. Βιβλίο [143549983]: Διαφορικές Εξισώσεις, Μετασχηματισμοί και Μιγαδικές Συναρτήσεις, 2η Έκδοση, Μυλωνάς Νίκος, Σχοινάς Χρήστος

COURSE OUTLINE

1. GENERAL

SCHOOL	OF SCIENCES		
DEPARTMENT	OF PHYSICS		
LEVEL OF STUDIES	Level 6		
COURSE CODE	Y401-2023	**SEMESTER**	4ο
COURSE TITLE	Electrical Circuits Laboratory		

TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
LECTURES	4	4.0
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	General Background
PREREQUISITES:	-
TEACHING & EXAMINATION LANGUAGE:	GREEK
COURSE OFFERED TO ERASMUS STUDENTS:	YES
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS244/

2. LEARNING OUTCOMES

Learning Outcomes
Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

The aim and objective of the course is to consolidate, through practice, the knowledge related to the Theory of Electricity and Electrical Circuits, as well as to develop the skills required for the implementation and experimental study of electrical circuits.
The main laboratory units include:
Methodology and application of electrical circuit measurements
Theoretical analysis of circuits with mixed resistor connections
Experimental verification of Circuit Laws
Experimental verification of Circuit Theorems
Measurement of electrical quantities in mixed resistor circuits
Measurement of electrical quantities in AC series and parallel circuits (RL, RC, RLC)
Simulation of electrical circuits on a computer
Upon successful completion of the course, the student will be able to:
• Identify and distinguish basic electrical components and circuits in practice, and understand their operation.
• Calculate characteristic quantities of electrical components and their characteristic curves.
• Construct a practical electrical circuit.
• Use instruments and laboratory devices to obtain measurements from electrical circuits.
• Verify the proper operation of an electrical component or circuit by combining experimental data with theoretical circuit analysis and the critical use of simulation

software.
• Detect faults in simple electrical components and circuits, and be able to propose solutions for their repair.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use
Adaptation to new situations
Decision making
Autonomous work
Teamwork
Working in an international environment
Working in an interdisciplinary environment
Production of new research ideas
Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking
Promoting free, creative and inductive reasoning

Search, analysis, and synthesis of data and information, using the necessary technologies

3. COURSE CONTENT

Instruments for Measuring Electrical Quantities
Oscilloscope
Theoretical analysis of circuits with mixed resistor connections
Mixed resistor circuits with direct voltage (DC)
RL, RC, and RLC circuits (Series and Parallel) with alternating voltage (AC)
Measurement of resistance, voltage, current, and power in DC and AC circuits
Kirchhoff's Laws
Theorems: Thevenin, Norton, and Superposition
Simulation of electrical circuits on a computer

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD
Face to face, Distance learning, etc.

Face to Face

USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT)
Use of ICT in Teaching, in Laboratory Education, in Communication with students

Use of ICT in Teaching
Use of ICT in Communication with students

TEACHING ORGANIZATION
The ways and methods of teaching are described in detail.
Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.

The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.

Activity	*Workload/semester*
Laboratory Exercise	90
Project creation	20
Bibliographic research & analysis	10
Course total (30 hours / ECTS)	**120**

STUDENT EVALUATION
Description of the evaluation process

Student Assessment Languages
Greek

Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report,Clinical examination of a patient,Artistic interpretation, Other/Others *Please indicate all relevant information about the course assessment and how students are informed*	**Methods (Formative or Concluding)** Formative **Student Assessment Methods** — **Percentage** Written Exam with Problem Solving — 80 Written Assignment — 20

5. SUGGESTED BIBLIOGRAPHY

- Suggested bibliography:
- Related academic journals:

ELECTRICAL CIRCUITS (Christos Volos), Kallipos Publications
Electrical Circuits, J.A. Edminister, ESPI Publications

Eudoxus
Book [2830]: Principles of Electrical Circuits: From Theory to Experiment, K. Efthymiadis, O. Kalogirou, I. Kyprianidis, K. Melidis, A. Siakavara... Details
Book [59420642]: Electrical Circuits, 6th Edition, C. Alexander, M. Sadiku, edited by Nikolaos Kousouras – Details

Additional Teaching Material:
Book [113928317]: Electrical Circuits, Christos Volos, Ektoras Emmanouil Nistazakis – Details

COURSE OUTLINE

1. GENERAL

SCHOOL	OF SCIENCES		
DEPARTMENT	OF PHYSICS		
LEVEL OF STUDIES	Level 6		
COURSE CODE	Y402-2023	**SEMESTER**	4ο
COURSE TITLE	WAVE OPTICS		

TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
LECTURES	4	6
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	Scientific Field (Specialized Background)
PREREQUISITES:	It is desirable for the student to have attended the following courses: Differential Calculus I and II Differential Equations Vector Calculus - Algebra Electromagnetism I Transforms and Fourier Analysis General Physics II
TEACHING & EXAMINATION LANGUAGE:	GREEK
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://physics.duth.gr/?page_id=6876

2. LEARNING OUTCOMES

Learning Outcomes

Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

The course includes wave phenomena in elastic media as well as the study of wave phenomena of Electromagnetic waves. Emphasis is placed on the phenomena of Polarization, Interference and Diffraction of light and their applications.
Upon successful completion of the course, the student will be able to:

- Understand in depth mechanical waves and the phenomena of geometric and wave optics.
- Perceive the function of optical instruments that they may encounter in a laboratory.

Upon successful attendance and completion, the course aims for the student to have acquired the following abilities:

- Ability to apply this knowledge to solve related complex problems.
- Critical thinking ability to be able to evaluate, analyze, and correlate this knowledge.
- Ability to interpret phenomena of everyday life.
- Ability to develop collaboration with other fellow students to solve problems related to this course.

General Skills *Name the desirable general skills upon successful completion of the module* *Search, analysis and synthesis of data and information,* *ICT Use* *Adaptation to new situations* *Decision making* *Autonomous work* *Teamwork* *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas* *Project design and management* *Equity and Inclusion* *Respect for the natural environment* *Sustainability* *Demonstration of social, professional and moral responsibility and sensitivity to gender issues* *Critical thinking* *Promoting free, creative and inductive reasoning*
• *Search for, analysis and synthesis of data and information, with the use of the necessary technology* • *Decision-making* • *Working independently* • *Working in an international environment* • *Production of new research ideas*

3. COURSE CONTENT

Waves in elastic media, Sound waves, Wave nature and propagation of light, Geometric Optics. Dispersion. Polarization. Interference and Coherence. Diffraction. Holography.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face to Face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Use of ICT in Teaching Use of ICT in Communication with students
TEACHING ORGANIZATION *The ways and methods of teaching are described in detail.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.* *The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.*	

Activity	*Workload/semester*
Lectures	120
Self study	30
Course total (25 hours / ECTS)	**150**

STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral*	**Student Assessment Languages** Greek **Methods (Formative or Concluding)** Concluding **Student Assessment Methods** — **Percentage** Written Exam with Problem Solving — 100

Exam, Presentation in audience, Laboratory Report,Clinical examination of a patient,Artistic interpretation, Other/Others *Please indicate all relevant information about the course assessment and how students are informed*	

5. SUGGESTED BIBLIOGRAPHY

1. Topics in Optics, I. Spyridelis, Publications: ZITI. Book ID in Eudoxus: 11054
2. Optics, E. Hecht, Publications: ESPI EKDOTIKI, Book ID in Eudoxus: 2544
3. "Optics: Basic Principles and Applications, E. Hecht, Publications Gutenberg Book ID in Eudoxus: 77111969

COURSE OUTLINE

1. GENERAL

SCHOOL	OF SCIENCES		
DEPARTMENT	OF PHYSICS		
LEVEL OF STUDIES	Level 6		
COURSE CODE	Y403-2023	**SEMESTER**	4º
COURSE TITLE	ELECTROMAGNETISM II		

TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
LECTURES	4	5
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	Background
PREREQUISITES:	-
TEACHING & EXAMINATION LANGUAGE:	GREEK
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS211/

2. LEARNING OUTCOMES

Learning Outcomes

Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

The course aims to understand Maxwell's equations and their solution as well as the phenomena related to the creation of electromagnetic fields of accelerated charges as well as issues of Electrodynamics.

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

- To have understood Maxwell's equations, the applications that result from solving them, to be familiar with the corresponding mathematical formalism.
- To understand the creation and propagation of the electromagnetic wave.
- To be able to handle Electrodynamics issues.
- To analyze basic and advanced problems and to be able to solve them so that he can clearly predict their outcome. To check its results.
- To identify all the parameters involved in a problem, and above all to prioritize them in terms of gravity, recognizing those that have the most significant contribution.
- To be able to provide a solution to a problem by adopting approaches, adequately documenting the mathematical part.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,	*Project design and management*
ICT Use	*Equity and Inclusion*
Adaptation to new situations	*Respect for the natural environment*
	Sustainability

Decision making *Autonomous work* *Teamwork* *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*	*Demonstration of social, professional and moral responsibility and sensitivity to gender issues* *Critical thinking* *Promoting free, creative and inductive reasoning*

- *Search for, analysis and synthesis of data and information, with the use of the necessary technology*
- *Decision-making*
- *Critical thinking*
- *Promoting free, creative and inductive reasoning*

3. COURSE CONTENT

Electromotive Force. Electromagnetic Induction. Maxwell's Equations. Charge and Energy. Momentum. Waves in One Dimension. Electromagnetic Waves in Vacuum. Electromagnetic Waves in Matter. Absorption and Dispersion. Guided Waves. Potential and Fields. Radiation. The Special Theory of Relativity. Relativistic Mechanics. Relativistic Electrodynamics.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face to Face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Use of ICT in Teaching Use of ICT in Communication with students
TEACHING ORGANIZATION *The ways and methods of teaching are described in detail.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.* *The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.*	

Activity	*Workload/semester*
Lectures	85
Self study	40
Course total (25 hours / ECTS)	**125**

STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report,Clinical examination of a patient,Artistic interpretation, Other/Others*	**Student Assessment Languages** Greek **Methods (Formative or Concluding)** Concluding **Student Assessment Methods** — **Percentage** Written Exam with Problem Solving — 100

Please indicate all relevant information about the course assessment and how students are informed	

5. SUGGESTED BIBLIOGRAPHY

- Suggested bibliography:
- Related academic journals:

- Βασικά Στοιχεία Ηλεκτρομαγνητισμού, Δημήτριος Βλάχος, Σύνδεσμος Ελληνικών Ακαδημαικών Βιβλιοθηκών. 2015.
- Εισαγωγή στην Ηλεκτροδυναμική, D. Griffiths, Ίδρυμα Τεχνολογίας και Έρευνας-Πανεπιστημιακές εκδόσεις Κρήτης 2004.
- Θ. Δ. Τσιμπούκης, Ηλεκτρομαγνητικό Πεδίο (ενιαίος τόμος), Ίδρυμα Τεχνολογίας και Έρευνας - Πανεπιστημιακές Εκδόσεις Κρήτης, Ηράκλειο, 2014.
- J. Kraus, Ηλεκτρομαγνητισμός, 5η εκδοση, Εκδόσεις Α. Τζιόλα & Υιοί Α.Ε., Θεσσαλονίκη, 2011.
- Ι. Λ. Βομβορίδης, Ηλεκτρομαγνητικά Πεδία, Μέρος Β, 2η έκδοση, Εκδότης: Καλαμαρά Έλλη, Αθήνα, 2012.
- ΣΤΟΙΧΕΙΑ ΗΛΕΚΤΡΟΜΑΓΝΗΤΙΣΜΟΥ, 7η διεθνής έκδοση, MATTHEW N. O. SADIKU, SUDARSHAN R. NELATURY, Μετάφραση Χάρης Βάρβογλης, Ομ. Καθηγητής ΑΠΘ, Εκδόσεις ΚΛΕΙΔΑΡΙΘΜΟΣ 2025.

COURSE OUTLINE

1. GENERAL

SCHOOL			
DEPARTMENT	DEPARTMENT OF PHYSICS		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE	Y404-2023	**SEMESTER**	4th Semester
COURSE TITLE	Electronics		

TEACHING ACTIVITIES If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
	4	5.0

COURSETYPE Background, General Knowledge, Scientific Area, Skill Development	Background
PREREQUISITES	It is suggested that the student attended the following: Calculus I and II Differential Equations Vectors-Algebra Introduction to Physics I and II
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	YES
COURSE URL:	https://eclass.emt.duth.gr/

2. LEARNING OUTCOMES

Learning Outcomes
Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

The purpose of the course is to introduce students to the basic concepts of electronics, the properties and functions of electronic components, as well as the analysis, design, and testing of electronic circuits. Specifically, the goal of the course is to provide fundamental knowledge of electronics for the most basic electronic components such as diodes, bipolar junction transistors (BJTs), and field-effect transistors (FETs), as well as the analysis and design of simple and complex electronic circuits formed by these components. During the lectures, exercises are solved to deepen understanding of each section. At the same time, students are given the opportunity, for better understanding of the electronic circuits presented, to analyze them with the help of simulation programs (Electronics Workbench, etc.) both during the lectures and during the Laboratory Exercises.
Upon successful completion of the course, the student will be able to:

-Distinguish the basic electronic components and know the different ways of connecting these components in a circuit.
-Recognize basic electronic circuits and understand their operation.
-Theoretically solve an electronic circuit by applying the laws, rules, and methodologies taught.
-Calculate characteristic parameters of electronic components, bias them appropriately, taking into account design requirements, and determine the characteristics of an electronic component.
-Learn and read datasheets of electronic components.
-Execute a simulation program to check the operation of a circuit.
-Detect faults in simple electronic components and circuits and be able to provide solutions for their repair.
-Design, analyze, and generally handle an electronic circuit.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use,Adaptation to new situations,
Decision making,
Autonomous work,
Teamwork,
Working in an international environment,
Working in an interdisciplinary environment, Production of new research ideas
Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking
Promoting free, creative and inductive reasoning

Search, analysis and synthesis of data and information, ICT Use
Autonomous work
Teamwork
Critical thinking
Promoting free, creative and inductive reasoning

3. COURSE CONTENT

-Semiconductors: Electronic Structure of Semiconductors, Intrinsic, Extrinsic Semiconductors, Conductivity of Semiconductors.
-Diodes: The p-n Junction, Reverse and Forward Bias of the p-n Junction, Current-Voltage Characteristic Curve (I-V), Circuit Study of Diode Operation – Load Line, Zener Diodes, Voltage Regulator with Zener Diode, Other Types of Diodes (Tunnel Diodes, Photodiodes and Light Emitting Diodes, Schottky Diodes, Varactor Diodes), Diode Circuits.
Diode Applications: Half-Wave Rectifier Circuits, Full-Wave Rectifier Circuits, Voltage Multipliers, Clipping Circuits, Climbing Circuits.
-Bipolar Junction Transistors (BJT): Structure of Transistors, Operation of Transistors – Transistor Currents, Common Emitter Configuration (C-E), Common Emitter Circuit Analysis, Common Emitter Amplifier, DC and AC Load Lines in a Common Emitter Amplifier, Common Collector Amplifier (CC, or Emitter Follower), The Transistor as a Switch.
-Field-Effect Transistor (FET): Introduction to Field-Effect Transistors (FET), JFET Structure, Operating Principle of JFET, JFET Biasing Methods, JFET as an Amplifier, JFET Amplifier with Common Source (C-S), JFET Amplifier with Common Drain (C-D).
-MOSFET Transistor: Structure, Operating Principle, Basic Circuits.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD Face to face, Distance learning, etc.	Face to face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) Use of ICT in Teaching, in Laboratory Education, in Communication with students	Use of ICT in Teaching Use of ICT in Communication with students

TEACHING ORGANIZATION

The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research& analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.

The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards

Activity	Workload/semester
Lectures	52
Bibliographic research & analysis	73
Total	**125**

STUDENT EVALUATION

Description of the evaluation process

Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others

Please indicate all relevant information about the course assessment and how students are informed

Student evaluation languages

Greek
English

Method (Formative or Concluding)

Summative

Student evaluation methods	Rate
Intermediate Written Exam	30
Written Exam with Problem Solving	50
Written Exam with Short Answer Questions	20

5. Suggested Bibliography

- ΗΛΕΚΤΡΟΝΙΚΑ ΚΥΚΛΩΜΑΤΑ, ΘΕΩΡΙΑ ΚΑΙ ΑΣΚΗΣΕΙΣ, Κωδικός Βιβλίου στον Εύδοξο: 41957349, Συγγραφείς: Κ. ΚΑΡΥΜΠΑΚΑΣ, ISBN: 9789603571179, Διαθέτης (Εκδότης): Χριστίνα και Βασιλική Κορδαλή Ο.Ε.

Eudoxus

- Εισαγωγή στην ηλεκτρονική, Κωδικός Βιβλίου στον Εύδοξο: 12173, Συγγραφείς: Τόμπρας Γιώργος Σ., ISBN: 9789605311926, Διαθέτης (Εκδότης): ΔΙΑΥΛΟΣ Α.Ε. ΕΚΔΟΣΕΙΣ ΒΙΒΛΙΩΝ
- Ηλεκτρονική, 9η Έκδοση, Κωδικός Βιβλίου στον Εύδοξο: 122079196, Συγγραφείς: Malvino A., Bates D., Hoppe P., ISBN: 9786182210277, Διαθέτης (Εκδότης): ΕΚΔΟΣΕΙΣ Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε.
- Μικροηλεκτρονικά Κυκλώματα, 8η Έκδοση, Κωδικός Βιβλίου στον Εύδοξο: 133045556, Συγγραφείς: Sedra Adel, Smith Kenneth, Carusone Chan Tony, Gaudet Vincent, ISBN: 9789604911875, Διαθέτης (Εκδότης): Α. ΠΑΠΑΣΩΤΗΡΙΟΥ & ΣΙΑ Ι.Κ.Ε.

COURSE OUTLINE: ENVIRONMENTAL PHYSICS

1. **GENERAL**

SCHOOL	OF SCIENCES		
DEPARTMENT	OF PHYSICS		
LEVEL OF STUDIES	Level 6		
COURSE CODE	Y405-2023	**SEMESTER**	4th
COURSE TITLE	ENVIRONMENTAL PHYSICS		
TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*		**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
LECTURES		3	4
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.			
COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	Scientific Area/Special Background		
PREREQUISITES:	-		
TEACHING & EXAMINATION LANGUAGE:	Greek		
COURSE OFFERED TO ERASMUS STUDENTS:	No		
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS247/		

2. **LEARNING OUTCOMES**

Learning Outcomes *Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.*
The purpose of the course is to provide the student with knowledge for understanding the physical principles and phenomena of the natural environment. Upon successful completion of the course, the student will be able to: • Have an overview of the phenomena of the Earth's climate system. • Interpret and draw qualitative conclusions about the propagation of radiation in the Earth's atmosphere and the greenhouse effect. • Be able, based on a small number of laws and concepts, to calculate the temperature on the Earth's surface and the influence of the atmosphere on it. • Have a general overview of the pollution problem (main pollutants, primary and secondary pollution sources, pollutant diffusion/dispersion, pollutant removal). • Have an overview of the dispersion of pollutants due to atmospheric movements, as well as the processes for removing pollutants from the atmosphere.

General Skills	
Name the desirable general skills upon successful completion of the module	
Search, analysis and synthesis of data and information, *ICT Use* *Adaptation to new situations* *Decision making* *Autonomous work* *Teamwork* *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*	*Project design and management* *Equity and Inclusion* *Respect for the natural environment* *Sustainability* *Demonstration of social, professional and moral responsibility and sensitivity to gender issues* *Critical thinking* *Promoting free, creative and inductive reasoning*
• Search, analysis and synthesis of data and information, using the necessary technologies. • Autonomous work. • Respect for the natural environment. • Promotion of free, creative and inductive thinking.	

3. COURSE CONTENT

Introduction to Atmospheric Physics, structure, composition of the atmosphere.
Solar radiation, propagation of solar radiation.
Greenhouse effect, global climate change.
Air pollution, meteorology, interaction of pollutants with the environment.
Atmospheric changes.
Stability – Instability of the atmosphere.
Mean and large-scale motions and influence on the dispersion of pollutants.
Boundary layer.
Models of transport, diffusion, and deposition of pollutants.
Effects of pollution on health and the environment.
Hydrological cycle and water pollution.
Physics and pollution of the soil.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face-to-face.
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Use of ICT in Teaching. Use of ICT in Communication with students.
TEACHING ORGANIZATION *The ways and methods of teaching are described in detail.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical*	

Activity	***Workload/semester***
Lectures	80
Self-study	20
Course total (25	**100**

Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc. *The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.*	hours / ECTS)
STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report,Clinical examination of a patient,Artistic interpretation, Other/Others* *Please indicate all relevant information about the course assessment and how students are informed*	**Student Assessment Languages** Greek **Methods (Formative or Concluding)** Concluding **Student Assessment Methods** **Percentage** Written Exam with Problem Solving 100

5. SUGGESTED BIBLIOGRAPHY

- Π. Κασσωμένος, «Φυσική Περιβάλλοντος», 1η Έκδοση, ΕΚΔΟΣΕΙΣ ΚΛΕΙΔΑΡΙΘΜΟΣ ΕΠΕ, 2017.
- Σ. Καραθανάσης, «Ατμοσφαιρική ρύπανση», 1η Έκδοση, ΕΚΔΟΣΕΙΣ Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε., 2006.
- Θ. Κουϊμτζής, Κ. Φυτιάνος, Κ. Σαμαρά – Κωνσταντίνου, Δ. Βουτσά, «Έλεγχος ρύπανσης περιβάλλοντος», 1η Έκδοση, Εκδόσεις University Studio Press Α.Ε., 2004.
- G. M. MASTERS, W. P. ELA, «Εισαγωγή στην Περιβαλλοντική Μηχανική και Επιστήμη», 3η Αμερικανική Έκδοση, ΕΚΔΟΣΕΙΣ ΚΛΕΙΔΑΡΙΘΜΟΣ Ε.Π.Ε., 2018.
- G. T. Miller, S. E. Spoolman, D. M. Andrews-Brown, «Περιβαλλοντική Επιστήμη», Επιστ. Επιμέλεια: Π. Δημητρακόπουλος, Κ. Γαβριλάκης, 17η Έκδοση, ΕΚΔΟΣΕΙΣ Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε., 2025.

COURSE OUTLINE

1. GENERAL

SCHOOL	OF SCIENCES		
DEPARTMENT	OF PHYSICS		
LEVEL OF STUDIES	Level 6		
COURSE CODE	E406-2023	**SEMESTER**	4th
COURSE TITLE	Physics Teaching		
TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*		**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
LECTURES		3	4
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.			
COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	Scientific Area, Skill Development		
PREREQUISITES:	-		
TEACHING & EXAMINATION LANGUAGE:	GREEK		
COURSE OFFERED TO ERASMUS STUDENTS:	NO		
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS216/		

2. LEARNING OUTCOMES

Learning Outcomes

Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

The course introduces key principles and methods in physics education. Through the study of research in physics education, students become familiar with contemporary approaches that promote the active engagement of learners in the teaching and learning process. Emphasis is placed on identifying students' learning difficulties and exploring ways to support them within collaborative learning environments. The course also focuses on the transformation of scientific knowledge into forms appropriate for school instruction, enabling students to develop meaningful understanding of scientific concepts.

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

- identify and apply appropriate strategies for promoting the active engagement of students in the learning process
- investigate, recognize, and address students' learning difficulties in classroom practice
- utilize research in physics education to identify and select contemporary instructional approaches, methods, and teaching practices
- design and organize instructional scenarios using a variety of approaches to knowledge construction

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use
Adaptation to new situations
Decision making
Autonomous work
Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues

Teamwork *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*	*Critical thinking* *Promoting free, creative and inductive reasoning*
• *Search, analysis and synthesis of data and information with the use of the necessary technology* • *Autonomous work* • *Teamwork* • *Critical thinking* • *Promoting free, creative and inductive reasoning*	

3. COURSE CONTENT

Contemporary learning theories and approaches in physics education. Expected learning outcomes from the teaching of physics. Active learning environments and ways of implementing them in classroom practice. Investigation of students' alternative conceptions during the teaching and learning process. Design and development of instructional approaches and the factors that influence them. Evaluation of teaching and the role of feedback. Basic principles for the development of instructional scenarios aimed at supporting students' knowledge construction.

1. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face to Face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Use of ICT in Teaching Use of ICT in Communication with students
TEACHING ORGANIZATION *The ways and methods of teaching are described in detail.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.* *The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.*	

Activity	*Workload/semester*
Lectures	50
Tutoring	0
Interactive learning	20
Written assignment	20
Study	10
Course total (25 hours / ECTS)	**100**

STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report,Clinical examination of a patient,Artistic interpretation, Other/Others*	**Student Assessment Languages** Greek **Methods (Formative or Concluding)** Formative

Student Assessment Methods	**Percentage**
Written Assignment	10%
Written Exams	90%

Please indicate all relevant information about the course assessment and how students are informed	

2. SUGGESTED BIBLIOGRAPHY

1. Πέντε Εύκολα Μαθήματα, Στρατηγικές για την επιτυχή διδασκαλία της Φυσικής, Ranndall D. Night, εκδόσεις Δίαυλος
2. Οδηγός Διδασκαλίας της Φυσικής, Arnold B. Arons, Εκδόσεις Τροχαλία

COURSE OUTLINE

1. GENERAL

SCHOOL			
DEPARTMENT	DEPARTMENT OF PHYSICS		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE	E407-2023	**SEMESTER**	4th Semester
COURSE TITLE	History and Evolution of Ideas in Physics		

TEACHING ACTIVITIES If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
	3	0.0

COURSETYPE Background, General Knowledge, Scientific Area, Skill Development	General Knowledge
PREREQUISITES	
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	YES
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS214/

2. LEARNING OUTCOMES

Learning Outcomes Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.
1. The understanding from the perspective of students of the evolutionary process of shaping the concepts of science. 2. The understanding from the perspective of the conditions of development of scientific knowledge, the role of the individual and the collective in this process. 3. The historical development of fundamental theories of physics (Mechanics - Thermodynamics - Quantum Mechanics and Theory of Relativity).

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use,Adaptation to new situations,
Decision making,
Autonomous work,
Teamwork,
Working in an international environment,
Working in an interdisciplinary environment, Production of new research ideas
Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking
Promoting free, creative and inductive reasoning

Search, analysis and synthesis of data and information, ICT Use
Autonomous work
Teamwork
Production of new research ideas
Critical thinking
Promoting free, creative and inductive reasoning

3. COURSE CONTENT

1. Why do we study the historical development of physics concepts?
2. Objective conditions of historical development.
3. Factors that influence the historical development of physics concepts.
4. The role of the scientist in the development of science.
5. The history of Mechanics.
6. The history of Thermodynamics.
7. The history of Quantum Mechanics.
8. The history of the Theory of Relativity.
9. Elements of the history of Astronomy.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD Face to face, Distance learning, etc.	Face to face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) Use of ICT in Teaching, in Laboratory Education, in Communication with students	Use of ICT in Teaching Use of ICT in Communication with students
TEACHING ORGANIZATION The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research& analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc. The supervised and unsupervised workload per activity is indicated here, so that total workload per semester	

Activity	Workload/semester
Lectures	39
Writing project	30
Bibliographic research & analysis	31
Total	**100**

complies to ECTS standards	
STUDENT EVALUATION Description of the evaluation process Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others Please indicate all relevant information about the course assessment and how students are informed	**Student evaluation languages** Greek English **Method (Formative or Concluding)** Formative **Student evaluation methods** — **Rate** Essay / Report — 100

5. Suggested Bibliography

ΙΣΤΟΡΙΑ ΚΑΙ ΕΞΕΛΙΞΗ ΤΩΝ ΙΔΕΩΝ ΣΤΗ ΦΥΣΙΚΗ, ΒΑΡΒΟΓΛΗΣ ΧΑΡΗΣ

Ιστορία της φυσικής, Segre Emilio

Μια σύντομη ιστορία της Φυσικής, J. L. Heilbron

Eudoxus

Βιβλίο [11433]: Η Ιστορία των Ιδεών στη Φυσική, Τσιλίκας Δημήτρης
Βιβλίο [94643777]: Μια σύντομη ιστορία της Φυσικής, J. L. Heilbron
Βιβλίο [12868007]: ΙΣΤΟΡΙΑ ΚΑΙ ΕΞΕΛΙΞΗ ΤΩΝ ΙΔΕΩΝ ΣΤΗ ΦΥΣΙΚΗ, ΒΑΡΒΟΓΛΗΣ ΧΑΡΗΣ
Βιβλίο [12190]: Ιστορία της φυσικής, Segre Emilio

COURSE OUTLINE

1. GENERAL

SCHOOL			
DEPARTMENT	DEPARTMENT OF PHYSICS		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE	E408-2023	**SEMESTER**	4th Semester
COURSE TITLE	Research Methodology		

TEACHING ACTIVITIES If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
	3	4.0

COURSETYPE Background, General Knowledge, Scientific Area, Skill Development	Background
PREREQUISITES	
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	YES
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS207/

2. LEARNING OUTCOMES

Learning Outcomes
Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

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

• Level 1 (Knowledge)
To know all types of publications and the rules that govern them.

• Level 2 (Comprehension)
To write academically, identifying and avoiding all forms of plagiarism.

• Level 3 (Application) & Level 4 (Analysis)
To review and edit academic texts.
To use reference management systems.
To check texts for potential plagiarism.

• Level 5 (Synthesis)
To create their own referencing styles or modify existing ones.

• Level 6 (Evaluation)
To assess academic assignments based on the academic criteria of various universities.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use,Adaptation to new situations,
Decision making,
Autonomous work,
Teamwork,
Working in an international environment,
Working in an interdisciplinary environment, Production of new research ideas
Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking
Promoting free, creative and inductive reasoning

Search, analysis and synthesis of data and information, ICT Use
Teamwork
Working in an interdisciplinary environment
Critical thinking

3. COURSE CONTENT

This course teaches students the principles of scientific writing using modern information technology tools.
In addition, it helps students better understand the requirements and guidelines for preparing and critically reviewing a scientific publication. Specifically, the course covers the following topics:

Proper literature review
Types of publications
Scientific electronic libraries
Smart search of scientific publications
Reference management systems
Plagiarism avoidance
Preparation of an article
Preparation of a thesis
Critical review of papers and presentations

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD Face to face, Distance learning, etc.	Face to face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) Use of ICT in Teaching, in Laboratory Education, in Communication with students	Use of ICT in Teaching Use of ICT in Communication with students

TEACHING ORGANIZATION
The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research& analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.

The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards

Activity	Workload/semester
Writing project	80
Lectures	40
Total	**120**

STUDENT EVALUATION
Description of the evaluation process

Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others

Please indicate all relevant information about the course assessment and how students are informed

Student evaluation languages
Greek

Method (Formative or Concluding)
Formative

Student evaluation methods	Rate
Written Assignment	100

5. Suggested Bibliography

M. Alley, The Craft of Scientific Writing, Springer, 1998.
R. Day, Scientific English: A Guide for Scientists and Other Professionals, Oryx Pr, 1992.

Eudoxus

E408-2023 "Ερευνητική Μεθοδολογία " 2024 4 Εαρινό 133151372 ΝΑΙ 122077689 Η Ερευνητική Μεθοδολογία στον Πραγματικό Κόσμο, 5η Έκδοση Gray David, Δελιάς Παύλος, Χατζόγλου Πρόδρομος (Επιστ. Επιμέλεια) 9786182210338 Τζιόλα 2023 5η Σύγγραμμα Σκληρό εξώφυλλο 21x29 760 56.03 ΟΧΙ
E408-2023 "Ερευνητική Μεθοδολογία " 2024 4 Εαρινό 133151373 ΝΑΙ 59383458 Εφαρμογές μεθοδολογίας επιστημονικής έρευνας Παράδειγμα: χρονολογική ηλικία και σχολική επίδοση Δανασσής-Αφεντάκης Αντώνιος, Δελλασούδας Λαυρέντιος 9789608028067 Δελλασούδας Λαυρέντιος 2004 3 Σύγγραμμα Μαλακό εξώφυλλο 14x21 432 12.96 ΟΧΙ

COURSE OUTLINE

1. GENERAL

SCHOOL	OF SCIENCES		
DEPARTMENT	OF PHYSICS		
LEVEL OF STUDIES	Level 6		
COURSE CODE	E410	**SEMESTER**	4°
COURSE TITLE	FOREIGN LANGUAGE (ENGLISH/FRENCH)		

TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
LECTURES	3	4
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	Special Background
PREREQUISITES:	-
TEACHING & EXAMINATION LANGUAGE:	GREEK
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS224/

2. LEARNING OUTCOMES

Learning Outcomes

Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

Students are expected to:

By the end of the course, students will have acquired sufficient knowledge of physical science, which will also be useful in their school courses. They will feel more confident and prepared in their field of specialization. They will acquire the necessary language skills and understand the usefulness of this language course so that they can apply them on a daily basis. They will be knowledgeable and articulate speakers, more confident in their specialized language, more organized, and ready for linguistic challenges after consolidating and strengthening the desired vocabulary they learned during the course series they attended.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use
Adaptation to new situations
Decision making
Autonomous work
Teamwork
Working in an international environment
Working in an interdisciplinary environment
Production of new research ideas
Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking
Promoting free, creative and inductive reasoning

- *Applying knowledge in practice*
- *Autonomous work*

- *Teamwork*

3. COURSE CONTENT

The course focuses on teaching texts in the specific subject area. Students become familiar with English/French academic discourse in their field of study and, more specifically, understand the lexical and syntactic structures found in scientific texts (e.g., textbooks, research articles, and journals). They develop skills in understanding written scientific discourse with an emphasis on enriching their vocabulary and producing written and spoken discourse. Classroom interaction is of paramount importance as it involves discussion and dialogue on scientific topics. The course offers students the opportunity to refresh their broad knowledge base and express ideas and challenges in the language of their specialization.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face to Face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Use of ICT in Teaching Use of ICT in Communication with students
TEACHING ORGANIZATION *The ways and methods of teaching are described in detail.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.* *The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.*	

Activity	*Workload/semester*
Lectures	80
Self study	20
Course total (25 hours / ECTS)	**100**

STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report,Clinical examination of a patient,Artistic interpretation, Other/Others* *Please indicate all relevant information about the course assessment and how students are informed*	**Methods** Concluding

Student Assessment Methods	**Percentage**
Writing short projects	30%
Written Exam with Problem Solving	70%

5. SUGGESTED BIBLIOGRAPHY

- Suggested bibliography:
- Related academic journals:

- Lexicon, Βασιλειάδου - Ζάχου Μαρία - Αφροδίτη,Δημέλη - Κωνσταντίνου Φρειδερίκη, Στεπανιάν Μπερτς, Φίνογλου - Χαρσούλη Ευθαλία
- Αγγλο-ελληνικό λεξικό φυσικών όρων, Παπαγιαννακόπουλος Π.
- Conseil de l'Europe/Strasbourg, Cadre européen commun de référence pour les langues : apprendre, enseigner, évaluer, Conseil de l'Europe : Division des langues vivantes, 2001
- Beacco, J.-C., Niveau B1 pour le français ; Un référentiel, Conseil de l'Europe, éd. Didier, 2011
- Caillier J. & Borg S. (Eds.), Forum Mondial Héraclès, Université de Perpignan Via Domitia. Actes du Colloque. Le français sur objectifs universitaires. Synergies Monde, 8(2), 2011
- Parpette, C., « Les discours académiques oraux : évolution des représentations et des stratégies d'enseignement en FLE. » Le français dans le monde : recherches et applications. Quel oral enseigner cinquante ans après le Français fondamental ? Paris : CLE international FIPF, 2008
- Deschepper, C., Acculturation aux discours universitaires : poser les variables de l'intervention didactique, Diptyque, 18, 93-126, 2010
- Eurin-Balmet S. ; Henao de Legge M., Pratiques du français scientifique, Hachette FLE, Paris, 1992

COURSE OUTLINE

1. GENERAL

SCHOOL			
DEPARTMENT	DEPARTMENT OF PHYSICS		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE	Y501-2023	**SEMESTER**	5th Semester
COURSE TITLE	Theoretical Mechanics I		

TEACHING ACTIVITIES If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
	3	5.0

COURSETYPE Background, General Knowledge, Scientific Area, Skill Development	Scientific Area
PREREQUISITES	Calculus I and II Differential Equations
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS260/

2. LEARNING OUTCOMES

Learning Outcomes Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.
Theoretical Mechanics I covers the fundamentals of Classical Mechanics using Newton's laws. Upon successful completion of the course, the student will have acquired knowledge about the properties of Newtonian gravity and dynamics. They will delve into the study of modern problems of Physics with qualitative-geometric methods, be able to describe the motion of bodies in various coordinate systems, write the equations of motion and solve these differential equations and determine the motion as a function of time and apply qualitative methods to the study of various topics, such as finding the limits of motion or the stability of equilibrium points with the help of integrals of motion and phase diagrams.

General Skills	
Name the desirable general skills upon successful completion of the module	
Search, analysis and synthesis of data and information, ICT Use,Adaptation to new situations, Decision making, Autonomous work, Teamwork, Working in an international environment, Working in an interdisciplinary environment, Production of new research ideas	Project design and management Equity and Inclusion Respect for the natural environment Sustainability Demonstration of social, professional and moral responsibility and sensitivity to gender issues Critical thinking Promoting free, creative and inductive reasoning
Autonomous work Production of new research ideas Promoting free, creative and inductive reasoning	

3. COURSE CONTENT

• Newtonian Mechanics: Axioms. Laws of Dynamics and Vector Differential Equations of Motion. Conservation Laws.
• Motion in Inertial and Non-Inertial Reference Systems: Hypothetical Forces and DE of Motion. Examples.
• Coordinate Systems: Expression of Differential Equations of Motion in Cartesian, Polar and Sperical Coordinates. Examples.
• Dynamics: Equilibrium Solutions and Stability Characterisation. Study of Conservative Systems of 1 Degree of Freedom (D.o.F.). Phase Diagrams.
• Applications to 1 D.o.F. Systems: Harmonic Oscillator, Simple Pendulum, Systems with Friction, Forced Oscillations.
• Central Forces: Conservation of Angular Momentum. Potential and Study of the Equivalent System of 1 D.o.F.
• Solving the equations of motion in basic fields of central forces in Physics: e.g. gravitational forces, Coulomb, Yukawa.
• Two-body problem. Kinematics of point masses.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD Face to face, Distance learning, etc.	Face to face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) Use of ICT in Teaching, in Laboratory Education, in Communication with students	Use of ICT in Teaching Use of ICT in Communication with students
TEACHING ORGANIZATION The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research& analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc. The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards	

Activity	Workload/semester
Interactive learning	39
Bibliographic research & analysis	86
Total	**125**

STUDENT EVALUATION Description of the evaluation process Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others Please indicate all relevant information about the course assessment and how students are informed	**Student evaluation languages** Greek **Method (Formative or Concluding)** Summative **Student evaluation methods** **Rate**

5. Suggested Bibliography

Eudoxus

Βιβλίο [8787]: ΘΕΩΡΗΤΙΚΗ ΜΗΧΑΝΙΚΗ ΤΟΜΟΣ Α', ΧΑΤΖΗΔΗΜΗΤΡΙΟΥ ΙΩΑΝΝΗΣ
Βιβλίο [33153244]: ΘΕΩΡΗΤΙΚΗ ΜΗΧΑΝΙΚΗ, ΧΑΤΖΗΔΗΜΗΤΡΙΟΥ ΙΩΑΝΝΗΣ
Βιβλίο [22695091]: ΚΛΑΣΙΚΗ ΜΗΧΑΝΙΚΗ, KIBBLE, T.W.B. & BERKSHIRE, F.H.

COURSE OUTLINE

1. GENERAL

SCHOOL			
DEPARTMENT	DEPARTMENT OF PHYSICS		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE	Y502-2023	**SEMESTER**	5th Semester
COURSE TITLE	Electronics Laboratory		

TEACHING ACTIVITIES If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
		4.0

COURSETYPE Background, General Knowledge, Scientific Area, Skill Development	Skill Development
PREREQUISITES	GENERAL PHYSICS II ELECTRONICS ELECTRICAL CIRCUITS
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	YES
COURSE URL:	https://exams.emt.ihu.gr/courses/PHYSICS218/

2. LEARNING OUTCOMES

Learning Outcomes
Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

The aim and objective of the course are:
the consolidation in practice of the knowledge about General Electronics, which has already been taught in the previous semester and the cultivation of the skills required for the implementation and experimental study of electronic circuits.

The main laboratory modules are:
• Diode circuits.
• Circuits with BJT and FET Transistors.
• Circuits with operational amplifiers and Circuits for implementing basic digital elements.

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

● To recognize and distinguish in practice basic electronic elements and circuits, as well as to be able to understand their function.
● To calculate characteristic sizes of electronic components, to polarize appropriately taking into account design frauds and also to find the characteristics of an electronic component.
● To be able to practically build an electronic circuit.
● Be able to use instruments and laboratory devices to take measurements from electronic circuits.
● To confirm the correct operation of an electronic circuit by combining experimental data with theoretical circuit analysis and the critical use of simulation programs.
● To learn and read data sheets of electronic components.
● Identify errors in simple electronic components and electronic circuits and be able to provide solutions for their repair.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use,Adaptation to new situations,
Decision making,
Autonomous work,
Teamwork,
Working in an international environment,
Working in an interdisciplinary environment, Production of new research ideas
Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking
Promoting free, creative and inductive reasoning

Search, analysis and synthesis of data and information, ICT Use
Decision making
Autonomous work
Teamwork
Project design and management
Critical thinking
Promoting free, creative and inductive reasoning

3. COURSE CONTENT

● Methodology and application of electronic circuit measurements.
● Diodes and electronic diode circuits.
● Bipolar Contact Transistors – BJTs (switch circuits and amplifier circuits).
● Field Effect Transistor – FET (characteristics and circuits).
● Operational amplifiers (characteristic and basic amplifier circuits).
● Elements of digital circuits (Boolean algebra, switching circuits, implementation of logic gates).

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD Face to face, Distance learning, etc.	Face to face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) Use of ICT in Teaching, in Laboratory Education, in Communication with students	Use of ICT in Teaching Use of ICT in Laboratory Education Use of ICT in Communication with students

TEACHING ORGANIZATION

The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research& analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.

The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards

Activity	Workload/semester
Laboratory Exercise	39
Writing project	50
Bibliographic research & analysis	11
Total	**100**

STUDENT EVALUATION

Description of the evaluation process

Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others

Please indicate all relevant information about the course assessment and how students are informed

Student evaluation languages

Greek
English

Method (Formative or Concluding)

Formative

Student evaluation methods	Rate
Written Assignment	50
Oral Exams	50

5. Suggested Bibliography

Εργαστηριακές Ασκήσεις Ηλεκτρονικής, (Θεοδωρίδης, Σίσκος, Κοσματόπουλος, Λαόπουλος, Νικολαϊδης, Παπαθανασιου)

Eudoxus

Βιβλίο [320086]: ΕΡΓΑΣΤΗΡΙΑΚΟΣ ΟΔΗΓΟΣ ΚΑΙ ΑΣΚΗΣΕΙΣ ΗΛΕΚΤΡΟΝΙΚΗΣ, ΝΙΣΤΑΖΑΚΗΣ ΕΚΤΟΡΑΣ
Βιβλίο [2785]: ΕΡΓΑΣΤΗΡΙΑΚΕΣ ΑΣΚΗΣΕΙΣ ΗΛΕΚΤΡΟΝΙΚΗΣ, Γ. ΘΕΟΔΩΡΙΔΗΣ, Κ. ΚΟΣΜΑΤΟΠΟΥΛΟΣ, Θ. ΛΑΟΠΟΥΛΟΣ, Σ. ΝΙΚΟΛΑΪΔΗΣ, Κ. ΠΑΠΑΘΑΝΑΣΙΟΥ, Σ. ΣΙΣΚΟΣ
Βιβλίο [77117465]: Εργαστηριακές Ασκήσεις Βασικών Ηλεκτρονικών,Οδηγός από Μικροηλεκτρονικά Κυκλώματα,7η έκδοση των Sedra/Smith, Gaudet Vincent C., Smith Kenneth C.
Βιβλίο [77117449]: Εισαγωγικό Εργαστήριο Κυκλωμάτων και Ηλεκτρονικής, Τσιβίδης Γιάννης

COURSE OUTLINE

1. GENERAL

SCHOOL	OF SCIENCES		
DEPARTMENT	OF PHYSICS		
LEVEL OF STUDIES	Level 6		
COURSE CODE	YS03-2023	**SEMESTER**	5º
COURSE TITLE	OPTICS LABORATORY		

TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
LECTURES	3	4
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	Scientific Field (Specialized Background)
PREREQUISITES:	-
TEACHING & EXAMINATION LANGUAGE:	GREEK
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS227/

2. LEARNING OUTCOMES

Learning Outcomes

Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

This course aims to familiarize students with the wave nature of light through experiments that highlight this nature, with an emphasis on Polarization, Interference, and Diffraction experiments. Upon successful completion of the course, the student will be able to:

- Perform light interference and diffraction experiments
- Detect the various states of Light Polarization and produce Polarized light in various ways.
- Construct Holograms

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use
Adaptation to new situations
Decision making
Autonomous work
Teamwork
Working in an international environment
Working in an interdisciplinary environment
Production of new research ideas
Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking
Promoting free, creative and inductive reasoning

- *Search for, analysis and synthesis of data and information, with the use of the necessary*

technology
- *Decision-making*
- *Working independently*
- *Working in an international environment*
- *Production of new research ideas*

3. COURSE CONTENT

Standing Waves. Polarization Phenomena – Study of Spectra. Production of linear, circular, and elliptically polarized light. Malus's Law. Birefringent crystal.
Interference Phenomena – Interferometric Setups. Diffraction Phenomena – Fraunhofer and Fresnel diffraction from monochromatic sources and natural light sources from various apertures. Holographic Setup.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face to Face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Use of ICT in Teaching Use of ICT in Communication with students
TEACHING ORGANIZATION *The ways and methods of teaching are described in detail.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.* *The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.*	

Activity	*Workload/semester*
Laboratory Exercise	100
Course total (25 hours / ECTS)	**100**

STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report,Clinical examination of a patient,Artistic interpretation, Other/Others* *Please indicate all relevant information about the course assessment and how students are informed*	**Student Assessment Languages** Greek **Methods (Formative or Concluding)** Concluding

Student Assessment Methods	**Percentage**
Laboratory Work	100

5. SUGGESTED BIBLIOGRAPHY

"Optics Laboratory Topics", Angelakeris Mavroeidis, Arvanitidis Ioannis, Vanidis Evangelos, Ves Sotirios, Viga Eleni, Vouroutzis Nikolaos, Gioti Maria, Katsikini Maria, PUBLISHER: ZITI, Book Code in Eudoxus: 22768467

COURSE OUTLINE

1. GENERAL

SCHOOL	OF SCIENCES		
DEPARTMENT	OF PHYSICS		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	Y504	**SEMESTER**	5ο
COURSE TITLE	QUANTUM MECHANICS I		

TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
LECTURES	4	5
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	Scientific Area
PREREQUISITES:	-
TEACHING & EXAMINATION LANGUAGE:	GREEK
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://eclass.emt.duth.gr/courses/

2. LEARNING OUTCOMES

Learning Outcomes

Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

Upon successful completion of the course, students will be able to: understand the fundamental concepts, principles, and laws of Quantum Mechanics, including wave–particle duality, the Schrödinger equation, the uncertainty principle, and their applications. To demonstrate knowledge of model quantum systems such as potential wells, the harmonic oscillator, and the hydrogen atom. To apply this knowledge to the solution of related complex problems and develop critical thinking skills to evaluate, analyze, and interrelate quantum mechanical principles and their implications.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use
Adaptation to new situations
Decision making
Autonomous work
Teamwork
Working in an international environment
Working in an interdisciplinary environment
Production of new research ideas
Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking
Promoting free, creative and inductive reasoning

- Application of knowledge in practice
- Exercise of critical and self-critical thinking
- Promotion of free, creative, and inductive thinking

3. COURSE CONTENT

Wave–particle duality of light and matter; statistical interpretation of the Schrödinger equation; uncertainty principle; vector spaces; linear operators; algebra of quantum mechanical operators; Dirac notation; simple quantum systems; three-dimensional problems: quantization of a particle in a box; central potentials; hydrogen atom.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face to Face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Use of ICT in Teaching Use of ICT in Communication with students
TEACHING ORGANIZATION *The ways and methods of teaching are described in detail.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.* *The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.*	

Activity	*Workload/semester*
Lectures	100
Tutorial	25
Course total (25 hours / ECTS)	**125**

STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report,Clinical examination of a patient,Artistic interpretation, Other/Others* *Please indicate all relevant information about the course assessment and how students are informed*	Final written examination (100%) (use of notes is not permitted).

5. SUGGESTED BIBLIOGRAPHY

- Suggested bibliography:
- Related academic journals:

- *Quantum Mechanics I*, S. Trachanas, ITE/PEK
- *Quantum Mechanics*, N. Zettili, Sophia Publications
- *Quantum Physics*, S. Gasiorowicz, Kleidarithmos Publications

COURSE OUTLINE

1. GENERAL

SCHOOL	OF SCIENCES		
DEPARTMENT	OF PHYSICS		
LEVEL OF STUDIES	Level 6		
COURSE CODE	Y505-2023	**SEMESTER**	5ο
COURSE TITLE			

TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
LECTURES	4	6
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	Scientific Area (Special Background)
PREREQUISITES:	-It is desirable for students to have attended the following: • Electromagnetism I • Atomic and Molecular Physics • Thermodynamics • Waves and Optics
TEACHING & EXAMINATION LANGUAGE:	GREEK
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://physics.duth.gr/?page_id=4652

2. LEARNING OUTCOMES

Learning Outcomes

Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

- The course provides students with the knowledge required to understand the basic concepts and methods of solid state physics, starting from the microscopic structure of matter.
- Upon successful completion of the course, students will be able to:
- Understand the crystalline structure of solid matter, particularly the concepts of crystal lattice, unit cell, reciprocal lattice, and the principles of diffraction from periodic structures, with applications to simple crystal structures.
- Mathematically describe lattice vibrations, optical and acoustic branches, and understand the concept of phonons.
- Understand the formation of energy bands and distinguish materials as metals, semiconductors, or insulators.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use
Adaptation to new situations
Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability

Decision making *Autonomous work* *Teamwork* *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*	*Demonstration of social, professional and moral responsibility and sensitivity to gender issues* *Critical thinking* *Promoting free, creative and inductive reasoning*

- **Skills developed:**
- Ability to apply this knowledge to solve related complex problems.
- Ability for critical thinking, analysis, and evaluation of these concepts.
- Ability to interpret phenomena from everyday life.
- A **General Competences:**
- Search, analysis, and synthesis of data and information using the necessary technologies.
- Adaptation to new situations.
- Decision-making.
- Independent work.
- Teamwork.
- Work in an international and interdisciplinary environment.
- Generation of new research ideas.
- Project design and management.
- Respect for diversity and multiculturalism.
- Respect for the natural environment.
- Demonstration of social, professional, and ethical responsibility and sensitivity to gender issues.
- Exercise of criticism and self-criticism.
- Promotion of free, creative, and inductive thinking.

- COURSE CONTENT

Bravais lattices, Unit cell, Reciprocal lattice, Diffraction from periodic structures, Bragg's law, Lattice vibrations: optical and acoustic branches, Phonons, Density of states, specific heat, thermal conductivity, Band structure: free and nearly free electrons, effective electron mass, Bloch theorem, metals, conductivity, energy density of states, valence and conduction bands. Semiconductors: intrinsic and extrinsic, impurities, holes, donors, acceptors, traps. Optical properties of solids.

3. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face to Face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Use of ICT in Teaching Use of ICT in Communication with students
TEACHING ORGANIZATION *The ways and methods of teaching are described in detail.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.*	

Activity	*Workload/semester*
Lectures	150
Self study	
Course total (25 hours / ECTS)	**150**

The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.	
STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report,Clinical examination of a patient,Artistic interpretation, Other/Others* *Please indicate all relevant information about the course assessment and how students are informed*	**Student Assessment Languages** Greek **Methods (Formative or Concluding)** Formative **Student Assessment Methods** — **Percentage** Written Exam with Problem Solving — 100

4. SUGGESTED BIBLIOGRAPHY

- *Solid State Physics (Introduction to the Principles of Materials Science)*, Harald Ibach & Hans Lüth, trans. S. Ves, Ziti Publications, Eudoxus Book Code: 12583778.

- *Introduction to Solid State Physics*, C. Kittel, Scientific and Technological Editions A.G. Pneumatikos, Eudoxus Code: 6847.

- *Solid State Physics*, Ashcroft & Mermin, Eudoxus Code: 22768829.

- *Solid State Physics*, Hofman, A. Papazisis Publications, Eudoxus Code: 94700247.

COURSE OUTLINE

1. GENERAL

SCHOOL			
DEPARTMENT	DEPARTMENT OF PHYSICS		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE	E506-2023	**SEMESTER**	5th Semester
COURSE TITLE	Basic telemetry applications		

TEACHING ACTIVITIES If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
	3	3.0

COURSETYPE Background, General Knowledge, Scientific Area, Skill Development	Skill Development
PREREQUISITES	
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS217/

2. LEARNING OUTCOMES

Learning Outcomes Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.
null

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use,Adaptation to new situations,
Decision making,
Autonomous work,
Teamwork,
Working in an international environment,
Working in an interdisciplinary environment, Production of new research ideas
Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking
Promoting free, creative and inductive reasoning

Search, analysis and synthesis of data and information, ICT Use
Autonomous work

3. COURSE CONTENT

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD
Face to face, Distance learning, etc.

Face to face

USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT)
Use of ICT in Teaching, in Laboratory Education, in Communication with students

Use of ICT in Teaching
Use of ICT in Laboratory Education

TEACHING ORGANIZATION
The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research& analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.

The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards

Activity	Workload/semester
Lectures	50
Internship (Placement)	25
Total	**75**

STUDENT EVALUATION
Description of the evaluation process

Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others

Student evaluation languages
Greek

Method (Formative or Concluding)
Formative

Student evaluation methods	Rate
Written exam with multiple choice test	70
Written Assignment	30

Please indicate all relevant information about the course assessment and how students are informed	

5. Suggested Bibliography

ΠΡΟΓΡΑΜΜΑΤΙΖΟΝΤΑΣ ΜΕ ΤΟΝ ΜΙΚΡΟΕΛΕΓΚΤΗ ARDUINO ΑΝΟΙΧΤΗ ΒΙΒΛΙΟΘΗΚΗ (https://www.openbook.gr/programmatizontas-me-ton-mikroelegkti-arduino/)

Eudoxus

1) ARDUINO: ΑΛΓΟΡΙΘΜΙΚΗ, ΠΡΟΓΡΑΜΜΑΤΙΣΜΟΣ ΚΑΙ ΕΦΑΡΜΟΓΕΣ
Κωδικός βιβλίου στον Εύδοξο : 102070452, ISBN : 9789606451744
Συγγραφείς: ΑΡΙΣΤΕΙΔΗΣ Σ. ΜΠΟΥΡΑΣ, ΓΙΑΝΝΗΣ Θ. ΚΑΠΠΟΣ
Εκδόσεις: ΕΚΔΟΣΕΙΣ ΚΛΕΙΔΑΡΙΘΜΟΣ ΕΠΕ

2) Ανάπτυξη Εφαρμογών με το Arduino, 3η Έκδοση
Κωδικός βιβλίου στον Εύδοξο : 102071811, ISBN : 9789604189373
Συγγραφείς: Παπάζογλου Παναγιώτης, Λιωνής Σπύρος-Πολυχρόνης
Εκδόσεις: ΤΖΙΟΛΑ

COURSE OUTLINE

1. GENERAL

SCHOOL			
DEPARTMENT	DEPARTMENT OF PHYSICS		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE	E507-2023	**SEMESTER**	5th Semester
COURSE TITLE	New Technologies in Education and Online Teaching of Physical Sciences		

TEACHING ACTIVITIES If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
	3	0.0

COURSETYPE Background, General Knowledge, Scientific Area, Skill Development	General Knowledge
PREREQUISITES	
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS219/

2. LEARNING OUTCOMES

Learning Outcomes
Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

the course is aimed at undergraduate students, over 2nd year, who have a very good
training in the basic knowledge of the positive sciences. It provides the student with the necessary
skills required for the effective use of new technologies (PC, Internet,
projectors, interactive boards, etc.) in the educational process. All of the above is happening
understandable with examples and exercises implemented in the Electronics labs
Computer. In the final stage, the homework student develops a complete
online course, using as many tools as possible than what he has
be taught. The aim of the course is for students to practice online teaching
courses and in the explanation of the material through the possibilities offered by modern technology
technology. In addition, he answers questions from students watching online
lesson through the corresponding online discussion environment.
In particular, after the successful completion of the course, the student will be able to:

Uses simulations and multimedia to teach advanced concepts Effectively uses the internet and its applications in education procedure Uses multimedia and presentation application creation software Creates and posts courses on the World Wide Web.
General Skills Name the desirable general skills upon successful completion of the module Search, analysis and synthesis of data and information, ICT Use,Adaptation to new situations, Decision making, Autonomous work, Teamwork, Working in an international environment, Working in an interdisciplinary environment, Production of new research ideas Project design and management Equity and Inclusion Respect for the natural environment Sustainability Demonstration of social, professional and moral responsibility and sensitivity to gender issues Critical thinking Promoting free, creative and inductive reasoning
Search, analysis and synthesis of data and information, ICT Use Decision making Working in an interdisciplinary environment Critical thinking Promoting free, creative and inductive reasoning

3. COURSE CONTENT

Theoretical Part of the Course I. II. Introduction to New Technologies in Education. Historical data, basic knowledge of the operation and use of the Internet (internet) and World Wide Web (www). III. Delimitations of the cognitive and methodological framework of New Technologies in Education. IV. V. VI. VII. VIII. IX. X. XI. XII. Necessity, purposes and reason for existence of New Technologies in Education. The course of development of New Technologies in Education at an international level Educators and New Technologies in Education. Application of New Technologies in Education. Pedagogical relationship of New Technologies in Education. Using simulations and multimedia to teach advanced concepts. Software for creating multimedia applications, presentations and analytical calculations. The internet in the educational process Post courses on the World Wide Web. XIII. Modern distance learning software (teleconferencing).

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD Face to face, Distance learning, etc.	Face to face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) Use of ICT in Teaching, in Laboratory Education, in	Use of ICT in Teaching Use of ICT in Communication with students

Communication with students	
TEACHING ORGANIZATION The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research& analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc. The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards	<table><tr><th>Activity</th><th>Workload/semester</th></tr><tr><td>Lectures</td><td>3</td></tr><tr><td>Total</td><td>3</td></tr></table>
STUDENT EVALUATION Description of the evaluation process Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others Please indicate all relevant information about the course assessment and how students are informed	**Student evaluation languages** Greek **Method (Formative or Concluding)** Formative **Student evaluation methods** — **Rate** Written Exam with Short Answer Questions — 100

5. Suggested Bibliography

The Digital Scholar: How Technology Is Transforming Scholarly Practice by Martin Weller - Bloomsbury Academic, 2011
2. The 2013 Free education technology resources textbook
3. http://www.humber.ca/centreforteachingandlearning/assets/files/Teaching%20Resources/2013_EmergingEdTech_Free-Education-Technology-Resources-eBook.pdf
4. 5. 6. 7. The Flipped Classroom Workshop in a Book by Kelly Walsh
Best Practices for Teaching with Emerging Technologies by Michelle Pacansky-Brock
E. Kastro, B. Hyslop, HTML5 και CSS3 με εικόνες, Κλειδάριθμος 2013
L. Lemay, R. Colburn, Πλήρες εγχειρίδιο της HTML και CSS, Γκιούρδας 2011

Eudoxus

Η Ερευνητική Μεθοδολογία στον Πραγματικό Κόσμο, 5η Έκδοση

COURSE OUTLINE

1. GENERAL

SCHOOL	OF SCIENCES		
DEPARTMENT	OF PHYSICS		
LEVEL OF STUDIES	Level 6		
COURSE CODE		**SEMESTER**	5ο
COURSE TITLE	Physics and Philosophy		

TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
LECTURES	3	3
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	Scientific Area
PREREQUISITES:	-
TEACHING & EXAMINATION LANGUAGE:	GREEK
COURSE OFFERED TO ERASMUS STUDENTS:	YES
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS224/

2. LEARNING OUTCOMES

Learning Outcomes

Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

Upon completion of the course, students will have a comprehensive understanding of the general problems encountered in physics and mathematical logic, and how these problems relate to philosophical considerations.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use
Adaptation to new situations
Decision making
Autonomous work
Teamwork
Working in an international environment
Working in an interdisciplinary environment
Production of new research ideas
Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking
Promoting free, creative and inductive reasoning

- Application of knowledge in practice.
- Adaptation to new situations.
- Teamwork.
- Work in an international environment.
- Work in an interdisciplinary environment.

- Respect for diversity and multiculturalism.
- Exercise of critical thinking and self-assessment.
- Promotion of free, creative, and inductive thinking.

3. COURSE CONTENT

Nature and Ancient Greek thought. The Ionian philosophers and the atomists. Plato's *Timaeus*. Mathematics, logic, and science. The programs of Russell and Frege. The Hubert–Brouwer controversy. Measuring the infinite with Cantor. Gödel's theorem. The limits of human cognition. Quantum mechanics. The uncertainty principle and the subject-object relationship. Bell inequalities. Quantum logic. Physics, metaphysics, and ontology. Anglo-Saxon epistemology (Popper, Kuhn, Feyerabend). Unity and diversity in nature. The search for meaning and the late Wittgenstein.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face to Face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Course material is organized and presented in PowerPoint slides. Support of the learning process through the electronic platform (e-class). Communication with students via email.
TEACHING ORGANIZATION *The ways and methods of teaching are described in detail.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.* *The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.*	

Activity	*Workload/semester*
Lectures	39
Preparation and writing of short papers or reports.	15
Study and analysis of relevant literature.	21
Course total (25 hours / ECTS)	**75**

STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report,Clinical examination of a patient,Artistic interpretation, Other/Others* *Please indicate all relevant information about the course assessment and how students are informed*	**Student Assessment Languages** Greek **Methods (Formative or Concluding)** Concluding

Student Assessment Methods	**Percentage**
Written examination with problem-solving:	50
Written assignments / coursework:	50
Total:	100

5. SUGGESTED BIBLIOGRAPHY

- Suggested bibliography:

- *Tsiantos, Vasilis, Everything is Numbers – The Positive Sciences Meet Philosophy, Tziola Editions, Thessaloniki, 2024.*
- *Brown, Harold I., Perception, Theory and Commitment: A New Philosophy of Science, Chicago University Press, 1977. Greek Edition: University of Crete Press.*
- *Baltas, Aristeidis, Stergiopoulos, Kostas (eds.), Philosophy and Sciences in the Twentieth Century, University of Crete Press.*

Additional Recommended Reading

- *Russell, Bertrand, History of Western Philosophy.*
- *Kinti, [Author], Philosophy of Science (Lecture Notes).*
- *Sakellariadis, [Author], Introduction to Philosophy of Science (Lecture Notes).*
- *Kalfas, [Author], Aristotelian Physics.*
- *Butterfield, Herbert, The Origins of Modern Science (1300–1800), Cultural Foundation of National Bank of Greece (M.I.E.T.).*
- *Gillispie, Charles C., On the Edge of Truth – The Evolution of Scientific Ideas from Galileo to Einstein, M.I.E.T.*
- *Harre, R. (ed.), Scientific Thought 1900–1960, M.I.E.T.*
- *Crombie, A.C., From Augustine to Galileo, M.I.E.T.*
- *Kirk, G.S., Raven, J.E., Schofield, M., The Presocratic Philosophers, M.I.E.T.*
- *Keisler, A., The Sleepwalkers (Pythagoras – Copernicus – Kepler – Galileo – Newton), Hatzinikolis Editions.*
- *Bernal, John D., Science in History, Zacharopoulos Editions.*
- *Bitsakis, Eftychis, Dialectics and Modern Physics, Iridanos Editions.*
- *Kuhn, T.S., The Structure of Scientific Revolutions, Contemporary Topics Editions.*
- *Heisenberg, W., Physics and Philosophy.*
- *Theodoridis, Charalampos, Introduction to Philosophy.*
- *Nietzsche, Friedrich, The Birth of Philosophy, Mari & Korontzi Editions.*
- *Wittgenstein, L., Tractatus Logico-Philosophicus, Papazisis Editions.*

COURSE OUTLINE

1. GENERAL

SCHOOL	OF SCIENCES		
DEPARTMENT	OF PHYSICS		
LEVEL OF STUDIES	Level 6		
COURSE CODE	Y601-2023	**SEMESTER**	6th
COURSE TITLE	Nuclear Physics		
TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*		**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
LECTURES		4	6
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.			
COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	Background		
PREREQUISITES:	-		
TEACHING & EXAMINATION LANGUAGE:	Greece		
COURSE OFFERED TO ERASMUS STUDENTS:	NO		
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS221/		

2. LEARNING OUTCOMES

Learning Outcomes

Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

The student is taught the fundamental principles of Nuclear Physics and elementary particles. Upon successful completion of the course, the student will have acquired:

- The ability to understand the structure of the nucleus, the phenomenon of radioactivity, α, β, and γ decays, fission and fusion, as well as the basic properties of elementary particles.
- The ability to apply this knowledge to solve related complex problems.
- The ability for critical thinking in order to evaluate, analyze, and correlate this knowledge.
- The ability to interpret phenomena encountered in everyday life.
- • The ability to develop collaboration with fellow students to solve problems related to this course.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use

Decision making
Autonomous work
Teamwork
Working in an international environment
Production of new research ideas

Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking
Promoting free, creative and inductive reasoning

- Search, analysis and synthesis of data and information
- Autonomous work

- Working in an international environment
- Working in an interdisciplinary environment

3. COURSE CONTENT

Properties of atomic nuclei. Interactions. Composition of nuclei, nuclear dimensions, and methods of their determination. Mass and binding energy of the nucleus. Nuclear forces and their characteristics. Yukawa potential. Nuclear models. Radioactivity. α-decay, fission, fusion. β-decay. γ-decay. Nuclear reactions. Fission and fusion. Introduction to Elementary Particles. The Standard Model — basic constituents. Feynman diagrams.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face to Face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Use of ICT in Teaching Use of ICT in Communication with students
TEACHING ORGANIZATION *The ways and methods of teaching are described in detail.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.* *The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.*	

Activity	*Workload/semester*
Lectures	75
Bibliographic research & analysis	10
Tutoring	25
Project	40
Course total (25 hours / ECTS)	**150**

STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report,Clinical examination of a patient,Artistic interpretation, Other/Others* *Please indicate all relevant information about the course assessment and how students are informed*	Student Assessment Languages Greek Methods (Formative or Concluding) Concluding Student Assessment Methods — Percentage Written Exam with Problem Solving — 40% Multiple Choice Test, Short Answer Questions — 30% Written Assignment — 30%

5. SUGGESTED BIBLIOGRAPHY

- ΕΙΣΑΓΩΓΗ ΣΤΗΝ ΠΥΡΗΝΙΚΗ ΦΥΣΙΚΗ, W.N. COTTINGHAM, D.A. GREENWOOD, ΤΥΠΩΘΗΤΩ, ΔΑΡΔΑΝΟΣ

- ΠΥΡΗΝΙΚΗ ΦΥΣΙΚΗ-ΒΑΣΙΚΕΣ ΑΡΧΕΣ ΚΑΙ ΠΥΡΗΝΟΣΥΝΘΕΣΗ, ΧΡΗΣΤΟΣ ΕΛΕΥΘΕΡΙΑΔΗΣ, COPY CITY

COURSE OUTLINE

1. GENERAL

SCHOOL			
DEPARTMENT	DEPARTMENT OF PHYSICS		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE	Y602-2023	**SEMESTER**	6th Semester
COURSE TITLE	Econophysics		

TEACHING ACTIVITIES If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
	4	6.0

COURSETYPE Background, General Knowledge, Scientific Area, Skill Development	Skill Development
PREREQUISITES	
TEACHING & EXAMINATION LANGUAGE:	Greek and English
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS258/

2. LEARNING OUTCOMES

Learning Outcomes Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.
null

General Skills	
Name the desirable general skills upon successful completion of the module	
Search, analysis and synthesis of data and information, ICT Use,Adaptation to new situations, Decision making, Autonomous work, Teamwork, Working in an international environment, Working in an interdisciplinary environment, Production of new research ideas	Project design and management Equity and Inclusion Respect for the natural environment Sustainability Demonstration of social, professional and moral responsibility and sensitivity to gender issues Critical thinking Promoting free, creative and inductive reasoning
Teamwork	

3. COURSE CONTENT

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD Face to face, Distance learning, etc.	Face to face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) Use of ICT in Teaching, in Laboratory Education, in Communication with students	Use of ICT in Teaching
TEACHING ORGANIZATION The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research& analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc. The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards	

Activity	Workload/semester
Lectures	52
Bibliographic research & analysis	53
Laboratory Exercise	20
Total	**125**

STUDENT EVALUATION Description of the evaluation process Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others Please indicate all relevant information about the course	**Student evaluation languages** Greek English **Method (Formative or Concluding)** Formative

Student evaluation methods	Rate
Written Assignment	100
or	or
Written Exam with Problem Solving	40
Written Exam with Short Answer Questions	60

assessment and how students are informed	

5. Suggested Bibliography

An Introduction to Econophysics, R. Madegna, H.E. Stanley, Cambridge University Press, 2004.
Classical Econophysics, W.P. Cockshott, A.F. Cottrel, G.J. Michaelson, I.P. Wright, V. Yacovenco, Routledge (Taylor and Francis).
Econophysics and Sociophysics: Trends and Perspectives, B.K. Chakrabarti (ed.),Wiley-VCH, 2006.
Economic Dynamics, R. Shone, Cambridge University Press, 2002.

Εύδοξος

COURSE OUTLINE

1. GENERAL

SCHOOL			
DEPARTMENT	DEPARTMENT OF PHYSICS		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE	Y603-2023	**SEMESTER**	6th Semester
COURSE TITLE	Material Science and Technology		

TEACHING ACTIVITIES If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
	4	6.0

COURSETYPE Background, General Knowledge, Scientific Area, Skill Development	Scientific Area
PREREQUISITES	
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS259/

2. LEARNING OUTCOMES

Learning Outcomes
Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

The course is a continuation of the knowledge acquired by the student in the Solid State Physics course and concerns their application to materials and devices.
Specifically, the course aims to provide knowledge on:
A) The concepts of the electrical behavior of materials, the concepts of resistance-conductivity, as well as the understanding of the temperature dependence of the conductivity of metallic materials, alloys and the criteria for selecting a metallic material as a conductor depending on the applications.
B) In semiconductor technology, their electrical and optical properties, the categories that appear depending on the type of their conductivity (intrinsic - extrinsic, extrinsic p-type or n-type), their technological importance and the limitations in their use, as well as the properties and applications of optoelectronic materials.
C) Insulating (dielectric) materials, their behavior in static electric and alternating fields, their possible uses.
D) In ??the magnetic properties of materials and their applications.
E) In the phenomenon of superconductivity, in the materials that exhibit it, the limitations of its use, as well as in the possibilities that

open up as the temperature at which we observe it increases.
Upon successful completion of the course, the student will be able to:
• Understand the concepts of resistance-conductivity-electrical resistance-specific electrical conductivity, and be able to classify a material from theoretical elements as a conductor, semiconductor, insulator, superconductor.
• Be able to experimentally calculate the conductivity of a material using an appropriate device that he/she will build.
• Be able to predict the electrical behavior of a material at a different temperature from that of the environment.
• Be able to select a material for use as a conductor or insulator and be able to evaluate how safe it is in use.
• Be able to exploit the properties of optoelectronic materials for applications.
• To have understood the magnetic properties of materials.
• To have understood the importance of superconductivity.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use,Adaptation to new situations,
Decision making,
Autonomous work,
Teamwork,
Working in an international environment,
Working in an interdisciplinary environment, Production of new research ideas

Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking
Promoting free, creative and inductive reasoning

Search, analysis and synthesis of data and information, ICT Use
Decision making
Working in an interdisciplinary environment
Production of new research ideas

3. COURSE CONTENT

I) Conductive materials
A. Conductivity and Resistance
B. Conductivity standard in metallic materials
C. Specific electrical resistance – Specific electrical conductivity
D. Classification of materials based on the value of specific electrical conductivity.
E. Dependence of specific electrical resistance on temperature
F. Conductivity in alloys
G. Criteria for selecting conductive materials
H. Study of typical materials (Cu, Ag, Au, Al, W)
II) Semiconductors and Devices
A. Semiconductor Materials
B. Semiconductor Devices and Applications
C. Optical Processes in Semiconductors and Semiconductor Devices
D. Photovoltaic Cells
E. LED - Laser Diode
III) Dielectric materials
A. Introduction to Dielectric (insulating) materials.
B. Dielectric constant of materials- Characteristics of dielectric materials.
C. Dielectric materials in constant fields
D Dielectric materials in alternating fields
E. Categories of dielectrics according to their polarization mode-Dielectric hysteresis.

F. Dielectric materials and new trends
IV) Magnetic Materials
A. Magnetic properties of matter
B. Classification of materials based on their magnetic behavior
C. Special applications of magnets
V) Superconducting materials.
A. Superconductivity
B. Magnetic properties of superconductors
C. Applications of superconductors (superconducting cables, superconducting magnets, superconducting computers)
D. Interpretation of the phenomenon

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD Face to face, Distance learning, etc.	Face to face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) Use of ICT in Teaching, in Laboratory Education, in Communication with students	Use of ICT in Teaching Use of ICT in Communication with students
TEACHING ORGANIZATION The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research& analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc. The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards	

Activity	Workload/semester
Lectures	52
Writing project	48
Bibliographic research & analysis	25
Total	**125**

STUDENT EVALUATION Description of the evaluation process Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others Please indicate all relevant information about the course assessment and how students are informed	**Student evaluation languages** Greek **Method (Formative or Concluding)** Formative

Student evaluation methods	Rate
Written Exam with Problem Solving	85
Written Assignment	15

5. Suggested Bibliography

- Αναγνωστόπουλος Α., Δημητριάδης Κ , Παπαδημητρίου Π.,"Σημειώσεις στη Φυσική Ημιαγωγών", Θεσσαλονίκη (1993).
- Μαγκαφάς Λ. "Ανάπτυξη Ιδιότητες και Εφαρμογές Κραμάτων Άμορφων Ημιαγωγών", Διδακτορική Διατριβή, Δ.Π.Θ. Ξάνθη, (1992).
- Οικονόμου Ε.Ν., "Φυσική Στερεάς Κατάστασης Ι,ΙΙ", Πανεπιστημιακές εκδόσεις Κρήτης, (1997).
- Οικονόμου Ν.Α.,"Εισαγωγή στη Φυσική Στερεάς Κατάστασης", Εκδόσεις Γιαχούδη Γιαπούλη,(1985).
- Θαναηλάκη Α.Κ., "Τεχνολογία Ηλεκτροτεχνικών και Ηλεκτροτεχνικών Υλικών" Τόμος Α΄ Αθήνα (1987).
- Χανιά Μ.Π., "Ηλεκτρικές και Οπτικές Ιδιότητες Τριαδικών Ενώσεων του Tl "[TlInX2 (X=S,Se,Te) TlGaX2 (X=S,Se,Te)]. " Διδακτορική Διατριβή, Θεσσαλονίκη, (1993).
- Χρυσουλάκης Γ.Δ. και Παντελής Δ.Ι., "Επιστήμη και Τεχνολογία των Μεταλλικών Υλικών ", Εκδόσεις Παπασωτηρίου, (1996).
- I. Jones,"Materials Science for Electrical and Electronic Engineers", Oxford University Press,2001
- R.Zachariason," Electrical Materials", Cengage Learning; 2 edition ,2011.
- L.Solymar, D.Walsh, R.Syms."Electrical Properties of Materials", Oxford University Press,2014.
- R.Smith,"Electrical Component Reliability Handbook", exida.com LLC; 3rd Edition,2012.
- R. Swingler,"Reliability Characterization of Electrical and Electronic Systems", Woodhead Publishing, 2015.
- Hippel,"Dielectric Materials and Applications", Artech House,1995.
- Hamagushi,"Basic Semiconductor Physic", Springer Berlin Heidelberg New York ,2010.
- Y. Yu. Peter, M. Cardona, "Fundamental of Semiconductors", Springer Berlin Heidelberg New York, 2001.
- J.Pipreck, "Semiconductor Optoelectronic Devices",Academic Press,ISBN 0-12-557190-9,2003.
- M.Balkanski, R.F.Wallis, "Semiconductor Physics and Applications", Oxford University Press, 2000.
- M.Getzlaff, "Fundamentals of Magnetism", Springer Berlin Heidelberg New York , 2008.
- O.Sergiyenko, Ed. " Optoelectronic Devices and Properties", InTech, 2011.

Eudoxus

Βιβλίο [102071492]: Επιστήμη και Τεχνολογία των Υλικών, 10η Έκδοση, Callister Wιlliam D., Rethwisch David G. Λεπτομέρειες
Βιβλίο [10996]: Επιστήμη και τεχνολογία υλικών, Βατάλης Αργύρης Σ. Λεπτομέρειες
Βιβλίο [59396169]: Τεχνολογία Υλικών, Μαγκαφάς Λ.- Χανιάς Μ. Λεπτομέρειες

COURSE OUTLINE

1. GENERAL

SCHOOL			
DEPARTMENT	DEPARTMENT OF PHYSICS UNDEGRADUATE STUDY PROGRAM: PHYSICS		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE	Y604-2023	**SEMESTER**	6th Semester
COURSE TITLE	Statistical Physics		

TEACHING ACTIVITIES If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
	4	6.0

COURSETYPE Background, General Knowledge, Scientific Area, Skill Development	Background
PREREQUISITES	None
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	YES
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS223/

2. LEARNING OUTCOMES

Learning Outcomes
Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

The course covers the subject of Statistical Physics. The basic principles of Statistical Physics will be introduced, along with how they connect microscopic to macroscopic properties. The fundamental distributions and the methods for selecting them will be discussed. The phenomenon of paramagnetism will be examined. The concept of an ideal gas and blackbody radiation will be analyzed.
Upon successful completion of the course, the student will be able to:

Understand the Basic Principles of Statistical Physics and how it links the microscopic structure of a system to its macroscopic properties.

Choose the appropriate statistical distribution (microcanonical, canonical, or grand canonical) depending on the conditions governing a given system.

Recognize the similarity of conditions in systems of different scales and thus generalize this knowledge and experience to other systems.

General Skills	
Name the desirable general skills upon successful completion of the module	
Search, analysis and synthesis of data and information, ICT Use,Adaptation to new situations, Decision making, Autonomous work, Teamwork, Working in an international environment, Working in an interdisciplinary environment, Production of new research ideas	Project design and management Equity and Inclusion Respect for the natural environment Sustainability Demonstration of social, professional and moral responsibility and sensitivity to gender issues Critical thinking Promoting free, creative and inductive reasoning
Search, analysis and synthesis of data and information, ICT Use Adaptation to new situations Decision making Autonomous work Teamwork Production of new research ideas	

3. COURSE CONTENT

The course covers topics related to the continuation of Thermodynamics and the explanation of macroscopic measurements based on theories originating from the microscopic world. It includes topics such as the determination of entropy, temperature, free energy, the partition function, the exact specification of microstates, probability distributions, and statistical ensembles. Additionally, it covers topics in quantum statistical physics, such as Fermi-Dirac, Bose-Einstein, and Maxwell-Boltzmann statistics. Finally, key theorems like the equipartition of energy are discussed, along with theories such as those of classical ideal gases, the Ising model, and paramagnetism.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD Face to face, Distance learning, etc.	Face to face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) Use of ICT in Teaching, in Laboratory Education, in Communication with students	Use of ICT in Communication with students
TEACHING ORGANIZATION The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research& analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc. The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards	

Activity	Workload/semester
Lectures	52
Bibliographic research & analysis	85
Writing project	30
Total	**167**

STUDENT EVALUATION Description of the evaluation process Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others Please indicate all relevant information about the course assessment and how students are informed	**Student evaluation languages** Greek English **Method (Formative or Concluding)** Summative **Student evaluation methods** **Rate**

5. Suggested Bibliography

Ότι υπάρχει και στον Εύδοξο

Eudoxus

Στατιστική Φυσική & Θερμοδυναμική, Βέργαδος Ι., ΡεμεδιάκηςΙ., Τριανταφυλλόπουλος Η.
ΣΤΑΤΙΣΤΙΚΗ ΦΥΣΙΚΗ, F.MANDL
Στατιστική φυσική, Ευαγγέλου Σ.

COURSE OUTLINE

1. GENERAL

SCHOOL	OF SCIENCES		
DEPARTMENT	OF PHYSICS		
LEVEL OF STUDIES	Level 6		
COURSE CODE	E606-2023	**SEMESTER**	6th
COURSE TITLE	Educational Psychology		
TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*		**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
LECTURES		3	5
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.			
COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	Scientific Area		
PREREQUISITES:	-		
TEACHING & EXAMINATION LANGUAGE:	GREEK		
COURSE OFFERED TO ERASMUS STUDENTS:	NO		
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS249/		

2. LEARNING OUTCOMES

Learning Outcomes

Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

The aim of the course is to examine the phenomena and behaviors that constitute the complex reality of educational practice, contributing to the understanding of the dynamics that shape the ever-evolving environment of the classroom. Emphasis is placed on the application of key psychological theories relevant to education, including theories of intelligence, cognitive development, and motivation. The course also draws upon research methods and perspectives from social psychology to better understand the interactions and processes that emerge between teachers and students within the educational setting. Within this framework, current topics from the international literature related to learning processes and students' academic achievement are also discussed. By the end of the semester, students are expected to be able to:

- understand the ways in which children and adolescents learn effectively to achieve high academic outcomes and successfully integrate into the school environment and the broader school community.
- be familiar with psycho-pedagogical practices that promote learning and contribute to improved academic performance.
- provide guidance and advisory support to teachers and parents on issues related to learning and teaching, with the aim of improving students' academic outcomes

Specific Learning Objectives

- Develop a deeper understanding of the multifaceted role of the contemporary teacher.
- Identify the social and psychological dynamics that emerge within the school environment and the interaction between students and teachers.
- Understand how teachers can manage classroom dynamics and factors influencing school performance.
- Recognize diversity and individual differences in the educational environment.

- Examine the balance between collective and individual learning processes.
- Understand the role of social representations in educational contexts.
- Explore cooperation and competition in learning environments.
- Develop strategies for crisis management and conflict resolution in the classroom.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use
Adaptation to new situations
Decision making
Autonomous work
Teamwork
Working in an international environment
Working in an interdisciplinary environment
Production of new research ideas
Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking
Promoting free, creative and inductive reasoning

- *Search, analysis and synthesis of data and information with the use of the necessary technology*
- *Teamwork*
- *Critical thinking*
- *Promoting free, creative and inductive reasoning*

3. COURSE CONTENT

1. Educational Psychology: Conceptual foundations, introductory concepts, and key issues in contemporary educational psychology.
2. Behavioral Approaches to Learning: Fundamental principles of behaviorism; forms of behavioral learning (associative learning, classical conditioning, operant conditioning); applications of behavioral approaches in classroom practice; critical perspectives on behaviorist theories.
3. Social-Cognitive Approaches to Learning: Core principles; Bandura's model of reciprocal determinism (1989); reinforcement and punishment within the social-cognitive framework; observational learning and modeling; self-efficacy and self-regulation; applications in classroom contexts; critical perspectives.
4. Cognitive Approaches to Learning: Basic principles; information-processing models; activation and use of cognitive processes in classroom learning; contemporary cognitive perspectives on learning and instruction; the role of metacognition; classroom applications and critical perspectives.
5. Self-Regulated Learning: Definition, prerequisites, and key components; strategies for promoting self-regulated learning; metacognitive instruction and its role in supporting autonomous learning.
6. Self-Concept and Self-Esteem: Conceptual definitions and developmental aspects; structure of self-concept; influencing factors (family, teachers, peers, social context, life experiences); academic self-concept and school achievement; stability and accuracy of self-perceptions; the role of self-esteem in students' development; self-perceptions of students with learning difficulties.
7. Motivation and Emotions in Learning: Dimensions of motivation and their relationship to learning (implicit theories of intelligence, achievement goals, self-efficacy beliefs, attribution theory, interest, expectancy–value theory, academic emotions); promoting motivation and achievement in school and family contexts.
8. Avoidance Behaviors in School Contexts: Conceptual framework, forms and predictors of avoidance behaviors, and their consequences; help-seeking avoidance and self-handicapping in educational settings.
9. Psychological Classroom Environment: Objective vs psychological dimensions of the classroom environment; instructional practices, learning climate, and classroom goals; the TARGET model (Ames, 1992).
10. Theories of Intelligence: Multiple conceptions of intelligence; major theoretical perspectives including Gardner's Multiple Intelligences, Sternberg's Triarchic Theory, and Goleman's Emotional Intelligence.

11. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face to Face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Use of ICT in Teaching Use of ICT in Communication with students
TEACHING ORGANIZATION *The ways and methods of teaching are described in detail.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.* *The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.*	

Activity	*Workload/semester*
Lectures	50
Tutoring	0
Interactive learning	20
Written assignment	20
Study	10
Course total (25 hours / ECTS)	**100**

STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report,Clinical examination of a patient,Artistic interpretation, Other/Others* *Please indicate all relevant information about the course assessment and how students are informed*	**Student Assessment Languages** Greek **Methods (Formative or Concluding)** Formative

Student Assessment Methods	**Percentage**
Written Assignment	10%
Written Exams	90%

12. SUGGESTED BIBLIOGRAPHY

1. Elliot, S. N., Kratochwill, T. R., Cook, J. L., & Travers, J. F. (2000/2008, μετ.). Εκπαιδευτική Ψυχολογία: Αποτελεσματική διδασκαλία, αποτελεσματική μάθηση. Αθήνα: Gutenberg (Επιμ. Μετ.: Α. Λεονταρή & Ε. Συγκολλίτου).
2. Eggen, P. & Kauchak, D. (2016/2017 μετ.). Εκπαιδευτική Ψυχολογία: Νέοι Ορίζοντες στη Μάθηση και τη Διδασκαλία. Αθήνα: Κριτική (Επιμ. Μετ.: Π. Δημητροπούλου)
3. Gonida, E. N., & Cortina, K. (2014). Parent involvement in homework: Relations with parent and student achievement-related motivational beliefs and achievement. British Journal of Educational Psychology, 84, 376-396.
4. Gonida, E. N., Karabenick, S. A., Makara, K. A., & Hatzikyriakou, G. (2014). Perceived parent goals and student goal orientations as predictors of seeking or not seeking help: Does age matter? Learning and Instruction, 33, 120-130.
5. Γεωργίου, Σ. Ν. (2012). Γονική εμπλοκή και ανάπτυξη του παιδιού. Στο Σ. Χατζηχρήστου & Η.

Μπεζεβέγκης (Επιμ. Έκδοσης), Ψυχο-Παιδία: Θέματα ανάπτυξης και προσαρμογής των παιδιών στην οικογένεια και το σχολείο (σελ. 43-61). Αθήνα: Πεδίο.

6. Γωνίδα, Ε. (2012). Κίνητρα και Μάθηση: Ο ρόλος του σχολείου και της οικογένειας. Στο Σ. Χατζηχρήστου & Η. Μπεζεβέγκης (Επιμ. Έκδοσης), Ψυχο-Παιδία: Θέματα ανάπτυξης και προσαρμογής των παιδιών στην οικογένεια και το σχολείο (σελ. 130-171). Αθήνα: Πεδίο.

7. Λεονταρή, Α. (2012). Αυτοεκτίμηση: μια βασική ψυχολογική ανάγκη; Στο Σ. Χατζηχρήστου & Η. Μπεζεβέγκης (Επιμ. Έκδοσης), Ψυχο-Παιδία: Θέματα ανάπτυξης και προσαρμογής των παιδιών στην οικογένεια και το σχολείο (σελ. 299-321). Αθήνα: Πεδίο

COURSE OUTLINE

1. GENERAL

SCHOOL			
DEPARTMENT	DEPARTMENT OF PHYSICS UNDEGRADUATE STUDY PROGRAM: PHYSICS		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE	Y703-2023	**SEMESTER**	7th Semester
COURSE TITLE	Astronomy - Astrophysics		

TEACHING ACTIVITIES If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
	4	7.0

COURSETYPE Background, General Knowledge, Scientific Area, Skill Development	Background
PREREQUISITES	None
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS253/

2. LEARNING OUTCOMES

Learning Outcomes Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.
The course aims at learning basic concepts in Astronomy, which is an important field of Physics. Students should be able to understand the basic laws and rules that govern the scientific subject of Astronomy-Astrophysics, understand and explain basic concepts in the Solar System (structure and phenomena in it), the Sun, galaxies (ours and others), as well as the concept of cosmology. They will also learn thoroughly the types and the evolution process of stars and galaxies. Finally, they will be able to solve basic Astronomy problems. By completing the course, students will have the ability to judge phenomena they see in the night sky, explain the evolution of our own and other star systems, and have knowledge of the evolution of the universe.

General Skills	
Name the desirable general skills upon successful completion of the module	
Search, analysis and synthesis of data and information, ICT Use,Adaptation to new situations, Decision making, Autonomous work, Teamwork, Working in an international environment, Working in an interdisciplinary environment, Production of new research ideas	Project design and management Equity and Inclusion Respect for the natural environment Sustainability Demonstration of social, professional and moral responsibility and sensitivity to gender issues Critical thinking Promoting free, creative and inductive reasoning
Adaptation to new situations Decision making Promoting free, creative and inductive reasoning	

3. COURSE CONTENT

Basic astronomy concepts
Coordinate Systems and Time
Ecliptic
Planetary Movements
Kepler's laws
Satellites and Comets
Star distances
Stellar magnitudes
Star temperature
Formation and intensity of spectral lines
Spectra and spectral classification of stars
Sun
Basic concepts of stellar evolution and the final stages of stars
Double stars
Variable stars
Evolution of galaxies
Cosmology

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD Face to face, Distance learning, etc.	Face to face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) Use of ICT in Teaching, in Laboratory Education, in Communication with students	Use of ICT in Teaching Use of ICT in Communication with students

TEACHING ORGANIZATION

The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research& analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.

The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards

Activity	Workload/semester
Lectures	52
Bibliographic research & analysis	140
Total	**192**

STUDENT EVALUATION

Description of the evaluation process

Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others

Please indicate all relevant information about the course assessment and how students are informed

Student evaluation languages

Greek

Method (Formative or Concluding)

Summative

Student evaluation methods	Rate
Written exam with multiple choice test	30
Written Exam with Short Answer Questions	30
Written Exam with Essay Development Questions	40

5. Suggested Bibliography

Του Ευδόξου

Eudoxus

Εισαγωγή στη σύγχρονη αστρονομία, Χ.Βάρβογλης, Ι.Σειραδάκης
Εισαγωγή στη Σύγχρονη Αστροφυσική, Bradley W Carroll, Dale A. Ostlie επιμ.Καζαντζίδης Στυλιανός, Παππάς Γεώργιος
ΑΣΤΡΟΦΥΣΙΚΗ ΤΟΜΟΣ Ι, SHU FRANK
ΑΣΤΡΟΦΥΣΙΚΗ ΤΟΜΟΣ ΙΙ, SHU FRANK

COURSE OUTLINE

1. GENERAL

SCHOOL	OF SCIENCES		
DEPARTMENT	OF PHYSICS		
LEVEL OF STUDIES	Undergraduate		
COURSE CODE	Y704	**SEMESTER**	7ο
COURSE TITLE	LABORATORY OF ATOMIC AND NUCLEAR PHYSICS		

TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
LECTURES	4	5
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	Scientific Area
PREREQUISITES:	-
TEACHING & EXAMINATION LANGUAGE:	GREEK
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS222/

2. LEARNING OUTCOMES

Learning Outcomes

Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

Upon successful completion of the course, students will have been introduced to the laboratory and experimental methodology for studying and acquiring data related to the fundamental concepts governing physical phenomena associated with light, electrons, and atoms. They will have observed and studied simple quantum phenomena, and will have understood concepts such as counting rate, detector dead time, geometry factor, detector efficiency, interaction cross section, activation, mean free path, and material thickness. Finally, they will have become familiar with the notions of measurement accuracy and experimental errors and will be able to incorporate them into the analysis of their experimental data.

In addition, they will have acquired the ability to quantitatively interpret physical quantities through real measurements, the critical capacity to compare theoretical predictions with experimental results, and the competence to prepare concise scientific reports with clear presentation of methodology, results, and error analysis.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use
Adaptation to new situations
Decision making
Autonomous work
Teamwork
Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking

Working in an international environment *Working in an interdisciplinary environment* *Production of new research ideas*	*Promoting free, creative and inductive reasoning*
• Application of knowledge in practice • Search, analysis, and synthesis of data and information • Adaptation to new situations • Individual report writing	

3. COURSE CONTENT

Error estimation in individual measurements, error propagation, least squares with errors, inverse square law calculations, radioactive decay law, β-radiation, beta emitter bremsstrahlung, gamma-ray spectroscopy, inelastic electron scattering (Franck–Hertz experiment), photoelectric effect (measurement of Planck's constant), wave nature of electrons (electron diffraction), determination of the mass and e/m ratio of the electron, interaction of light with matter, scintillators, and the use of specialized software for simulations of the above experiments.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face to Face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Use of ICT in Teaching Use of ICT in Communication with students
TEACHING ORGANIZATION *The ways and methods of teaching are described in detail.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.* *The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.*	

Activity	*Workload/semester*
Laboratory experiment	70
Writing lab report	45
Self Study	10
Course total (25 hours / ECTS)	**125**

STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report,Clinical examination of a patient,Artistic interpretation, Other/Others* *Please indicate all relevant information about the course*	Compulsory in-class assignments (30%). Proper execution of the experiment (10%). Final written examination (60%) (use of notes is not permitted).

assessment and how students are informed	

5. SUGGESTED BIBLIOGRAPHY

- Suggested bibliography:
- Related academic journals:

- *Laboratory Exercises in Atomic Physics*, S. Dedoussis et al., Thessaloniki, 1998
- *Nuclear Physics in the Laboratory – Student Exercises*, Ch. Eleftheriadis et al., COPYCITY, Thessaloniki, 2012

COURSE OUTLINE

1. GENERAL

SCHOOL	OF SCIENCES		
DEPARTMENT	OF PHYSICS		
LEVEL OF STUDIES	Level 6		
COURSE CODE	APE705-2023	**SEMESTER**	7th
COURSE TITLE	Quantum Mechanics II		

TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
LECTURES	3	6
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	Scientific Area
PREREQUISITES:	-
TEACHING & EXAMINATION LANGUAGE:	GREEK
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://eclass.emt.duth.gr/courses/ PHYSICS263

2. LEARNING OUTCOMES

Learning Outcomes

Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

Advanced topics in Quantum Mechanics are introduced with emphasis on the mathematical formalism of Hermitian operators and the quantum theory of orbital and spin momentum.

Upon successful completion of the course, the student will
- have acquired basic knowledge of Hermitian operators and their application,
- interpret the Pauli's Principle
- have understood the need to quantize orbital and spin momentum.

The student will have acquired the ability to
- solve related complex problems.
- think critically so that they can evaluate, analyze and correlate this knowledge.
- interpret phenomena of everyday life.
- develop cooperation with other students to solve problems related to this course.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use
Adaptation to new situations
Decision making
Autonomous work
Teamwork
Working in an international environment
Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking
Promoting free, creative and inductive reasoning

Working in an interdisciplinary environment *Production of new research ideas*
• *Search, analysis and synthesis of data and information with the use of the necessary technology* • *Autonomous work* • *Teamwork* • *Promoting free, creative and inductive reasoning*

3. COURSE CONTENT

Hermitian Operators. Unitary Operators. Position Momentum and Spin Operators. Time Evolution Operator. Orbital Momentum and Spin Eigenvalues - Eigenfunctions. Stern-Gerlach Experiment. Interpretation. Spin Introduction. Construction of Wave Functions. Addition of Momenta. Identical Particles. Pauli Principle. Principles of the Periodic Table.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face to Face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Use of ICT in Teaching Use of ICT in Communication with students
TEACHING ORGANIZATION *The ways and methods of teaching are described in detail.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.* *The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.*	

Activity	*Workload/semester*
Lectures	39
Bibliographic research & analysis	95
Written assignment	13
Exams	3
Course total (25 hours / ECTS)	**150**

STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report,Clinical examination of a patient,Artistic interpretation, Other/Others* *Please indicate all relevant information about the course assessment and how students are informed*	**Student Assessment Languages** Greek **Methods (Formative or Concluding)** Concluding

Student Assessment Methods	**Percentage**
Written Assignment	10%
Written Exams	90%

5. SUGGESTED BIBLIOGRAPHY

- ΕΙΣΑΓΩΓΗ ΣΤΗΝ ΚΒΑΝΤΟΜΗΧΑΝΙΚΗ, Κ. ΤΑΜΒΑΚΗΣ, LEADER BOOKS
- ΚΒΑΝΤΙΚΗ ΦΥΣΙΚΗ, STEPHEN GASIOROWICZ, ΕΚΔΟΣΕΙΣ ΚΛΕΙΔΑΡΙΘΜΟΣ ΕΠΕ

COURSE OUTLINE

1. GENERAL

SCHOOL			
DEPARTMENT	DEPARTMENT OF PHYSICS		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE	SSE706-2023	**SEMESTER**	7th Semester
COURSE TITLE	Electronic Circuits		

TEACHING ACTIVITIES If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
	4	5.0

COURSETYPE Background, General Knowledge, Scientific Area, Skill Development	Scientific Area
PREREQUISITES	
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	YES
COURSE URL:	https://eclass.emt.duth.gr/

2. LEARNING OUTCOMES

Learning Outcomes
Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

This course aims in providing specialized knowledge of Electronics and advanced issues thereof. A good knowledge of basic electronics is required. The main modules are:
Differential amplifier pair
Current sources
Basic operational amplifier circuits
Advanced operational amplifier circuits
Oscillators - Multivibrators
Upon successful completion of the course the student will be able to:
To recognize and distinguish in practice advanced electronic elements and circuits, as well as to be able to understand their operation.
Be able to design an electronic circuit in practice.
To detect errors in simple electronic components and electronic circuits and to be able to provide solutions for their repair.

General Skills	
Name the desirable general skills upon successful completion of the module	
Search, analysis and synthesis of data and information, ICT Use,Adaptation to new situations, Decision making, Autonomous work, Teamwork, Working in an international environment, Working in an interdisciplinary environment, Production of new research ideas	Project design and management Equity and Inclusion Respect for the natural environment Sustainability Demonstration of social, professional and moral responsibility and sensitivity to gender issues Critical thinking Promoting free, creative and inductive reasoning
Search, analysis and synthesis of data and information, ICT Use Autonomous work Teamwork Project design and management Critical thinking Promoting free, creative and inductive reasoning	

3. COURSE CONTENT

Amplifying topologies with bipolar transistors (BJTs)
Basic circuit design technologies with BJTs (TTL, ECL)
Basic operational amplifier circuits
Advanced operational amplifier circuits
Bias and stability of amplifiers
Reference current circuits and current sources
Differential amplifier
Oscillators
Multivibrators

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD Face to face, Distance learning, etc.	Face to face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) Use of ICT in Teaching, in Laboratory Education, in Communication with students	Use of ICT in Communication with students
TEACHING ORGANIZATION The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research& analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc. The supervised and unsupervised workload per activity is indicated here, so that total workload per semester	

Activity	Workload/semester
Lectures	52
Bibliographic research & analysis	73
Total	**125**

complies to ECTS standards	
STUDENT EVALUATION Description of the evaluation process Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others Please indicate all relevant information about the course assessment and how students are informed	**Student evaluation languages** Greek English **Method (Formative or Concluding)** Summative **Student evaluation methods** — **Rate** Intermediate Written exam — 40 Written Exam with Problem Solving — 40 Written Exam with Short Answer Questions — 20

5. Suggested Bibliography

Microelectronic Circuits, Sedra Smith 8th ed.
The art of Electronics, Horowitz Hill 2nd edition

Eudoxus

ΜΙΚΡΟΗΛΕΚΤΡΟΝΙΚΑ ΚΥΚΛΩΜΑΤΑ, 8η Έκδοση
Κωδικός Βιβλίου στον Εύδοξο: 68396095
Έκδοση: 7η/2017
Συγγραφείς: Sedra Adel, Smith Kenneth
ISBN: 9789604911066
Τύπος: Σύγγραμμα
Διαθέτης (Εκδότης): Α. ΠΑΠΑΣΩΤΗΡΙΟΥ & ΣΙΑ Ι.Κ.Ε.

Μικροηλεκτρονική, 5η Έκδοση-Βελτιωμένη
Κωδικός Βιβλίου στον Εύδοξο: 68380792
Έκδοση: 5η Βελτιωμένη/2017
Συγγραφείς: Jaeger Richard - Blalock Travis, Αλκιβιάδης Χατζόπουλος (επιμέλεια)
ISBN: 9789604187164
Τύπος: Σύγγραμμα
Διαθέτης (Εκδότης): ΕΚΔΟΣΕΙΣ Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε.

COURSE OUTLINE

1. GENERAL

SCHOOL	OF SCIENCES		
DEPARTMENT	OF PHYSICS		
LEVEL OF STUDIES	Level 6		
COURSE CODE	APE719-2023	**SEMESTER**	7º
COURSE TITLE	NANOMATERIALS AND APPLICATIONS		

TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
LECTURES	3	6
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	Scientific Field, (Specialized Background)
PREREQUISITES:	-
TEACHING & EXAMINATION LANGUAGE:	GREEK
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://physics.duth.gr/?page_id=6876

2. LEARNING OUTCOMES

Learning Outcomes

Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

The course provides essential knowledge about the nanoscale and the laws that govern it. The categories of nanomaterials and the various techniques for their development are presented, as well as their applications in everyday life. Indicative application areas are medicine, energy, materials, food, environment, etc.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use
Adaptation to new situations
Decision making
Autonomous work
Teamwork
Working in an international environment
Working in an interdisciplinary environment
Production of new research ideas
Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking
Promoting free, creative and inductive reasoning

- *Search for, analysis and synthesis of data and information, with the use of the necessary technology*
- *Decision-making*
- *Working independently*
- *Working in an international environment*

- *Production of new research ideas*

3. COURSE CONTENT

Introduction to Nanotechnology and Nanomaterials (Size, Units, Scale). Micro, Meso and Macroporous Materials (Classification, Materials, Properties). Phenomena at the Nanoscale (Phenomena, Surfaces, Interfaces). Categories and Properties of Nanomaterials (Nanotubes, fibers, nanoparticles, Optical properties, Mechanical, Electrical, etc.). Synthesis Techniques for Nanomaterials (Vapor deposition coatings, microfabrication, colloidal systems, etc.). Applications of Nanomaterials (medicine, Food, Automotive Industry, etc.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face to Face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Use of ICT in Teaching Use of ICT in Communication with students
TEACHING ORGANIZATION *The ways and methods of teaching are described in detail.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.* *The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.*	

Activity	*Workload/semester*
Lectures	120
Self study	30
Course total (25 hours / ECTS)	**150**

STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report,Clinical examination of a patient,Artistic interpretation, Other/Others* *Please indicate all relevant information about the course assessment and how students are informed*	**Student Assessment Languages** Greek **Methods (Formative or Concluding)** Concluding

Student Assessment Methods	**Percentage**
Written Exam with Problem Solving	100

5. SUGGESTED BIBLIOGRAPHY

Nanostructures Nanomaterials, Book Code in Eudoxus: 77114123,
Edition: 1st/2018, Authors: Konstantinos A. Charitidis, ISBN: 978-960-254-705-2, Type: Textbook, Supplier (Publisher): NATIONAL TECHNICAL UNIVERSITY OF ATHENS

COURSE OUTLINE

1. GENERAL

SCHOOL			
DEPARTMENT	DEPARTMENT OF PHYSICS		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE	SSE708-2023	**SEMESTER**	7th Semester
COURSE TITLE	Materials Characterization		

TEACHING ACTIVITIES If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
	3	6.0

COURSETYPE Background, General Knowledge, Scientific Area, Skill Development	Scientific Area
PREREQUISITES	
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	YES
COURSE URL:	https://new.physics.duth.gr/wp-content/uploads/2024/09/Χαρακτηρισμός-Υλικών-GR.pdf

2. LEARNING OUTCOMES

Learning Outcomes
Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

The purpose of the course is to provide knowledge on the material characterization techniques that are necessary for the complete identification of the materials. The characterization of materials is distinguished in the determination of particle size, in their crystalline properties, in the determination of morphology, in their structural and chemical analyzes as well as in the determination of its physical properties. In the context of the course, all modern characterization techniques are covered with the corresponding theory and organology.
Upon successful completion of the course, the student will be able to:
• To understand and distinguish the necessary characterization techniques
• To know the basic laws of characterization of materials
• To deepen the use of methods such as characterization using X-rays, spectroscopy, etc., for the characterization of materials.
• Classify materials according to their characteristics
•Be familiar with concepts such as macro or micro scale.

General Skills	
Name the desirable general skills upon successful completion of the module	
Search, analysis and synthesis of data and information, ICT Use,Adaptation to new situations, Decision making, Autonomous work, Teamwork, Working in an international environment, Working in an interdisciplinary environment, Production of new research ideas	Project design and management Equity and Inclusion Respect for the natural environment Sustainability Demonstration of social, professional and moral responsibility and sensitivity to gender issues Critical thinking Promoting free, creative and inductive reasoning
Working in an interdisciplinary environment Production of new research ideas Equity and Inclusion Promoting free, creative and inductive reasoning	

3. COURSE CONTENT

Introduction to material characterization (Dimensions, Crystallography, Chemical Analyses)
Optical and Electron Microscopy (Optical, SEM, TEM)
X-Ray Scattering and Diffraction (XRD, SAXS, SANS, DLS, U-SAXS)
Characterization of Porosity (Nitrogen, Mercury Porosity)
Thermal Analysis (DTA, DCS)
Electrical Characterization

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD Face to face, Distance learning, etc.	Face to face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) Use of ICT in Teaching, in Laboratory Education, in Communication with students	Use of ICT in Teaching Use of ICT in Communication with students
TEACHING ORGANIZATION The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research& analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc. The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards	

Activity	Workload/semester
Lectures	6
Total	**6**

STUDENT EVALUATION Description of the evaluation process Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others Please indicate all relevant information about the course assessment and how students are informed	**Student evaluation languages** Greek **Method (Formative or Concluding)** Summative **Student evaluation methods** — **Rate** Written Exam with Short Answer Questions — 70 Written Exam with Problem Solving — 30

5. Suggested Bibliography

- Τεχνολογία υλικών ,Λ. Μαγκαφάς,Μ. Χανιάς, Εκδόσεις Τζιόλα,2017
-Materials Characterization Techniques, Sam Zhang, Lin Li, Ashok Kumar (2008) CRC Press.
- Physical Methods for Materials Characterisation, Peter E.J. Flewitt, R.K. Wild (2003) CRC Press.
-Magnetism and Magnetic Materials J. M. D. Coey (2010) Cambridge University Press.
-Electron Paramagnetic Resonance of Transition Ions A. Abragam, B. Bleaney (2012) Reprint edition Oxford University Press.
- Transmission Electron Microscopy Physics of Image Formation Reimer, L., Kohl, H., (2008) Springer Series in Optical Sciences
-Materials Characterization: Introduction to Microscopic and Spectroscopic Methods, Yang Leng, Wiley & Sons; 1st Edition, June 2008.
E. Vansant, A. Mitropoulos, and J. Nolan, Exciting Nanoporous Materials Fundamentals, Characterisation, Applications and Trends. Saarbrucken: LAP LAMBERT Academic Publishing, 2015.

Eudoxus

94691877 Φασματομετρικές Μέθοδοι στην Σύγχρονη Ενόργανη Ανάλυση Μαρία Όξενκιουν - Πετροπούλου
94643529 Ενόργανη Ανάλυση Granger II M. Robert, Yochum M. Hank, Granger N. Jill, Sienerth D. Karl
102075157 Εισαγωγή στην Επιστήμη και Τεχνολογία των Υλικών, 6η Έκδοση Callister William D., Rethwisch David G.
10989 Ενόργανη χημική ανάλυση ΙΙ Στράτης Ιωάννης, Θεμελής Δημήτρης, Ζαχαριάδης Γεώργιος, Ανθεμίδης Α., Οικονόμου Α.
94691877 Φασματομετρικές Μέθοδοι στην Σύγχρονη Ενόργανη Ανάλυση Μαρία Όξενκιουν - Πετροπούλου

COURSE OUTLINE

1. GENERAL

SCHOOL			
DEPARTMENT	DEPARTMENT OF PHYSICS		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE	SSE709-2023	**SEMESTER**	7th Semester
COURSE TITLE	Physics and Technology of Thin Films		

TEACHING ACTIVITIES If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
	3	6.0

COURSETYPE Background, General Knowledge, Scientific Area, Skill Development	Scientific Area
PREREQUISITES	none
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	YES
COURSE URL:	https://exams.emt.ihu.gr/modules/auth/courses.php

2. LEARNING OUTCOMES

Learning Outcomes
Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

The purpose of the course is to acquaint the students with the Physics and technology of surfaces and especially thin films, providing knowledge about the physical mechanisms and processes that govern surface structures and the mechanisms and processes of composition and microstructural development of thin films. In this context, the methods used for the synthesis and characterization of the films are reviewed, their physical and mechanical properties are studied and applications of thin films in microelectronics, biomedicine, the development of optical devices, etc. are presented.

Upon completion of the course, students should:
• To understand the fundamental mechanisms and processes that govern the formation and microstructural development of thin films.
• Know the advantages and disadvantages of different deposition methods.
• Have knowledge of the capabilities and importance of thin films for a variety of applications.

General Skills	
Name the desirable general skills upon successful completion of the module	
Search, analysis and synthesis of data and information, ICT Use,Adaptation to new situations, Decision making, Autonomous work, Teamwork, Working in an international environment, Working in an interdisciplinary environment, Production of new research ideas	Project design and management Equity and Inclusion Respect for the natural environment Sustainability Demonstration of social, professional and moral responsibility and sensitivity to gender issues Critical thinking Promoting free, creative and inductive reasoning
Search, analysis and synthesis of data and information, ICT Use Autonomous work Working in an interdisciplinary environment Production of new research ideas Promoting free, creative and inductive reasoning	

3. COURSE CONTENT

Introduction to Surface Physics and definition of thin films, atomic structure, surface thermodynamics, chemical reactivity, crystal structure, crystalline and amorphous materials, Bravais lattices, crystallographic directions and planes, nanocrystalline, polycrystalline and epitaxial thin films, crystalline film defects and disassembly. Convection and diffusion phenomena and surface diffusion. Mechanical stresses and elastic deformation in thin films. Film formation, nucleation and growth, homoepitaxial and heteroepitaxial growth. Development of thin films by deposition techniques, chemical deposition, physical vapor deposition, sputtering, molecular beam epitaxy, laser deposition. Physical and mechanical stability and properties of films. Methods of characterization of films with electron and X-ray diffraction techniques, microscopy and spectroscopic study of surfaces. Modern applications of thin films in microelectronics, optical devices, biomedical technology, solar panel technology, etc.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD Face to face, Distance learning, etc.	Face to face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) Use of ICT in Teaching, in Laboratory Education, in Communication with students	Use of ICT in Teaching Use of ICT in Communication with students
TEACHING ORGANIZATION The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research& analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc. The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards	

Activity	Workload/semester
Lectures	75
Writing project	25
Bibliographic research & analysis	50
Total	**150**

STUDENT EVALUATION Description of the evaluation process Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others Please indicate all relevant information about the course assessment and how students are informed	**Student evaluation languages** Greek English **Method (Formative or Concluding)** Formative **Student evaluation methods** — **Rate** Written Exam with Problem Solving — 70 Written exam with multiple choice test — 30

5. Suggested Bibliography

Βιβλίο [94692386]: Διατάξεις Ημιαγωγών, Φυσική και Τεχνολογία, 3η Έκδοση, Sze Simon, Lee Ming-Kwei
Βιβλίο [41956294]: ΕΙΣΑΓΩΓΗ ΣΤΙΣ ΔΙΑΤΑΞΕΙΣ ΗΜΙΑΓΩΓΩΝ, Neamen
Βιβλίο [50659222]: Φυσική Ημιαγωγών, Τριμπέρης Γιώργος

Eudoxus

Βιβλίο [94692386]: Διατάξεις Ημιαγωγών, Φυσική και Τεχνολογία, 3η Έκδοση, Sze Simon, Lee Ming-Kwei
Βιβλίο [41956294]: ΕΙΣΑΓΩΓΗ ΣΤΙΣ ΔΙΑΤΑΞΕΙΣ ΗΜΙΑΓΩΓΩΝ, Neamen
Βιβλίο [50659222]: Φυσική Ημιαγωγών, Τριμπέρης Γιώργος

COURSE OUTLINE

1. GENERAL

SCHOOL			
DEPARTMENT	DEPARTMENT OF PHYSICS		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE	SSE710-2023	**SEMESTER**	7th Semester
COURSE TITLE	Nonlinear circuits and systems		

TEACHING ACTIVITIES If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
	3	6.0

COURSETYPE Background, General Knowledge, Scientific Area, Skill Development	Specialities
PREREQUISITES	
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	YES
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS242/

2. LEARNING OUTCOMES

Learning Outcomes Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.
Upon completion of the course, students will have acquired: 1. the ability to distinguish between linear and nonlinear electrical circuits. 2. The ability to know and be able to calculate various quantities and indices of nonlinear circuits. 3. The ability to implement nonlinear dynamic systems through nonlinear electronic and electrical circuits. 4. Knowledge of special programs for implementing electronic and electrical circuits.

General Skills	
Name the desirable general skills upon successful completion of the module	
Search, analysis and synthesis of data and information, ICT Use,Adaptation to new situations, Decision making, Autonomous work, Teamwork, Working in an international environment, Working in an interdisciplinary environment, Production of new research ideas	Project design and management Equity and Inclusion Respect for the natural environment Sustainability Demonstration of social, professional and moral responsibility and sensitivity to gender issues Critical thinking Promoting free, creative and inductive reasoning
Production of new research ideas Critical thinking Promoting free, creative and inductive reasoning	

3. COURSE CONTENT

1. Introductory elements of nonlinear dynamics. 2. 2-terminal resistors. V-i characteristics. 3. From linear to nonlinear resistor. Simple diode. Tunnel diode. Bilateral elements. Connections of nonlinear elements: i) in series, ii) in parallel, iii) mixed connection. Binaryity. Zener diode circuits. 4. Piecewise linear techniques. Concave and convex resistors. Neon lamps. Current and voltage-controlled resistors. Operating points in DC - DC analysis. Analytical method. Graphical and numerical methods. 5. Operational Amplifier (O.A.) circuits. Overall operation in the linear region and in the saturation regions. Ideal O.A. model. Negative and positive feedback circuits. 6. Nonlinear feedback. Negative impedance converter. Algorithm for designing piecewise linear characteristics. N- and S-type characteristics. 7. Memristors. 8. Implementation of nonlinear dynamic systems through nonlinear electrical-electronic circuits. 9. Multisim.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD Face to face, Distance learning, etc.	Face to face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) Use of ICT in Teaching, in Laboratory Education, in Communication with students	Use of ICT in Teaching Use of ICT in Communication with students
TEACHING ORGANIZATION The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research& analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc. The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards	

Activity	Workload/semester
Lectures	39
Writing project	50
Bibliographic research & analysis	61
Total	**150**

STUDENT EVALUATION Description of the evaluation process Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others Please indicate all relevant information about the course assessment and how students are informed	**Student evaluation languages** Greek English **Method (Formative or Concluding)** Summative **Student evaluation methods** **Rate**

5. Suggested Bibliography

Eudoxus

ΜΗ ΓΡΑΜΜΙΚΑ ΚΥΚΛΩΜΑΤΑ, Τύπος: Σύγγραμμα, Ι.Μ. ΚΥΠΡΙΑΝΙΔΗΣ, 2008, ΣΥΓΧΡΟΝΗ ΠΑΙΔΕΙΑ, ISBN: 978-960-357 085-1

COURSE OUTLINE

1. GENERAL

SCHOOL			
DEPARTMENT	DEPARTMENT OF PHYSICS		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE	CHE711-2023	**SEMESTER**	7th Semester
COURSE TITLE	Nonlinear dynamics - Chaos Theory		

TEACHING ACTIVITIES If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
	4	5.0

COURSETYPE Background, General Knowledge, Scientific Area, Skill Development	Scientific Area
PREREQUISITES	
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	YES
COURSE URL:	https://eclass.emt.duth.gr/

2. LEARNING OUTCOMES

Learning Outcomes Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.
This course develops systematically the theory of nonlinear dynamics and chaos theory. Nonlinear phenomena are presented in the frame of physics but also within other disciplines such as biology, chemistry, climatology and economics. Upon successful completion of the course the student will have: • Basic knowledge of chaos theory and nonlinear systems and their application to physical systems. And it will have acquired the: • Ability to apply this knowledge to solve relevant complex problems. • Ability to think critically so that they can evaluate, analyze and relate this knowledge. • Ability to interpret phenomena of everyday life. • Ability to develop collaboration with other fellow students to solve problems related to this course

General Skills	
Name the desirable general skills upon successful completion of the module	
Search, analysis and synthesis of data and information, ICT Use,Adaptation to new situations, Decision making, Autonomous work, Teamwork, Working in an international environment, Working in an interdisciplinary environment, Production of new research ideas	Project design and management Equity and Inclusion Respect for the natural environment Sustainability Demonstration of social, professional and moral responsibility and sensitivity to gender issues Critical thinking Promoting free, creative and inductive reasoning
Search, analysis and synthesis of data and information, ICT Use Autonomous work Teamwork Critical thinking Promoting free, creative and inductive reasoning	

3. COURSE CONTENT

Dynamical systems as continuous flows in phase space and as visualizations.
Equilibrium points and stability.
Branches in one-dimensional systems.
Introduction to chaotic dynamics.
One-dimensional visualizations-Accounting image-Period doubling branch.
Bernoulli shift and definition of chaos.
Two-dimensional visualizations.
Fixed, periodic points and their stability.
Poincare–Bendixson theorem.
Boundary circles - Hopf bifurcation - Stability of boundary circles - Smale's horseshoe.
Lorenz's System - The Henon Illustration.
Chaotic attractors.
Lyapunov exhibitors.
Chaos in conserving systems- The standard illustration.
Examples-Applications.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD Face to face, Distance learning, etc.	Face to face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) Use of ICT in Teaching, in Laboratory Education, in Communication with students	Use of ICT in Teaching Use of ICT in Communication with students

TEACHING ORGANIZATION

The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research& analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.

The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards

Activity	Workload/semester
Lectures	52
Bibliographic research & analysis	53
Laboratory Exercise	20
Total	**125**

STUDENT EVALUATION

Description of the evaluation process

Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others

Please indicate all relevant information about the course assessment and how students are informed

Student evaluation languages

Greek
English

Method (Formative or Concluding)

Formative

Student evaluation methods	Rate
Written Assignment	100
or	or
Written Exam with Problem Solving	40
Written Exam with Short Answer Questions	60

5. Suggested Bibliography

Chaos and Nonlinear Dynamics, Robert Hilborn 2nd edition
Nonlinear Dynamics and Chaos, Steven Strogatz
Chaos and Timeseries Analysis, Julien Sprott

Eudoxus

ΕΙΣΑΓΩΓΗ ΣΤΑ ΜΗ ΓΡΑΜΜΙΚΑ ΔΥΝΑΜΙΚΑ ΣΥΣΤΗΜΑΤΑ
Κωδικός Βιβλίου στον Εύδοξο: 320107
Έκδοση: 1/2016
Συγγραφείς: ΓΕΩΡΓΙΟΣ ΒΟΥΓΙΑΤΖΗΣ, ΕΥΘΥΜΙΑ ΜΕΛΕΤΛΙΔΟΥ
ISBN: 978-960-603-103-8
Τύπος: Ηλεκτρονικό Βιβλίο
Διαθέτης (Εκδότης): Ελληνικά Ακαδημαϊκά Ηλεκτρονικά Συγγράμματα και Βοηθήματα - Αποθετήριο "Κάλλιπος"

ΔΥΝΑΜΙΚΑ ΣΥΣΤΗΜΑΤΑ ΚΑΙ ΧΑΟΣ
Κωδικός Βιβλίου στον Εύδοξο: 9617
Έκδοση: 1η εκδ./1995
Συγγραφείς: Μπούντης Αναστάσιος
ISBN: 9789607510228
Τύπος: Σύγγραμμα
Διαθέτης (Εκδότης): Α. ΠΑΠΑΣΩΤΗΡΙΟΥ & ΣΙΑ Ι.Κ.Ε.

Ειδικά θέματα μη γραμμικής δυναμικής και εφαρμογές
Κωδικός Βιβλίου στον Εύδοξο: 127532923
Έκδοση: 1

Συγγραφείς: Μαάιτα, Τζαμάλ-Οδυσσέας
ISBN: 9786182281451
Τύπος: Ηλεκτρονικό Βιβλίο
Διαθέτης (Εκδότης): ΚΑΛΛΙΠΟΣ Ανοικτές Ακαδημαϊκές Εκδόσεις

COURSE OUTLINE

1. GENERAL

SCHOOL	OF SCIENCES		
DEPARTMENT	OF PHYSICS		
LEVEL OF STUDIES	Level 6		
COURSE CODE	APE719-2023	**SEMESTER**	7º
COURSE TITLE	INTRODUCTION TO NEURAL NETWORKS		

TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
LECTURES	3	6
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	Core Scientific Course (Specialized Background)
PREREQUISITES:	-
TEACHING & EXAMINATION LANGUAGE:	GREEK
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://physics.duth.gr/?page_id=6876

2. LEARNING OUTCOMES

Learning Outcomes

Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

The course aims to provide an introduction to neural networks and their applications, with an emphasis on physics. It offers students the opportunity to understand the use of neural networks in time series prediction, classification, decision making, and control rule implementation.

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

- Apply intelligent control techniques.
- Identify the importance of variables affecting a system.
- Perform prediction and cross-prediction in time series.
- As future leaders of innovative organizations, make appropriate forecasts and decisions.
- Collaborate effectively with peers to solve problems related to the course.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use
Adaptation to new situations
Decision making
Autonomous work
Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues

Teamwork *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*	*Critical thinking* *Promoting free, creative and inductive reasoning*
The course contributes to the development of the following skills: • Searching, analyzing, and synthesizing data and information using appropriate technologies. • Decision making. • Critical thinking and self-assessment. • Promoting free, creative, and inductive thinking.	

3. COURSE CONTENT

Introduction to neural networks. Supervised learning . Self-learning. Backpropagation neural networks. Time-delay neural networks. Neural network architectures. Architectures based on nonlinear analysis. Classification. One-step and multi-step time series prediction.Cross-prediction. Applications using R, Python, and Matlab

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face to Face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Use of ICT in Teaching Use of ICT in Communication with students
TEACHING ORGANIZATION *The ways and methods of teaching are described in detail.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.* *The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.*	

Activity	*Workload/semester*
Lectures	120
Self study	30
Course total (25 hours / ECTS)	**150**

STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report,Clinical*	**Student Assessment Languages** Greek **Methods (Formative or Concluding)** Concluding **Student Assessment Methods** — **Percentage** Written Exam with Problem Solving — 100

examination of a patient,Artistic interpretation, Other/Others *Please indicate all relevant information about the course assessment and how students are informed*	

5. SUGGESTED BIBLIOGRAPHY

- S. Haykin, *Neural Networks: A Comprehensive Foundation*, Prentice Hall, 2005, p. 823.
- Juan R. Rabuñal & Julián Dorado, *Artificial Neural Networks in Real Life Applications*, IDEA Group Publishing, 2006, p. 371.
- K. Diamantaras, *Artificial Neural Networks*, Kleidarithmos, 1st Edition, 2007, ISBN: 978-960-461-080-8.

COURSE OUTLINE

(1) GENERAL

SCHOOL	Physics		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	CHE714	**SEMESTER**	7th
COURSE TITLE	Network & Graph Theory		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Tutorials (Theory) & practice works	3	6

COURSE TYPE	General background
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	

(2) LEARNING OUTCOMES

Learning outcomes

The purpose of the course is to teach students a basic tool for the study of physical and non-physical systems that exhibit behavior based on the rules of statistical physics. More specifically, and as it has been observed that a multitude of systems in nature have characteristics that can be studied with a graph theory-based methodology, the student will be taught to distinguish and explain unexpected behaviors in various technological, economic and social systems.

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

- Understands the meaning of graphs and recognizes them in different systems.
- Separate systems in which the use of the graph/network tool will be able to yield and reveal results not visible in the first place.
- Study basic structural characteristics of a network.
- Draws conclusions about its possible temporal evolution.
- Identify structural weaknesses in existing systems and design appropriate new ones, more resistant to attacks.

General Competences

- Search, analysis and synthesis of data and information, also using the necessary technologies.
- Decision making.
- Autonomous Work.
- Work in an interdisciplinary environment.
- Generating new research ideas.
- Exercise criticism and self-criticism.
- Promotion of free, creative and inductive thinking.

(3) SYLLABUS

Introduction to networks theory and the concept of connectivity. Basic concepts and mathematical definitions of graphs. Introduction to the concept of graph. Graph construction. Operations with graphs and properties of graphs and other networks. The value of nodes in the network based on metrics. Directed Graphs. Routes - paths - circles. Structure Properties: Connectivity network, diameter, density, and aggregation. Dynamic of networks and graphs. Structure changes, causes of change, temporal study of networks. Dissemination/Propagation of information/viruses. Resistance to attacks. Multi-layer networks. Interconnected networks. Networks of networks.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	In the classroom, face to face.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Basic software (windows, word, power point, the web, etc.). Support of learning process through the electronic platform / e-class
TEACHING METHODS	

Activity	***Semester workload***
Lectures	39
Project	50
Independent Study	61
Course total	150

STUDENT PERFORMANCE EVALUATION	Writing small projects (50%). Final written exam (50%)

(5) ATTACHED BIBLIOGRAPHY

- Newman, M.E.J. Networks: An Introduction. Oxford University Press. 2010
- R. Cohen; S. Havlin (2010). Complex Networks: Structure, Robustness and Function. Cambridge University Press.
- Newman, M., Barabási, A.-L., Watts, D.J. [eds.] (2006) The Structure and Dynamics of Networks. Princeton, N.J.: Princeton University Press.

COURSE OUTLINE

1. GENERAL

SCHOOL			
DEPARTMENT	DEPARTMENT OF PHYSICS		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE	APE715-2023	**SEMESTER**	7th Semester
COURSE TITLE	Renewable Energy Sources		

TEACHING ACTIVITIES If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
	3	6.0

COURSETYPE Background, General Knowledge, Scientific Area, Skill Development	Skill Development
PREREQUISITES	Statistics
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://eclass.emt.duth.gr/

2. LEARNING OUTCOMES

Learning Outcomes
Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

The course aims to introduce students to the concept of Renewable Energy. Acquire skills on assessment conversion sizes RES in electricity and thermal energy. Conversion of solar, wind, hydraulic, geothermal and biomass energy into electricity and acquire skills on technologies. In particular it will be deepened to:

- Introduction to Renewable Energy Sources (RES).
- Solar power. Converting solar energy into electricity.
- Photovoltaic phenomenon. Characteristics Photovoltaic component.
- Performance PV components.
- Technologies PV systems.
- Wind power. Wind potential.
- Kinetic energy of wind.
- Curves duration, speed.
- Conversion of wind energy into electricity.

- Wind Analysis
- Wind farms
- Hydropower.
- Principle hydroelectric system.
- Small hydro projects.
- Features
- Hydroelectric power plant turbine, performance.
- Geothermal energy, geothermal features. Exploiting geothermal energy.
- Uses geothermal energy.
- Shallow Geothermal.
- Biomass, formation, origin, recovery.
- Methods of converting biomass, biomass conversion technologies into energy.
- Wave energy, characteristics, utilization.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use,Adaptation to new situations,
Decision making,
Autonomous work,
Teamwork,
Working in an international environment,
Working in an interdisciplinary environment, Production of new research ideas
Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking
Promoting free, creative and inductive reasoning

Project design and management

3. COURSE CONTENT

1.Energeia flashback, Basic concepts, energy issue, power plants, energy mix, energy, design.
2. Renewable Energy, basic concepts, advantages, disadvantages RES, RES development Brief
3. RES and Environment, National targets RES contribution of RES in the Energy Balance, biofuels, cogeneration
4. Hydropower, history, advantages hydropower Authority hydraulic conversion into electricity.
5. Hydraulic stations, split into small (SHP) and large, main parts, operation principle.
6. Turbines, description, function, types, hydrological analysis Identification, selection turbine, power, energy produced turbine.
7. Biomass, basic concepts, creation, origin, biomass cycle Advantages Disadvantages Biomass utilization.
8. Methods of converting biomass into energy. Thermochemical, biochemical, methods, direct combustion, produced products.
9. Electricity - Cogeneration Biomass technology power plants from biomass.
10. Geothermal throwback, advantages, basic concepts, applications.
11. Geothermal fields, formation, readability exploitation.
12. Electricity from geothermal energy and use for other purposes.
13. Shallow geothermal energy, principle of operation, exploitation of shallow geothermal systems, pumps heat.
14. The wave energy, basic concepts, systems.
15. Wind energy, wind, characteristics
16. Wind Energy Conversion Systems
17. turbines, wind farms, planning, evaluation
18. Solar energy
19. Solar energy conversion systems
20. The photovoltaic effect, P / V systems, features, design

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD Face to face, Distance learning, etc.	Face to face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) Use of ICT in Teaching, in Laboratory Education, in Communication with students	Use of ICT in Teaching
TEACHING ORGANIZATION The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research& analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc. The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards	
STUDENT EVALUATION Description of the evaluation process Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others Please indicate all relevant information about the course assessment and how students are informed	**Student evaluation languages** Greek **Method (Formative or Concluding)** Formative **Student evaluation methods** — **Rate** Written Assignment — 20 Written exam with multiple choice test — 80

Activity	Workload/semester
Lectures	80
Writing project	40
Bibliographic research & analysis	30
Total	**150**

5. Suggested Bibliography

? Μ. Φυτίκας “Γεωθερμία”, Εκδόσεις ΤΖΙΟΛΑ, 2004
? Δ. Παπαντώνης, “Μικρά Υδροηλεκτρικά Έργα” Εκδόσεις ΣΥΜΕΩΝ 2001
? Γ. Παπαϊωάνου “Ήπιες Μορφές Ενέργειας”, Εκδόσεις ΙΩΝ 2009 B. Sorensen, “Renewable Energy Conversion, Transmission, and Storage”,Academic Press 2008
? B.Godfrey “Renewable Energy” Amazon, 2007

Eudoxus

Ενέργεια, Περιβάλλον και Αειφόρος Ανάπτυξη
Κωδικός Βιβλίου στον Εύδοξο: 94645312
Έκδοση: 1η/2020
Συγγραφείς: Πολυζάκης Απόστολος
ISBN: 9786188359062
Τύπος: Σύγγραμμα
Διαθέτης (Εκδότης): Πολυζάκης Απόστολος ΜΟΝ. ΙΚΕ

Ανανεώσιμες Πηγές Ενέργειας

Κωδικός Βιβλίου στον Εύδοξο: 22770910
Έκδοση: 1η Έκδ./2013
Συγγραφείς: Τσούτσος Θ., Κανάκης Ι.
ISBN: 9789604910670
Τύπος: Σύγγραμμα
Διαθέτης (Εκδότης): Α. ΠΑΠΑΣΩΤΗΡΙΟΥ & ΣΙΑ Ι.Κ.Ε.

ΑΝΑΝΕΩΣΙΜΕΣ ΠΗΓΕΣ ΕΝΕΡΓΕΙΑΣ Β' ΕΚΔΟΣΗ
Κωδικός Βιβλίου στον Εύδοξο: 112701036
Έκδοση: 2η/2023
Συγγραφείς: ΑΣΗΜΑΚΟΠΟΥΛΟΣ Δ., ΑΡΑΜΠΑΤΖΗΣ Γ., ΑΓΓΕΛΗΣ-ΔΗΜΑΚΗΣ Α., ΚΑΡΤΑΛΙΔΗΣ Α., ΤΣΙΛΙΓΚΙΡΙΔΗΣ Γ.
ISBN: 9789606330445
Τύπος: Σύγγραμμα
Διαθέτης (Εκδότης): "σοφία" Ανώνυμη Εκδοτική & Εμπορική Εταιρεία

Ανανεώσιμες Πηγές Ενέργειας
Κωδικός Βιβλίου στον Εύδοξο: 122079110
Έκδοση: 1η/2023
Συγγραφείς: Μπιτζιώνης Βασίλειος, Μπιτζιώνης Δημήτριος
ISBN: 9786182210345
Τύπος: Σύγγραμμα
Διαθέτης (Εκδότης): ΕΚΔΟΣΕΙΣ Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε.

COURSE OUTLINE

1. GENERAL

SCHOOL	OF SCIENCES		
DEPARTMENT	OF PHYSICS		
LEVEL OF STUDIES	Level 6		
COURSE CODE	APE716-2023	**SEMESTER**	7th
COURSE TITLE	Nuclear technology		

TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
LECTURES	3	6
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	Skill Development
PREREQUISITES:	-
TEACHING & EXAMINATION LANGUAGE:	Greece
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS145/

2. LEARNING OUTCOMES

Learning Outcomes
Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

The aim of the course is for students to become familiar with the basic concepts of nuclear technology and radiation protection. They should also understand the operation and safety of nuclear reactors for energy production. The course topics include the following:

- Introduction to Nuclear Physics – Radioactivity
- Detection of Ionizing Radiation of Particle and Electromagnetic Nature
- Sources of Radiation in the Natural Environment
- Cross Sections and Types of Nuclear Reactions
- Description of the Average Neutron Life Cycle and their Role in Nuclear Technology – Monte Carlo Method
- Nuclear Energy and Reactor Technology – Shielding
- Power Plants with Next-Generation Reactors
- Causes of Accidents, Reactor Control and Safety
- Nuclear Fuel Management
- Radiation Doses and Protection

Use of a specialized simulation program to help calculate more complex geometries and examples

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

- Understand the physics of radioactive decay and the interactions of radiation with matter.
- Have a solid understanding of neutron reactions, reaction cross sections, and relationships for reaction rates.
- Be familiar with fission, fissile materials, and neutron moderation.
- Understand the principles and instruments for detecting and measuring radiation.
- Know the basic principles of radiation protection.

- Perform calculations for γ-ray shielding.
- Evaluate the basic design parameters of a nuclear reactor.
-

Upon successful completion of the course, the student will have acquired the ability to:

- Demonstrate deep knowledge and understanding of the basic concepts, principles, and laws related to the mechanics of a point particle, solid-body mechanics, fluid mechanics, the harmonic oscillator, and mechanical waves, as well as the concepts and principles of Heat and Thermodynamics.
- Apply this knowledge to solve related complex problems.
- Employ critical thinking to evaluate and analyze this knowledge.
- Interpret phenomena encountered in everyday life.
- Collaborate effectively with fellow students to solve problems related to this course.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,	*Project design and management*
ICT Use	*Equity and Inclusion*
	Respect for the natural environment
	Sustainability
Decision making	*Demonstration of social, professional and moral*
Autonomous work	*responsibility and sensitivity to gender issues*
Teamwork	*Critical thinking*
Working in an international environment	*Promoting free, creative and inductive reasoning*
Production of new research ideas	

- Promoting free, creative and inductive reasoning
- Autonomous work
- Working in an international environment
- Working in an interdisciplinary environment

3. COURSE CONTENT

I. Introduction to the Concepts of Nuclear Physics and Radioactivity – Mass Defect.
II. Detection and Measurement of Radiation. Detection of Ionizing Radiation of Particulate and Electromagnetic Nature. Sources of Radiation in the Natural Environment.
III. Nuclear Reactions and Reaction Cross Sections. Fission. Interactions of Matter and Radiation.
IV. Effective Cross Sections and Types of Nuclear Reactions. Description of the Average Neutron Life Cycle and their Role in Nuclear Technology.
V. Nuclear Energy and Reactor Technology.
VI. Design and Configuration of Nuclear Power Plants. Concept of Criticality. Criticality Calculations.
VII. Power Generation Plants Using Next-Generation Reactors.
VIII. Causes of Accidents, Reactor Control and Safety.
IX. Nuclear Fuel Management.
X. Radiation Doses and Protection.
XI. Monte Carlo Method.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face to Face	
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Use of ICT in Teaching Use of ICT in Communication with students	
TEACHING ORGANIZATION *The ways and methods of teaching*	***Activity***	***Workload/semester***
	Lectures	80

are described in detail. *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.* *The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.*	Bibliographic research & analysis: 20 Tutoring: 25 Project: 20 Course total (25 hours / ECTS): **150**
STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report,Clinical examination of a patient,Artistic interpretation, Other/Others* *Please indicate all relevant information about the course assessment and how students are informed*	Student Assessment Languages Greek Methods (Formative or Concluding) Concluding Student Assessment Methods — Percentage Written Exam with Problem Solving — 80% Written Assignment — 20%

5. SUGGESTED BIBLIOGRAPHY

- ΠΥΡΗΝΙΚΗ ΤΕΧΝΟΛΟΓΙΑ, Τσάγκας Νικόλαος, Εκδόσεις ΑΪΒΑΖΗ, Ξάνθη 1986. Κωδικός Βιβλίου στον Εύδοξο: 1255
- ΕΙΣΑΓΩΓΗ ΣΤΗΝ ΠΥΡΗΝΙΚΗ ΤΕΧΝΟΛΟΓΙΑ, Αντωνόπουλος - Ντόμης Μιχάλης, Θεσσαλονίκη Εκδόσεις Ζήτη Πελαγία & Σια Ο.Ε. Κωδικός Βιβλίου στον Εύδοξο: 112663.
- Nuclear Energy: Principles, Practices, and Prospects, David Bodansky, Springer, 2004.
- Nuclear Engineering: Theory and Technology of Commercial Nuclear Power, Ronald Allen Knief, Hemisphere Publishing Corporation, 1992.
- Πυρηνική Ενέργεια και Τεχνολογικές Εφαρμογές, Πολυζάκης Απόστολος, ΣΙΑ ΕΕ (Power Heat Cool). Κωδικός Βιβλίου στον Εύδοξο: 102117623.

GENERAL

SCHOOL	Physics		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	APE718	**SEMESTER**	7th
COURSE TITLE	Energy Systems Modelling		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
Tutorials (Theory) & practice works	3	6

COURSE TYPE	General background
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	https://eclass.emt.duth.gr/courses/PHYSICS252/

(1) LEARNING OUTCOMES

Learning outcomes

Purpose and aim of the course is to enable students to design and calculate the combination of different forms of energy to meet the energy needs of an area and learn the basic principles of energy planning and energy strategy.
Analytical during the semester will be deepened to:
•Types of energy
• Origin
•Characteristics
• Utilization
• Energy Production technologies, products
• The Energy issue
• Environmental aspects of energy
• Security of energy supply
• Exogenous factors
• The energy design and European policies
• The national energy strategy
• Decision making theory for energy planning
• Renewable energy sources in the energy planning

General Competences

• Understand concepts
• Design of general
• Work in unity energy planning
• Teamwork
• Decision-making on energy planning
• Respect for the environment through the design process

(2) SYLLABUS

- Energy system
- General orientation of Energy planning
- Description of existing situation
- Energy from which sources
- Transmission and distribution of energy (infrastructure)
- Energy consumption (production, societies)
- Energy policy objectives
- Strategy - regulatory - Legal status of Energy Planning
- Energy Reference System
- Institutional framework
- Energy Planning Framework for Energy Production
- Electricity Production Technologies
- Energy Planning and Renewable Energy Sources
- Methodological framework of Energy Planning

(3) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY	In the classroom, face to face.
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Lectures and Laboratory Exercises using Power Point presentations. Website of the course in e-class with supporting and auxiliary material which is updated at regular intervals. Software simulation Application. E-mail contact.
TEACHING METHODS	

Activity	***Semester workload***
Lectures	80
Project	20
Independent Study	50
Course total	150

STUDENT PERFORMANCE EVALUATION	Final writing examination where students solve different problems concerning Energy Planning

(4) ATTACHED BIBLIOGRAPHY

- Μοντελοποίηση και Βέλτιστος Έλεγχος Συστημάτων, Νικόλαος Κρικέλης, Εκδότης Γρηγόριος Χρυσοσόμου Φουντάς, 2000.
- Ηλεκτρικά Κινητήρια Συστήματα:Μοντελοποίηση, Ανάλυση και Έλεγχος, Ramu Krishnan, Εκδότης Κλειδάριθμος ΕΠΕ, 2009.

COURSE OUTLINE

1. GENERAL

SCHOOL	OF SCIENCES		
DEPARTMENT	OF PHYSICS		
LEVEL OF STUDIES	Level 6		
COURSE CODE	APE719-2023	**SEMESTER**	7º
COURSE TITLE	APPLIED PHYSICS		

TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
LECTURES	3	6
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	Scientific Area
PREREQUISITES:	-
TEACHING & EXAMINATION LANGUAGE:	GREEK
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS224/

2. LEARNING OUTCOMES

Learning Outcomes

Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

Aim of this course is to understand the students the structure and operation of Synchronous three-phase machines and Asynchronous machines (Three-phase and Single-phase). The objective of the course is to acquire the necessary theoretical background and especially the familiarization with mathematical analysis principles for the study of variables, parameters, behaviour and control of these machines. The deepening in the different sections that will be presented will be achieved by solving selected exercises.

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

- Understand the operation of Synchronous and Asynchronous Machines.
- Understand the construction parts of Synchronous and Asynchronous Machines.
- Be able to analyze the operation of Synchronous and Asynchronous Machines through the respective equivalent circuits.
- Understand the basic design elements of Synchronous and Asynchronous Machines.
- To interpret the thermal phenomena in electric machines.
- To interpret phenomena of everyday life.
- To develop partnerships with other fellow students to solve problems related to this course.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,	*Project design and management*
ICT Use	*Equity and Inclusion*
Adaptation to new situations	*Respect for the natural environment*
	Sustainability

Decision making *Autonomous work* *Teamwork* *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*	*Demonstration of social, professional and moral responsibility and sensitivity to gender issues* *Critical thinking* *Promoting free, creative and inductive reasoning*

- *Search for, analysis and synthesis of data and information, with the use of the necessary technology*
- *Decision-making*
- *Working independently*
- *Working in an international environment*
- *Production of new research ideas*

3. COURSE CONTENT

Synchronous - Asynchronous Machines: Construction, operating principles, types of machines. Analysis of basic Machine for the comprehension of creation of magnetic fields therein. Synchronous Three-phase Generators, Synchronous Three-phase motors, Asynchronous (Induction) Three-phase motors, Asynchronous Three-phase Generator, Single-phase motors. Basic principles of infrared thermography. Basic laws of electromagnetic radiation. Applications of infrared thermography on electric machines.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face to Face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Use of ICT in Teaching Use of ICT in Communication with students
TEACHING ORGANIZATION *The ways and methods of teaching are described in detail.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.* *The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.*	

Activity	*Workload/semester*
Lectures	80
Self study	40
Written Assignment	30
Course total (25 hours / ECTS)	**150**

STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report,Clinical*	**Student Assessment Languages** Greek **Methods (Formative or Concluding)** Concluding

Student Assessment Methods	**Percentage**
Written Exam with Problem Solving	70
Writing Assignment	30

examination of a patient,Artistic interpretation, Other/Others *Please indicate all relevant information about the course assessment and how students are informed*	

5. SUGGESTED BIBLIOGRAPHY

- Suggested bibliography:
- Related academic journals:

- S. J. Chapman, “Ηλεκτρικές Μηχανές AC-DC”, 4η Έκδοση, Εκδόσεις Α. ΤΖΙΟΛΑΣ & ΥΙΟΙ Α.Ε., 2009.
- Π. Μαλατέστας, "ΗΛΕΚΤΡΙΚΕΣ ΜΗΧΑΝΕΣ", 3η Έκδοση, Εκδόσεις Α. ΤΖΙΟΛΑΣ & ΥΙΟΙ Α.Ε. , 2015.
- S. Umans, “Fitzgerald and Kingsley's Electric Machinery”, 7th Edition, McGraw-Hill Education - Europe, 2013.
- I. BOLDEA, L. TUTELEA, "Electric Machines", Taylor & Francis Inc, 2009.

COURSE OUTLINE

1. GENERAL

SCHOOL	OF SCIENCES		
DEPARTMENT	OF PHYSICS		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	APE717	**SEMESTER**	7ο
COURSE TITLE	ELEMENTARY PARTICLES		

TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
LECTURES	4	5
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	Scientific Area
PREREQUISITES:	-
TEACHING & EXAMINATION LANGUAGE:	GREEK
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://eclass.emt.duth.gr/courses/ (The course does not exist in eclass)

2. LEARNING OUTCOMES

Learning Outcomes

Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

This course equips students with the fundamental knowledge and skills required to describe subatomic phenomena within the framework of relativistic quantum mechanics. Emphasis is placed on the structure of hadrons as explained by the Standard Model of quarks. Upon successful completion, students will be able to apply relativistic methods to quantum phenomena and analyze the role of symmetries. The course covers the dynamics and symmetries underlying the Electroweak and Strong interactions, bridging theoretical predictions with experimental discoveries. It provides the essential background for understanding ongoing developments and current experiments in the field of Particle Physics.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use
Adaptation to new situations
Decision making
Autonomous work
Teamwork
Working in an international environment
Working in an interdisciplinary environment
Production of new research ideas
Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking
Promoting free, creative and inductive reasoning

- Application of knowledge in practice

- Search, analysis, and synthesis of data and information
- Independent work
- Teamwork
- Work in an international environment
- Work in an interdisciplinary environment
- Generation of new research ideas
- Promotion of free, creative, and inductive thinking

3. COURSE CONTENT

Classification of elementary particles, relativistic kinematics, Mandelstam variables, resonances and invariant mass, symmetries and conservation laws, cross sections, Fermi's Golden Rule and Feynman diagrams, electromagnetic interactions (electron–electron scattering, Quantum Electrodynamics), weak interactions, deep inelastic scattering, proton structure functions, neutrinos, strong interactions, unification of Electroweak interactions (Standard Model), discovery of the Higgs boson at the LHC, and the search for New Physics with emphasis on recent developments.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face to Face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Use of ICT in Teaching Use of ICT in Communication with students
TEACHING ORGANIZATION *The ways and methods of teaching are described in detail.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.* *The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.*	

Activity	*Workload/semester*
Lectures	92
Self study	30
Exams	3
Course total (25 hours / ECTS)	**125**

STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report,Clinical examination of a patient,Artistic interpretation, Other/Others* *Please indicate all relevant information about the course*	Optional short assignments (10%). Final written examination (90%–100%), consisting of problem solving from different sections of the course (use of notes is not permitted).

assessment and how students are informed	

5. SUGGESTED BIBLIOGRAPHY

- Suggested bibliography:
- Related academic journals:

- *Concepts of Elementary Particle Physics*, Michael E. Peskin
- *Particle Physics*, B.R. Martin & G. Shaw (edited and translated into Greek by G. Tsipolitis)
- *Introduction to Elementary Particle Physics*, Alessandro Bettini

COURSE OUTLINE

1. GENERAL

SCHOOL			
DEPARTMENT	DEPARTMENT OF PHYSICS		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE	APE720-2023	**SEMESTER**	7th Semester
COURSE TITLE	Bioengineering		

TEACHING ACTIVITIES If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
	3	6.0

COURSETYPE Background, General Knowledge, Scientific Area, Skill Development	Scientific Area
PREREQUISITES	
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	YES
COURSE URL:	https://exams.emt.ihu.gr/courses/PHYSICS241/

2. LEARNING OUTCOMES

Learning Outcomes
Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

The course serves as an introduction to the scientific field of Biomechanics, which is the application of the sciences of physics, mathematics, chemistry, computer science, engineering, etc., to living organisms with the aim of prevention, diagnosis, or treatment. The goal of the course is to understand and study the properties governing the functioning of the human body, with the ultimate purpose of solving problems faced by living organisms, particularly humans.

Upon the successful completion of the course, the student will be able to:
- combine physics with the functioning of living systems,
- understand the field of Biomechanics,
- apply critical thinking,
- combine different physical principles within a system.

General Skills	
Name the desirable general skills upon successful completion of the module	
Search, analysis and synthesis of data and information, ICT Use,Adaptation to new situations, Decision making, Autonomous work, Teamwork, Working in an international environment, Working in an interdisciplinary environment, Production of new research ideas	Project design and management Equity and Inclusion Respect for the natural environment Sustainability Demonstration of social, professional and moral responsibility and sensitivity to gender issues Critical thinking Promoting free, creative and inductive reasoning
Search, analysis and synthesis of data and information, ICT Use Working in an interdisciplinary environment	

3. COURSE CONTENT

Basic Principles of Biomechanics
Human Physiology
Bioelectric Phenomena
Biomaterials and Their Interaction with the Body
Mechanics of the Human Body
Biomechanics of Biofluids
Biomechanics of Biosolids
Biostatistics

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD Face to face, Distance learning, etc.	Face to face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) Use of ICT in Teaching, in Laboratory Education, in Communication with students	Use of ICT in Teaching Use of ICT in Communication with students
TEACHING ORGANIZATION The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research& analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc. The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards	

Activity	Workload/semester
Lectures	5
Interactive learning	1
Total	**6**

STUDENT EVALUATION Description of the evaluation process Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others Please indicate all relevant information about the course assessment and how students are informed	**Student evaluation languages** Greek English **Method (Formative or Concluding)** Summative **Student evaluation methods** — **Rate** Written Exam with Short Answer Questions — 80 Written Exam with Problem Solving — 20

5. Suggested Bibliography

ΕΙΣΑΓΩΓΗ ΣΤΗΝ ΕΜΒΙΟΜΗΧΑΝΙΚΗ, Κωδικός Βιβλίου στον Εύδοξο: 68375695, Έκδοση: 2/2017Συγγραφείς: J.D. Humphrey,S.L.O'RourkeISBN: 9789603307822Τύπος: ΣύγγραμμαΔιαθέτης (Εκδότης): ΓΡΗΓΟΡΙΟΣ ΧΡΥΣΟΣΤΟΜΟΥ ΦΟΥΝΤΑΣ
/Fundamentals of Bioengineering [electronic resource], Κωδικός Βιβλίου στον Εύδοξο: 80505918, Έκδοση: /2016, Συγγραφείς: Villadsen, ISBN: 9783527697441,Τύπος: Ηλεκτρονικό Βιβλίο, Διαθέτης (Εκδότης): HEAL-Link Wiley ebooks
Bioengineering [electronic resource], Κωδικός Βιβλίου στον Εύδοξο: 73262026, Αριθμός τόμου: Έκδοση: /2015Συγγραφείς: Mirjana PavlovicISBN: 9783319107981Τύπος: Ηλεκτρονικό ΒιβλίοΔιαθέτης (Εκδότης): HEAL-Link Springer ebooks

Eudoxus

ΕΙΣΑΓΩΓΗ ΣΤΗΝ ΕΜΒΙΟΜΗΧΑΝΙΚΗ, Κωδικός Βιβλίου στον Εύδοξο: 68375695, Έκδοση: 2/2017Συγγραφείς: J.D. Humphrey,S.L.O'RourkeISBN: 9789603307822Τύπος: ΣύγγραμμαΔιαθέτης (Εκδότης): ΓΡΗΓΟΡΙΟΣ ΧΡΥΣΟΣΤΟΜΟΥ ΦΟΥΝΤΑΣ
/Fundamentals of Bioengineering [electronic resource], Κωδικός Βιβλίου στον Εύδοξο: 80505918, Έκδοση: /2016, Συγγραφείς: Villadsen, ISBN: 9783527697441,Τύπος: Ηλεκτρονικό Βιβλίο, Διαθέτης (Εκδότης): HEAL-Link Wiley ebooks
Bioengineering [electronic resource], Κωδικός Βιβλίου στον Εύδοξο: 73262026, Αριθμός τόμου: Έκδοση: /2015Συγγραφείς: Mirjana PavlovicISBN: 9783319107981Τύπος: Ηλεκτρονικό ΒιβλίοΔιαθέτης (Εκδότης): HEAL-Link Springer ebooks

COURSE OUTLINE

1. GENERAL

SCHOOL			
DEPARTMENT	DEPARTMENT OF PHYSICS		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE		**SEMESTER**	4th Semester
COURSE TITLE	Metrology and Measurement Systems		

TEACHING ACTIVITIES If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
	3	4.0

COURSETYPE Background, General Knowledge, Scientific Area, Skill Development	Background
PREREQUISITES	
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS256/

2. LEARNING OUTCOMES

Learning Outcomes Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.
Upon successful completion of the course, students know: Learning the structure and organization of the pillars of the National Quality System. Familiarity with procedures of a quality system. Familiarity with laboratory rules and procedures. Perform precision measurements. Calculation of measurement uncertainties.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use,Adaptation to new situations,
Decision making,
Autonomous work,
Teamwork,
Working in an international environment,
Working in an interdisciplinary environment, Production of new research ideas
Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking
Promoting free, creative and inductive reasoning

Search, analysis and synthesis of data and information, ICT Use
Adaptation to new situations
Decision making
Autonomous work
Teamwork
Working in an international environment
Working in an interdisciplinary environment
Production of new research ideas
Project design and management
Equity and Inclusion
Respect for the natural environment
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking
Promoting free, creative and inductive reasoning

3. COURSE CONTENT

Introduction to metrology (structure and perspectives of the Greek metrology system). Units and methodology of measuring mass-volume-density, force-pressure-momentum-hardness, temperature, dimensions. Quality Systems. Traceability, verification, certification, accreditation, standardization, benchmarking. Typical uncertainty calculation scenarios - necessary mathematical background.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD Face to face, Distance learning, etc.	Face to face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) Use of ICT in Teaching, in Laboratory Education, in Communication with students	Use of ICT in Teaching
TEACHING ORGANIZATION The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research& analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.	

Activity	Workload/semester
Lectures	80
Bibliographic research & analysis	20

The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards	<table><tr><th>Activity</th><th>Workload/semester</th></tr><tr><td>Total</td><td>100</td></tr></table>
STUDENT EVALUATION Description of the evaluation process Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others Please indicate all relevant information about the course assessment and how students are informed	**Student evaluation languages** Greek **Method (Formative or Concluding)** Formative **Student evaluation methods** — **Rate** Written Exam with Problem Solving — 80 Written Assignment — 20

5. Suggested Bibliography

1. Συστήματα μετρήσεων,Βασικές αρχές, Συγγραφείς: Bentley John P.,(Εκδότης): ΜΑΡΙΑ ΠΑΡΙΚΟΥ & ΣΙΑ ΕΠΕ, 1η έκδ./2009
2. Τεχνολογία Μετρήσεων - Αισθητήρια, Συγγραφείς: Γαστεράτος,Μουρούτσος,Ανδρεάδης, (Εκδότης): ΤΣΟΤΡΑΣ ΑΝ ΑΘΑΝΑΣΙΟΣ, Έκδοση: 1η/2013
3. Αισθητήρες Μέτρησης και Ελέγχου, Συγγραφείς: Καλοβρέκτης Κωνσταντίνος, (Εκδότης): ΕΚΔΟΣΕΙΣ Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε.. Έκδοση: 3η/2018
4. Sensors for Measurement and Control, Peter Elgar, TecQuipment Limited: 1998.

Eudoxus

1. Συστήματα μετρήσεων,Βασικές αρχές, Συγγραφείς: Bentley John P.,(Εκδότης): ΜΑΡΙΑ ΠΑΡΙΚΟΥ & ΣΙΑ ΕΠΕ, 1η έκδ./2009
2. Τεχνολογία Μετρήσεων - Αισθητήρια, Συγγραφείς: Γαστεράτος,Μουρούτσος,Ανδρεάδης, (Εκδότης): ΤΣΟΤΡΑΣ ΑΝ ΑΘΑΝΑΣΙΟΣ, Έκδοση: 1η/2013
3. Αισθητήρες Μέτρησης και Ελέγχου, Συγγραφείς: Καλοβρέκτης Κωνσταντίνος, (Εκδότης): ΕΚΔΟΣΕΙΣ Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε.. Έκδοση: 3η/2018
4. Sensors for Measurement and Control, Peter Elgar, TecQuipment Limited: 1998.

Diploma Thesis

(1) GENERAL

SCHOOL	Physics		
LEVEL OF STUDIES	UNDERGRADUATE		
COURSE CODE	THE702	**SEMESTER**	7th or 8th
COURSE TITLE	Diploma Thesis		

INDEPENDENT TEACHING ACTIVITIES	**WEEKLY TEACHING HOURS**	**CREDITS**
		12

COURSE TYPE	Knowledge Deepening / Consolidation
PREREQUISITE COURSES:	
LANGUAGE OF INSTRUCTION and EXAMINATIONS:	GREEK
IS THE COURSE OFFERED TO ERASMUS STUDENTS	NO
COURSE WEBSITE (URL)	https://exams.emt.ihu.gr/modules/auth/courses.php

(2) LEARNING OUTCOMES

Learning outcomes

After the course, the student will have used knowledge and ideas from wide range sciences in a general or specific area. The student will present his/her skills in understanding a research question or problem, analyzing its components and solving it.

General Competences

- Apply knowledge in practice
- Retrieve, analyse and synthesise data and information, with the use of necessary technologies
- Make decisions
- Work autonomously
- Generate new research ideas
- Be critical and self-critical
- Advance free, creative and causative thinking

(3) SYLLABUS

During the execution of the Diploma Thesis the students are trained, under the guidance of the supervisor, to face complicated scientific questions the answer of which requires experimental design and combinatorial use of under-graduate knowledge. In addition, during the execution of the Diploma Thesis the students are trained to work as team members, to conduct focused literature searches, to take own initiatives and to become familiar with scientific research.
The Diploma Thesis may cover an extended range of relevant with physics areas varying from materials, physical and chemical processes, energy, environment, biotechnology or computational modelling

subjects that may be form individual parts of larger research programs or Ph.D. dissertations that are in progress.

(4) TEACHING and LEARNING METHODS - EVALUATION

DELIVERY		
USE OF INFORMATION AND COMMUNICATIONS TECHNOLOGY	Basic software (windows, word, power point, the web, etc.). Support of learning process through the electronic platform / e-class	
TEACHING METHODS	***Activity***	***Semester workload***
STUDENT PERFORMANCE EVALUATION		

(5) ATTACHED BIBLIOGRAPHY

Depends on the subject of the dissertation.

COURSE OUTLINE

1. GENERAL

SCHOOL	OF SCIENCES		
DEPARTMENT	OF PHYSICS		
LEVEL OF STUDIES	Level 6		
COURSE CODE	SSE801	**SEMESTER**	8º
COURSE TITLE	Nanoelectronics		

TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
LECTURES	3	6
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	Scientific Area
PREREQUISITES:	-
TEACHING & EXAMINATION LANGUAGE:	GREEK
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS234/

2. LEARNING OUTCOMES

Learning Outcomes

Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

Aim of this course of the course is to introduce nanoelectronics (materials and devices) to Physics department students.

Upon successful completion of the course, the student will have acquired:

- Knowledge of nanoelectronic devices operation.
- Ability to design nanomaterials and nanodevices
- Ability to apply this knowledge to solve related complex problems.
- Ability to think critically so that they can evaluate, analyze and correlate this knowledge.
- Ability to interpret phenomena of everyday life.
- Ability to develop cooperation with other students to solve problems related to this course

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use
Adaptation to new situations
Decision making
Autonomous work
Teamwork
Working in an international environment
Working in an interdisciplinary environment
Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking
Promoting free, creative and inductive reasoning

Production of new research ideas
• *Search for, analysis and synthesis of data and information, with the use of the necessary technology* • *Decision-making* • *Working independently* • *Working in an international environment* • *Production of new research ideas*

3. COURSE CONTENT

Fundamental concepts of nanoscopic physics,
Description of necessary physical principles for understanding nanoelectronic devices.
Description of nanoelectronic devices,
Nanosolids,
Semiconductor quantum dots,
Nanoscopic electrodes,
Nanoparticles,
Nanostructures,
Nanostructured materials,
Carbon nanowires,
Nanowire FETs.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face to Face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Use of ICT in Teaching Use of ICT in Communication with students
TEACHING ORGANIZATION *The ways and methods of teaching are described in detail.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.* *The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.*	

Activity	*Workload/semester*
Lectures	39
Self study	85
Project	26
Course total (25 hours / ECTS)	**150**

STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report,Clinical*	**Student Assessment Languages** Greek **Methods (Formative or Concluding)** Concluding

Student Assessment Methods	**Percentage**
Written Exam with Problem Solving	50
Essay / Report, Presentation in audience	*50*

examination of a patient,Artistic interpretation, Other/Others *Please indicate all relevant information about the course assessment and how students are informed*	

5. SUGGESTED BIBLIOGRAPHY

- Suggested bibliography:
- Related academic journals:

- Αρχές νανοηλεκτρονικής, Hanson George W., Εκδόσεις Τζιόλα

COURSE OUTLINE

1. GENERAL

SCHOOL	OF SCIENCES		
DEPARTMENT	OF PHYSICS		
LEVEL OF STUDIES	Level 6		
COURSE CODE	SSE802-2023	**SEMESTER**	8º
COURSE TITLE	DESIGN OF NEW MATERILAS AND DEVICES		

TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
LECTURES	4	5
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	General Background
PREREQUISITES:	It is desirable for the student to have attended the following courses: ELECTRONICS SOLID STATE PHYSICS QUANTUM MECHANICS I QUANTUM MECHANICS II
TEACHING & EXAMINATION LANGUAGE:	GREEK
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS224/

2. LEARNING OUTCOMES

Learning Outcomes

Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

The purpose and aim of the course is to enable students to interpret phenomena related to mass or charge transport issues within materials and to design the crystal structure of a material, accurately determining the type and concentration of the dominant point defects, aiming for a specific behavior. Also, through the teaching of the course, students will be able to design new innovative micro and nano electronic devices as well as sensors, considering their desired properties. Within the framework of the course, students will be trained in the use of specialized simulation software for micro and nano electronic devices, aiming at the design of new innovative devices.

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

- Understand and interpret the properties of materials
- Recognize the basic properties and differentiations that appear in materials with the appearance of point defects
- Know techniques for introducing defects into materials aiming for a specific behavior.
- Design innovative devices with specific properties.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,	*Project design and management*
ICT Use	*Equity and Inclusion*
Adaptation to new situations	*Respect for the natural environment*
	Sustainability

Decision making *Autonomous work* *Teamwork* *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*	*Demonstration of social, professional and moral responsibility and sensitivity to gender issues* *Critical thinking* *Promoting free, creative and inductive reasoning*

- *Search for, analysis and synthesis of data and information, with the use of the necessary technology*
- *Decision-making*
- *Working independently*
- *Working in an international environment*
- *Production of new research ideas*

3. COURSE CONTENT

Intrinsic and extrinsic point defects in oxides. Diagrams of point ionic defects. Electronic defects. Intrinsic deviations from stoichiometry. Extrinsic deviations from stoichiometry. Brouwer diagrams of point defects. Applications in the design of micro and nano microelectronic devices and sensors using simulation software.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face to Face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Use of ICT in Teaching Use of ICT in Communication with students
TEACHING ORGANIZATION *The ways and methods of teaching are described in detail.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.* *The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.*	

Activity	*Workload/semester*
Lectures	52
Self study	118
Course total (25 hours / ECTS)	**170**

STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report,Clinical*	**Student Assessment Languages** Greek **Methods (Formative or Concluding)** Concluding **Student Assessment Methods** — **Percentage** Written Exam with Problem Solving — 100

examination of a patient,Artistic interpretation, Other/Others *Please indicate all relevant information about the course assessment and how students are informed*	

5. SUGGESTED BIBLIOGRAPHY

- Electronic Thin Film Science: for electrical engineers and materials scientists, K.-N. Tu, J. W. **Mayer** and L. C. Feldman, Macmillan Publishing Company, New York, 1992
- Electronic Materials Science, J.W. **Mayer**, S.S. Lau, Macmillan Publishing Company, New **York**, 1990 "VLSI Technology"
- S. M. Sze 2**nd Edition**, McGraw-Hill 1988
- S. Selberherr, "Analysis and Simulation of Semiconductor Devices" Springer Verlag 1984.
- Athena User's Manual, Silvaco International. **Atlas User's Manual**, Silvaco International.

COURSE OUTLINE

1. GENERAL

SCHOOL	OF SCIENCES		
DEPARTMENT	OF PHYSICS		
LEVEL OF STUDIES	Level 6		
COURSE CODE	SSE803	**SEMESTER**	8º
COURSE TITLE	SELECT ISSUES IN OPTICS		

TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
LECTURES	3	6
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	Scientific Area (Special Background)
PREREQUISITES:	-
TEACHING & EXAMINATION LANGUAGE:	GREEK
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://physics.duth.gr/?page_id=6876

2. LEARNING OUTCOMES

Learning Outcomes

Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

The purpose of this course is to provide knowledge of the operating principles of lasers, optical fibers, the phenomenon of chromatic polarization, the polarizing microscope, nonlinear optical phenomena, and holography.

- Upon successful completion of the course, the student will be able to:
- Understand the operating principles and types of lasers.
- Understand how optical fibers work and their applications.
- Understand the phenomenon of chromatic polarization in conjunction with the polarizing microscope.
- Understand the phenomena of nonlinear optics and their technological applications.
- Understand the principles of holography.
- Interpret phenomena observed in everyday life.
- Collaborate effectively with fellow students to solve problems related to the course.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use
Adaptation to new situations
Decision making
Autonomous work
Teamwork
Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking

Working in an international environment *Working in an interdisciplinary environment* *Production of new research ideas*	*Promoting free, creative and inductive reasoning*
The course aims to develop the following competencies: • Search, analysis, and synthesis of data and information using the necessary technologies. • Decision-making. • Critical thinking and self-evaluation. • Promotion of free, creative, and inductive thinking.	

3. COURSE CONTENT

Operating principles of lasers. Population inversion. Types of lasers.Optical fibers. Chromatic polarization.Polarizing microscope.Nonlinear optics (Kerr and Pockels effects). Holography.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face to Face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Use of ICT in Teaching Use of ICT in Communication with students
TEACHING ORGANIZATION *The ways and methods of teaching are described in detail.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.* *The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.*	

Activity	*Workload/semester*
Lectures	120
Self study	30
Course total (25 hours / ECTS)	**150**

STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report,Clinical examination of a patient,Artistic interpretation, Other/Others* *Please indicate all relevant information about the course assessment and how students are informed*	**Student Assessment Languages** Greek **Methods (Formative or Concluding)** Concluding **Student Assessment Methods** — **Percentage** Written Exam with Problem Solving — 100

5. SUGGESTED BIBLIOGRAPHY

- **Laser – Physics and Technology**, Persephone P., Arakynthos
- **Introduction to Quantum Optics and Lasers**, Ves S., Giachoudi
- **Optics: Basic Principles and Applications**, Eugene Hecht (Scientific Editor: Sotiris Ves), 1st Edition, Gutenberg, 2018, ISBN: 9789600119558 [Eudoxus Code: 77111969]

COURSE OUTLINE

1. GENERAL

SCHOOL			
DEPARTMENT	DEPARTMENT OF PHYSICS		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE	SSE804-2023	**SEMESTER**	8th Semester
COURSE TITLE	Electronic Circuits and Digital Systems Laboratory		

TEACHING ACTIVITIES If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
	3	6.0

COURSETYPE Background, General Knowledge, Scientific Area, Skill Development	Scientific Area
PREREQUISITES	None
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	YES
COURSE URL:	https://exams.emt.ihu.gr/courses/PHYSICS238/

2. LEARNING OUTCOMES

Learning Outcomes
Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

The aim and objective of the course are:
The consolidation in practice of the knowledge about specialized electronics topics, which have already been taught in the previous semester and the cultivation of the skills required for their implementation and experimental study.

The main laboratory modules are:
• Differential amplifier pair.
• Circuits with operational amplifiers.
• Oscillator circuits and multivibrator circuits.
Upon successful completion of the course, the student will be able to:
• Recognize and distinguish in practice basic electronic elements and circuits, as well as being able to understand their function.
• To calculate characteristic sizes of electronic components, to polarize appropriately taking into account design frauds and also to find the characteristics of an electronic component.

• To be able to practically build an electronic circuit. • Be able to use instruments and laboratory devices to take measurements from electronic circuits. • To confirm the correct operation of an electronic circuit by combining experimental data with theoretical circuit analysis and the critical use of simulation programs. • To learn and read data sheets of electronic components. • Identify errors in simple electronic components and electronic circuits and be able to provide solutions for their repair.
General Skills Name the desirable general skills upon successful completion of the module Search, analysis and synthesis of data and information, ICT Use,Adaptation to new situations, Decision making, Autonomous work, Teamwork, Working in an international environment, Working in an interdisciplinary environment, Production of new research ideas Project design and management Equity and Inclusion Respect for the natural environment Sustainability Demonstration of social, professional and moral responsibility and sensitivity to gender issues Critical thinking Promoting free, creative and inductive reasoning
Search, analysis and synthesis of data and information, ICT Use Decision making Autonomous work Teamwork Project design and management Critical thinking Promoting free, creative and inductive reasoning

3. COURSE CONTENT

• Methodology and application of electronic circuit measurements. • Diodes and electronic diode circuits. • Bipolar Contact Transistors – BJTs (switch circuits and amplifier circuits). • Field Effect Transistor – FET (characteristics and circuits) • Operational amplifiers (characteristic and basic amplifier circuits). • Elements of digital circuits (Boolean algebra, switching circuits, implementation of logic gates).

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD Face to face, Distance learning, etc.	Face to face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) Use of ICT in Teaching, in Laboratory Education, in Communication with students	Use of ICT in Teaching Use of ICT in Communication with students

TEACHING ORGANIZATION

The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research& analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.

The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards

Activity	Workload/semester
Lectures	11
Laboratory Exercise	39
Writing project	80
Bibliographic research & analysis	20
Total	**150**

STUDENT EVALUATION

Description of the evaluation process

Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others

Please indicate all relevant information about the course assessment and how students are informed

Student evaluation languages

Greek
English

Method (Formative or Concluding)

Formative

Student evaluation methods	Rate
Written Assignment	50
Laboratory Report	50

5. Suggested Bibliography

- A. Brown, Vranesic, “Σχεδίαση Ψηφιακών Συστημάτων με τη Γλώσσα VHDL”, ΕΚΔΟΣΕΙΣ Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε., 3η Έκδοση, 2011, ISBN: 978-960-418-340-1, Κωδικός Βιβλίου στον Εύδοξο: 18548944.
- B. Tokheim Roger, “Ψηφιακά Ηλεκτρονικά”, ΕΚΔΟΣΕΙΣ Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε., 1η Έκδοση, 2018, ISBN: 978-960-418-735-5, Κωδικός Βιβλίου στον Εύδοξο: 68374023.
- Γ. Floyd Thomas L., “Ψηφιακά ηλεκτρονικά”, ΣΤΕΛΛΑ ΠΑΡΙΚΟΥ & ΣΙΑ ΟΕ, 1η έκδ., 2007, ISBN: 978-960-411-646-1, Κωδικός Βιβλίου στον Εύδοξο: 14795.
- A. Thomas Floyd, “Digital Fundamentals”, Pearson Group, 11th Ed., 2015, ISBN: 978-1292075983.
- B. John F. Wakerly, “Digital Design Principles & Practices”, Pearson, 5th Ed., 2018, 978-0134460093

Eudoxus

Βιβλίο [320086]: ΕΡΓΑΣΤΗΡΙΑΚΟΣ ΟΔΗΓΟΣ ΚΑΙ ΑΣΚΗΣΕΙΣ ΗΛΕΚΤΡΟΝΙΚΗΣ, ΝΙΣΤΑΖΑΚΗΣ ΕΚΤΟΡΑΣ
Βιβλίο [77117449]: Εισαγωγικό Εργαστήριο Κυκλωμάτων και Ηλεκτρονικής, Τσιβίδης Γιάννης

COURSE OUTLINE

1. GENERAL

SCHOOL			
DEPARTMENT	DEPARTMENT OF PHYSICS		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE	SSE805-2023	**SEMESTER**	9th Semester
COURSE TITLE	Digital circuits and systems		

TEACHING ACTIVITIES If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
	3	6.0

COURSETYPE Background, General Knowledge, Scientific Area, Skill Development	Scientific Area
PREREQUISITES	
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	YES
COURSE URL:	https://exams.emt.ihu.gr/modules/auth/courses.php

2. LEARNING OUTCOMES

Learning Outcomes
Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

The course aims to familiarize students with:
• A detailed understanding of the theory of logical design of synchronous and asynchronous sequential circuits.
• The analysis and optimal design of synchronous sequential circuits.
• The analysis and design of counters and registers.
• An in-depth understanding of the operation of basic types of memories (RAM, ROM) and programmable logic structures (PLAs, PALs, PLDS, FPGAs).
• The design of digital circuits at the register level.
• The analysis and design of asynchronous sequential circuits.

Upon completion of the course, the student will:
• Have acquired an extensive theoretical background in the logical design of sequential circuits.
• Be able to apply techniques and methods for: a) the analysis and b) the optimal design (minimization and coding of states) of

synchronous sequential circuits.
• Will be able to design counters and registers according to the needs of the applications.
• Will have a deep understanding of the concepts and methods for designing circuits at the register level.
• Will be able to apply techniques and methods for deriving the architecture and control circuit at the register level.
• Will know the operation of basic types of memories (RAMs, ROMs) and basic programmable logic structures (PLAs, PALs, PLDs, FPGAs) and their special characteristics.
• Will be able to: a) analyze the operation of asynchronous sequential circuits and b) apply techniques and methods of minimizing and coding states for the design of asynchronous sequential circuits without problems of races and hazards.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use,Adaptation to new situations,
Decision making,
Autonomous work,
Teamwork,
Working in an international environment,
Working in an interdisciplinary environment, Production of new research ideas
Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking
Promoting free, creative and inductive reasoning

Search, analysis and synthesis of data and information, ICT Use
Decision making
Autonomous work
Teamwork

3. COURSE CONTENT

• Modern Sequential Logic: Analysis of modern sequential circuits (Equations, state tables and diagrams), State minimization and coding, Finite state machines (Mealy & Moore machines), Design process (State and excitation tables, Design with JK, T, D flip-flops). Design examples.
• Registers and counters: Shift registers (Parallel/serial loading, bidirectional registers etc.), Burst counters, Synchronous counters, Counters with unused states, Ring counters.
• Memory and programmable logic: Random access memory-RAM (read/write, timing, memory types), Memory decoding, Error detection and correction, Read-only memory (ROM), Programmable logic (PLAs, PALs, PLDs, FPGAs).
• Register-level design: Introduction and terminology, Algorithmic state machines (ASM diagrams, simplification, timing), Control logic circuit, Multiplexer design, Chase-free design, Design examples.
• Asynchronous sequential logic: Introduction, Analysis process (transition and flow tables, chase conditions, stability), Latched circuits, Design process, State minimization, State coding to avoid chase and spark problems.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD Face to face, Distance learning, etc.	Face to face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) Use of ICT in Teaching, in Laboratory Education, in Communication with students	Use of ICT in Teaching Use of ICT in Communication with students

TEACHING ORGANIZATION The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research& analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc. The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards	

Activity	Workload/semester
Lectures	55
Tutoring	30
Writing project	25
Bibliographic research & analysis	40
Total	**150**

STUDENT EVALUATION Description of the evaluation process Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others Please indicate all relevant information about the course assessment and how students are informed	**Student evaluation languages** Greek English **Method (Formative or Concluding)** Formative

Student evaluation methods	Rate
Written Assignment	50
Written Exam with Problem Solving	50

5. Suggested Bibliography

- Σχεδίαση Λογικών κυκλωμάτων και Υπολογιστών (2016), 5η Έκδοση, Morris Mano, Charles R. Kime, Tom Martin, [59384943], Διαθέτης (Εκδότης): Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε.
- Ψηφιακή Σχεδίαση (2018), 6η Έκδοση, Mano Morris, Ciletti Michael, [68406394], Διαθέτης (Εκδότης): Α. ΠΑΠΑΣΩΤΗΡΙΟΥ & ΣΙΑ Ι.Κ.Ε.
- Ψηφιακή Σχεδίαση (2015), 1η Έκδοση, WILLIAM J. DALLY, R. CURTIS HARTING, [32998377], Διαθέτης (Εκδότης): ΙΔΡΥΜΑ ΤΕΧΝΟΛΟΓΙΑΣ & ΕΡΕΥΝΑΣ – ΠΑΝΕΠΙΣΤΗΜΙΑΚΕΣ ΕΚΔΟΣΕΙΣ ΚΡΗΤΗΣ

- Συναφή επιστημονικά περιοδικά:
- Journal of Circuits, Systems and Computers ISSN (print): 0218-1266 | ISSN (online): 1793-6454
- Science Journal of Circuits, Systems and Signal Processing ISSN Print: 2326-9065, ISSN Online: 2326-9073

Eudoxus

Βιβλίο [18548949]: Ψηφιακά Ηλεκτρονικά ., Kleitz W. Λεπτομέρειες
Βιβλίο [18548697]: Ψηφιακά Ηλεκτρονικά, Leach, Malvino Λεπτομέρειες
Βιβλίο [133024408]: Ψηφιακή Σχεδίαση, 2η Βελτιωμένη Έκδοση, Ρουμελιώτης Μάνος, Σουραβλάς Σταύρος Λεπτομέρειες

COURSE OUTLINE

1. GENERAL

SCHOOL			
DEPARTMENT	DEPARTMENT OF PHYSICS		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE	CHE806-2023	**SEMESTER**	8th Semester
COURSE TITLE	Chaotic systems evaluation		

TEACHING ACTIVITIES If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
	3	6.0

COURSETYPE Background, General Knowledge, Scientific Area, Skill Development	Scientific Area
PREREQUISITES	
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	YES
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS239/

2. LEARNING OUTCOMES

Learning Outcomes Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.
The course aims to assess chaotic systems through the properties of recorded time series. Upon successful completion of the course, the student will have acquired the ability to distinguish whether a time series is a product of noise or originates from a deterministic chaotic system. Ability to assess the characteristics of a chaotic deterministic system using metrics of nonlinear dynamics. Ability to predict the temporal evolution of a time series. Ability to apply this knowledge to the solution of related complex problems. Ability to think critically so that they can evaluate, analyze, and correlate this knowledge. Ability to develop collaboration with other students to solve problems related to this course.

General Skills	
Name the desirable general skills upon successful completion of the module	
Search, analysis and synthesis of data and information, ICT Use,Adaptation to new situations, Decision making, Autonomous work, Teamwork, Working in an international environment, Working in an interdisciplinary environment, Production of new research ideas	Project design and management Equity and Inclusion Respect for the natural environment Sustainability Demonstration of social, professional and moral responsibility and sensitivity to gender issues Critical thinking Promoting free, creative and inductive reasoning
Working in an interdisciplinary environment Production of new research ideas	

3. COURSE CONTENT

Time Series Analysis.
Phase space.
Stationarity.
Autocorrelation function.
Mutual information function.
Nearest neighbors.
Morphofractional dimension.
Information dimension.
Autocorrelation dimension.
Kolmogorov entropy.
Lyapunov coefficients.
Time series forecasting.
Application with Tisean software.
Applications to natural systems.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD Face to face, Distance learning, etc.	Face to face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) Use of ICT in Teaching, in Laboratory Education, in Communication with students	Use of ICT in Communication with students
TEACHING ORGANIZATION The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research& analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc. The supervised and unsupervised workload per activity is	

Activity	Workload/semester
Lectures	39
Tutoring	30
Bibliographic research & analysis	38

indicated here, so that total workload per semester complies to ECTS standards	<table><tr><th>Activity</th><th>Workload/semester</th></tr><tr><td>Writing project</td><td>18</td></tr><tr><td>Total</td><td>125</td></tr></table>
STUDENT EVALUATION Description of the evaluation process Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others Please indicate all relevant information about the course assessment and how students are informed	**Student evaluation languages** Greek English **Method (Formative or Concluding)** Summative **Student evaluation methods** — **Rate** Written Exam with Problem Solving — 100

5. Suggested Bibliography

ΔΥΝΑΜΙΚΑ ΣΥΣΤΗΜΑΤΑ ΚΑΙ ΧΑΟΣ ΤΟΜΟΣ Β΄, ΑΝΑΣΤΑΣΙΟΣ Χ. ΜΠΟΥΝΤΗΣ.

ΔΥΝΑΜΙΚΑ ΣΥΣΤΗΜΑΤΑ 2η εκδοση, ΑΝΑΣΤΑΣΙΟΥ ΣΤΑΥΡΟΣ, ΜΠΟΥΝΤΗΣ ΑΝΑΣΤΑΣΙΟΣ.

ΕΙΣΑΓΩΓΗ ΣΤΑ ΜΗ ΓΡΑΜΜΙΚΑ ΔΥΝΑΜΙΚΑ ΣΥΣΤΗΜΑΤΑ, ΓΕΩΡΓΙΟΣ ΒΟΥΓΙΑΤΖΗΣ, ΕΥΘΥΜΙΑ ΜΕΛΕΤΛΙΔΟΥ (Kallipos).

ΕΙΔΙΚΑ ΘΕΜΑΤΑ ΜΗ ΓΡΑΜΜΙΚΗΣ ΔΥΝΑΜΙΚΗΣ ΤΖΑΜΑΛ ΟΔΥΣΣΕΑΣ ΜΑΑΪΤΑ, ΕΥΘΥΜΙΑ ΜΕΛΕΤΛΙΔΟΥ (Kallipos).

Eudoxus

Βιβλίο [3674]: ΔΥΝΑΜΙΚΑ ΣΥΣΤΗΜΑΤΑ ΚΑΙ ΧΑΟΣ ΤΟΜΟΣ Β΄, ΑΝΑΣΤΑΣΙΟΣ Χ. ΜΠΟΥΝΤΗΣ.
Βιβλίο [94645822]: ΔΥΝΑΜΙΚΑ ΣΥΣΤΗΜΑΤΑ 2η εκδοση, ΑΝΑΣΤΑΣΙΟΥ ΣΤΑΥΡΟΣ, ΜΠΟΥΝΤΗΣ ΑΝΑΣΤΑΣΙΟΣ.
Βιβλίο [122089501]: Ανάλυση Χρονοσειρών, 3η Έκδοση, Tsay S. Ruey, Χριστόπουλος Διονύσιος (Επιστ. Επιμέλεια)

COURSE OUTLINE

1. GENERAL

SCHOOL	OF SCIENCES		
DEPARTMENT	OF PHYSICS		
LEVEL OF STUDIES	Level 6		
COURSE CODE	CHE807	**SEMESTER**	8°
COURSE TITLE	DATA ANALYTICS		

TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
LECTURES	3	6
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	Scientific Area, Skill Development
PREREQUISITES:	-
TEACHING & EXAMINATION LANGUAGE:	GREEK
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS224/

2. LEARNING OUTCOMES

Learning Outcomes

Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

Aim of this course is to introduce students to the concepts and methods of data analysis and their application to real-world problems.

Upon successful completion of the course, students will have acquired the ability to:

- Understand the operation and use of modern data analysis methods.
- Analyze and extract knowledge from real data.
- Develop collaborations with other students to solve problems related to this course.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use
Adaptation to new situations
Decision making
Autonomous work
Teamwork
Working in an international environment
Working in an interdisciplinary environment
Production of new research ideas
Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking
Promoting free, creative and inductive reasoning

- *Searching, analyzing, and synthesizing data and information, using the necessary technologies.*
- *Decision making.*

- *Promoting free, creative and inductive reasoning*
- *Application of knowledge in practice*
- *Autonomous work*

3. COURSE CONTENT

Introduction: definitions, data, examples. Probabilities and random variables: probability elements, distributions, distribution parameters, basic distributions. Statistical data: parameter estimation and hypothesis testing. Uncertainty and measurement error: systematic and random errors, propagation of error. Correlation and regression: correlation, simple and multiple regression, linear and nonlinear regression. Time series: basic characteristics of time series, correlation in time series.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face to Face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Use of ICT in Teaching Use of ICT in Communication with students
TEACHING ORGANIZATION *The ways and methods of teaching are described in detail.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.* *The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.*	

Activity	*Workload/semester*
Lectures	100
Tutorial	40
Self study/Analysis of Bibliography/ Preparation	10
Course total (25 hours / ECTS)	**150**

STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report,Clinical examination of a patient,Artistic interpretation, Other/Others* *Please indicate all relevant information about the course assessment and how students are informed*	**Student Assessment Languages** Greek **Methods (Formative or Concluding)** Concluding

Student Assessment Methods	**Percentage**
Written final exam with problem solving	90%
Writing short assignments	10%

5. SUGGESTED BIBLIOGRAPHY

- Suggested bibliography:
- Related academic journals:

- Εφαρμοσμένη Στατιστική, Μπόρα-Σέντα Ε. και Μωυσιάδης Χ., Εκδόσεις Ζήτη, Θεσσαλονίκη 1997.
- Computational Statistics Handbook with MATLAB, Martinez W.L. and Martinez A.R., Chapman and Hall, 2002.
- Exploratory Data Analysis with MATLAB, Martinez W.L. and Martinez A.R., Chapman and Hall, 2005.
- Statistical Techniques for Data Analysis, Taylor J.K. and Cihon C., Chapman and Hall, 2004.
- Making Sense of Data, A Practical Guide to Exploratory Data Analysis and Data Mining, Myatt G.J., Wiley-Interscience, 2007.
- Time Series Analysis, Forecasting and Control, Box G.E.P., Jenkins G.M. and Reinsel G.C., Prentice Hall, 1994.
- Hyperstat, βιβλίο στο διαδίκτυο (online Book): http://davidmlane.com/hyperstat/
- Concepts and Applications of Inferential Statistics, Lowry R., βιβλίο στο διαδίκτυο (online book): http://faculty.vassar.edu/lowry/webtext.html

COURSE OUTLINE

1. GENERAL

SCHOOL			
DEPARTMENT	DEPARTMENT OF PHYSICS		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE	CHE808-2023	**SEMESTER**	8th Semester
COURSE TITLE	Advanced Programming Languages		

TEACHING ACTIVITIES If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
	3	6.0

COURSETYPE Background, General Knowledge, Scientific Area, Skill Development	Scientific Area
PREREQUISITES	Algorithms and Computers Programming Differential Calculus I Differential Calculus II Differential Equations Theoretical Mechanics I
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS144/

2. LEARNING OUTCOMES

Learning Outcomes Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.
The main objective of the first module of the course is to learn the Mathematica software through the analysis of mathematical models that describe natural phenomena in various fields of science, while the purpose of the second module is to analyze problems and program their solution with the C language. An additional objective is the transition to object-oriented programming with C++. The course is interactive and the learning of programming languages takes place during the lectures, as participants are asked to code in real time. After completing the courses, students will be able to: • Recognize the usefulness of analytical mathematical methods and their limitations and utilize computational methods. • Know basic programming concepts, structures and techniques.

- Check the accuracy and appropriateness of a program.
- Know the basic principles of object-oriented programming and how to apply them.
- Create programs with the C programming language and apply the principles of object-oriented programming in C++.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use,Adaptation to new situations,
Decision making,
Autonomous work,
Teamwork,
Working in an international environment,
Working in an interdisciplinary environment, Production of new research ideas
Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking
Promoting free, creative and inductive reasoning

Search, analysis and synthesis of data and information, ICT Use
Adaptation to new situations
Decision making
Autonomous work
Production of new research ideas
Promoting free, creative and inductive reasoning

3. COURSE CONTENT

In module A, the numerical study of properties of dynamical systems is taught using Mathematica and more specifically the following: Analytical and Numerical Solution of D.E., Basic Concepts and Definitions of Dynamical Systems, Autonomous Systems 1 D.o.F., Linear Systems 2x2, Non-Linear Autonomous Systems 2x2, Non-autonomous and Non-linear Systems 2x2

In module B (C/C++) the following will be covered: Basic programming concepts, structures and techniques. Variables, variable types, expressions, numerical calculations. Input/Output Formatting. Operators, Control Structures, Conditions, Decision Structures, Loops. Data Input/Output to Files. Functions and Procedures, Recursion. Lists, Arrays and Search and Sorting Algorithms. Strings. Dynamic Memory Allocation. Structures. Classes, objects, streams, inheritance and polymorphism.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD Face to face, Distance learning, etc.	Face to face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) Use of ICT in Teaching, in Laboratory Education, in Communication with students	Use of ICT in Teaching Use of ICT in Laboratory Education

TEACHING ORGANIZATION

The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research& analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.

The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards

Activity	Workload/semester
Lectures	13
Interactive learning	113
Writing project	24
Total	**150**

STUDENT EVALUATION

Description of the evaluation process

Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others

Please indicate all relevant information about the course assessment and how students are informed

Student evaluation languages

Greek

Method (Formative or Concluding)

Summative

Student evaluation methods	Rate
Written Assignment	25
Written Exam with Problem Solving	75

5. Suggested Bibliography

Επιπρόσθετο υλικό βιβλιογραφίας προτείνεται κατά τη διάρκεια των παραδόσεων.

Eudoxus

Βιβλίο [122074103]: C Προγραμματισμός, 9η Έκδοση, Paul Deitel, Harvey Deitel Λεπτομέρειες
Βιβλίο [133029170]: Προγραμματισμός με C, 4η Έκδοση, Forouzan Behrouz, Afyouni Hassan, Αγγελή Χρυσάνθη, Αντωνόπουλος Χρήστος, Ντουφεξή Ιωάννα (Επιστ. Επιμέλεια) Λεπτομέρειες
Βιβλίο [122078440]: Η ΓΛΩΣΣΑ ΠΡΟΓΡΑΜΜΑΤΙΣΜΟΥ C++, BJARNE STROUSTRUP Λεπτομέρειες
Βιβλίο [112690605]: Προγραμματισμός με C++ Αντικειμενοστρεφής Προσέγγιση, Forouzan B.A., Gilberg R.F.

COURSE OUTLINE

1. GENERAL

SCHOOL	OF SCIENCES		
DEPARTMENT	OF PHYSICS		
LEVEL OF STUDIES	Level 6		
COURSE CODE	CHE809-2023	**SEMESTER**	8°
COURSE TITLE	QUANTUM INFORMATION THEORY		

TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
LECTURES	4	5
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	Scientific Area
PREREQUISITES:	It is desirable for the student to have attended the following courses: QUANTUM MECHANICS I QUANTUM MECHANICS II
TEACHING & EXAMINATION LANGUAGE:	GREEK
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	

2. LEARNING OUTCOMES

Learning Outcomes

Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

The course provides students with the necessary tools to understand the impact of quantum physics on information theory, forming the quantum theory of information. Upon successful completion of the course, the student will be able to:

- Possess knowledge regarding Qubits, quantum entanglement, quantum teleportation.
- Possess knowledge regarding quantum bits (qubits) and quantum computers.
- Apply this knowledge to solve related complex problems.
- Demonstrate critical thinking in order to evaluate, analyze, and correlate this knowledge.
- Interpret phenomena of everyday life.
- Develop collaboration with other fellow students to solve problems related to this course.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use
Adaptation to new situations
Decision making
Autonomous work
Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues

Teamwork *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*	*Critical thinking* *Promoting free, creative and inductive reasoning*
• *Search for, analysis and synthesis of data and information, with the use of the necessary technology* • *Decision-making* • *Working independently* • *Working in an international environment* • *Production of new research ideas*	

3. COURSE CONTENT

Basic Quantum Physics. Qubit (quantum + bit) - Quantum interference. Entanglement - Quantum teleportation.
Quantum computers - Quantum algorithms. Quantum phenomena in complex systems. Applications.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face to Face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Use of ICT in Teaching Use of ICT in Communication with students
TEACHING ORGANIZATION *The ways and methods of teaching are described in detail.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.* *The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.*	

Activity	*Workload/semester*
Lectures	52
Self study	118
Course total (25 hours / ECTS)	**170**

STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report,Clinical examination of a patient,Artistic interpretation, Other/Others*	**Student Assessment Languages** Greek **Methods (Formative or Concluding)** Concluding **Student Assessment Methods** — **Percentage** Written Exam with Problem Solving — 100

Please indicate all relevant information about the course assessment and how students are informed	

5. SUGGESTED BIBLIOGRAPHY

I. Karafyllidis, Quantum Computers - Basic Concepts, Kleidarithmos, 2005

COURSE OUTLINE

1. GENERAL

SCHOOL	OF SCIENCES		
DEPARTMENT	OF PHYSICS		
LEVEL OF STUDIES	Level 6		
COURSE CODE	APE810-2023	**SEMESTER**	8ο
COURSE TITLE	TELECOMMUNICATION SYSTEMS		

TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
LECTURES	3	5.0
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	General Background, Scientific Area
PREREQUISITES:	-
TEACHING & EXAMINATION LANGUAGE:	GREEK
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS152/

2. LEARNING OUTCOMES

Learning Outcomes

Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

This course introduces the fundamental concepts of Telecommunication Systems. It presents the basic analog and digital modulation techniques (Amplitude Modulation – AM and Frequency Modulation – FM). Emphasis is placed on the techniques used in the design of transmitters and receivers for Telecommunication Systems.
The course also covers spectral frequency analysis, noise, and various types of filters. Special attention is given to antenna systems, optical fibers, and mobile telephony systems.
Upon successful completion of the course, students will be able to:
Understand how information propagates through a wireless medium, the governing techniques, and the methods required for the implementation of basic telecommunication systems.
Identify the stages of transmitters and receivers in Telecommunication Systems and understand their functions and structural components.
Understand amplitude modulation (AM), frequency modulation (FM), and pulse code modulation (PCM).
Comprehend the basic principles of time and frequency multiplexing.
Understand the fundamental principles and concepts of noise in telecommunication systems.
Recognize the main characteristics of systems that convert analog signals to digital.
Understand the transmission and reception systems for signals (both wireless and wired).

Identify different antenna systems in relation to operating frequencies.
Understand cutoff, pass, and band filters.
Recognize the categories, uses, advantages, and disadvantages of optical fibers.
Understand the structure and operation of cellular mobile telephony systems.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use
Adaptation to new situations
Decision making
Autonomous work
Teamwork
Working in an international environment
Working in an interdisciplinary environment
Production of new research ideas
Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking
Promoting free, creative and inductive reasoning

Search, analysis, and synthesis of data and information, using the necessary technologies, Production of new research ideas

3. COURSE CONTENT

Model of a Telecommunication System – Stages
Electromagnetic wave
Transmitter – Receiver – Channel
Wireless and wired communication channels
Modulation – Multiplexing – Channel capacity
Types of signals
Modulation – Demodulation
Noise – Attenuation – Distortion
Frequency filters
Antennas for wireless communication systems
Structured cabling
Optical fibers
Mobile telephony

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face to Face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Use of ICT in Teaching
TEACHING ORGANIZATION *The ways and methods of teaching are described in detail.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.* *The supervised and unsupervised*	

Activity	*Workload/semester*
Lectures	80
Field Exercise	10
Laboratory Exercise	10
Bibliographic research & analysis	50
Course total (30 hours / ECTS)	**150**

workload per activity is indicated here, so that total workload per semester complies to ECTS standards.	
STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report,Clinical examination of a patient,Artistic interpretation, Other/Others* *Please indicate all relevant information about the course assessment and how students are informed*	**Student Assessment Languages** Greek **Methods (Formative or Concluding)** Formative **Student Assessment Methods** — **Percentage** Written Exam with Problem Solving — 80 Written Assignment — 20

5. SUGGESTED BIBLIOGRAPHY

- Suggested bibliography:
- Related academic journals:

1) WIRELESS COMMUNICATIONS – Konstantinos Tsoukatos, Kallipos Publications
2) SATELLITE COMMUNICATIONS – Demosthenes Vougioukas, Kallipos Publications
3) DIGITAL COMMUNICATIONS – Nikolaos Mitrou, Kallipos Publications

Eudoxus
Book [86055001]: Communications and Computer Networks, 2nd Edition, Spyros L. Panetsos
Book [112696305]: Principles of Modern Communication Systems, Samuel O. Agbo, Matthew N. O. Sadiku
Book [133025258]: Principles of Telecommunication Systems, 3rd Revised Edition, Herbert Taub, Donald Schilling, Christos Kourkoulis (Scientific Editor)

COURSE OUTLINE: ATMOSFERIC PHYSICS

1. **GENERAL**

SCHOOL	OF SCIENCES		
DEPARTMENT	OF PHYSICS		
LEVEL OF STUDIES	Level 6		
COURSE CODE	APE811-2023	**SEMESTER**	8th
COURSE TITLE	ATMOSFERIC PHYSICS		
TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*		**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
LECTURES		3	6
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.			
COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	Scientific Area, Skills Development		
PREREQUISITES:	-		
TEACHING & EXAMINATION LANGUAGE:	Greek		
COURSE OFFERED TO ERASMUS STUDENTS:	No		
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS248/		

2. **LEARNING OUTCOMES**

Learning Outcomes

Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

The purpose of the course is to provide students with a broad overview of Atmospheric Physics and Climate, offering in-depth understanding of natural processes and anthropogenic effects.

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

- Conduct research on topics in Atmospheric Physics, with a particular focus on interpreting qualitative and quantitative data from observations and modeling.
- Understand in depth and write scientific papers, oral presentations, and independent research.
- Understand the concept of climate, natural processes, and anthropogenic effects.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information, *ICT Use* *Adaptation to new situations* *Decision making* *Autonomous work* *Teamwork* *Working in an international environment* *Working in an interdisciplinary environment* *Production of new research ideas*	*Project design and management* *Equity and Inclusion* *Respect for the natural environment* *Sustainability* *Demonstration of social, professional and moral responsibility and sensitivity to gender issues* *Critical thinking* *Promoting free, creative and inductive reasoning*

- Application of knowledge in practice.
- Search, analysis and synthesis of data and information, using the necessary technologies.
- Adaptation to new situations.
- Autonomous work.
- Teamwork.
- Work in an interdisciplinary environment.
- Respect for the natural environment.
- Exercise of criticism and self-criticism.
- Promotion of free, creative and inductive thinking.

3. COURSE CONTENT

Structure and composition of the atmosphere. Thermodynamics of the atmosphere. Dynamics of the atmosphere. Air masses and frontal surfaces. Cloud Physics. Atmospheric electricity. Interaction of radiation and the atmosphere. Atmospheric pollution. Atmospheric turbulence and elements of the diffusion of gaseous pollutants. The atmosphere in motion.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face-to-face.
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Use of ICT in Teaching. Use of ICT in Communication with students.
TEACHING ORGANIZATION *The ways and methods of teaching are described in detail.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.*	

Activity	***Workload/semester***
Lectures	120
Self-study	30
Course total (25 hours / ECTS)	**150**

The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.	
STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report,Clinical examination of a patient,Artistic interpretation, Other/Others* *Please indicate all relevant information about the course assessment and how students are informed*	**Student Assessment Languages** Greek **Methods (Formative or Concluding)** Concluding **Student Assessment Methods** **Percentage** Written Exam with Problem Solving 100

5. SUGGESTED BIBLIOGRAPHY

- Wallace, Hobbs, «Atmospheric Science», Academic Press, 2006.
- Hewitt, Jackson, «Atmospheric Science for Environmental Scientists», Wiley-Blackwell, 2009.
- Andrews, «An Introduction to Atmospheric Physics», Cambridge University Press, 2000.
- Μ. Λαζαρίδης, «Ατμοσφαιρική ρύπανση με στοιχεία μετεωρολογίας», 2η Έκδοση, ΕΚΔΟΣΕΙΣ Α. ΤΖΙΟΛΑ & ΥΙΟΙ Α.Ε., 2010.
- Χ. Ζερεφός, «Εισαγωγικά Μαθήματα στη Φυσική της Ατμόσφαιρας», 1η Έκδοση, Διαθέτης (Εκδότης): Α. ΠΑΠΑΣΩΤΗΡΙΟΥ & ΣΙΑ Ι.Κ.Ε., 2009.

COURSE OUTLINE

1. GENERAL

SCHOOL			
DEPARTMENT	DEPARTMENT OF PHYSICS		
LEVEL OF STUDIES	ISCED level 6 – Bachelor's or equivalent level		
COURSE CODE	APE814-2023	**SEMESTER**	8th Semester
COURSE TITLE	Medical Physics		

TEACHING ACTIVITIES If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
	3	6.0

COURSETYPE Background, General Knowledge, Scientific Area, Skill Development	Scientific Area
PREREQUISITES	
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS235/

2. LEARNING OUTCOMES

Learning Outcomes
Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

The course provides an in-depth exploration of the scientific field of medical physics, where students will be taught:

the interaction of radiation with matter,
the production of isotopes for medical applications,
the physics of diagnostic radiology, radiotherapy, nuclear medicine, and ultrasonography,
the operating principles of medical imaging systems,
as well as special topics in physics as applied to medicine.
Finally, students will learn about the effects of radiation on biological systems.

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

Understand medical terminology related to the field of medical physics

Combine a fundamental science (Physics) with the field of Medicine Comprehend the basic principles underlying various medical specialties and one of the core components of medicine, which is diagnosis Apply critical thinking
General Skills Name the desirable general skills upon successful completion of the module Search, analysis and synthesis of data and information, ICT Use,Adaptation to new situations, Decision making, Autonomous work, Teamwork, Working in an international environment, Working in an interdisciplinary environment, Production of new research ideas Project design and management Equity and Inclusion Respect for the natural environment Sustainability Demonstration of social, professional and moral responsibility and sensitivity to gender issues Critical thinking Promoting free, creative and inductive reasoning
Search, analysis and synthesis of data and information, ICT Use Working in an interdisciplinary environment Production of new research ideas Equity and Inclusion Critical thinking

3. COURSE CONTENT

Interaction of radiation with matter Production of isotopes for medical applications Physics of: a. Diagnostic Radiology b. Radiotherapy c. Nuclear Medicine d. Ultrasonography Operating principles of medical imaging systems, including: Ultrasound scanners Gamma cameras Computed Tomography (CT) scanners Positron Emission Tomography (PET) scanners Magnetic Resonance Imaging (MRI) systems Special topics in physics applied to medicine, such as: Medical accelerators Radiation detectors Basic principles of radiation protection

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD Face to face, Distance learning, etc.	Face to face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT)	Use of ICT in Teaching Use of ICT in Communication with students

Use of ICT in Teaching, in Laboratory Education, in Communication with students	
TEACHING ORGANIZATION The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research& analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc. The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards	
STUDENT EVALUATION Description of the evaluation process Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others Please indicate all relevant information about the course assessment and how students are informed	

Activity	Workload/semester
Lectures	110
Bibliographic research & analysis	40
Total	**150**

Student evaluation languages
Greek

Method (Formative or Concluding)
Summative

Student evaluation methods	Rate
Written Exam with Essay Development Questions	100

5. Suggested Bibliography

? Η Φυσική στη Βιολογία και την Ιατρική, Κωδικός Βιβλίου στον Εύδοξο: 77657097, Έκδοση: 2Η ΕΛΛΗΝΙΚΗ/2018Συγγραφείς: Paul DavidovitsISBN: 978-960-583-420-3Τύπος: ΣύγγραμμαΔιαθέτης (Εκδότης): ΠΑΡΙΣΙΑΝΟΥ ΑΝΩΝΥΜΗ ΕΚΔΟΤΙΚΗ ΕΙΣΑΓΩΓΙΚΗ ΕΜΠΟΡΙΚΗ ΕΤΑΙΡΙΑ ΕΠΙΣΤΗΜΟΝΙΚΩΝ ΒΙΒΛΙΩΝ
? Ιατρική Φυσική 2η έκδοση, Κωδικός Βιβλίου στον Εύδοξο: 32997826, Έκδοση: 2η έκδ./2013, Συγγραφείς: Γεωργίου Ε., Γιακουμάκης Ε., Δημητρίου Π.,Καραΐσκος Π., Κόττου Σ., Λουίζη Α., Μαλαμίτση Ι.,Παπαγιάννης Π., ISBN: 9789963716722, Τύπος: Σύγγραμμα, Διαθέτης (Εκδότης): BROKEN HILL PUBLISHERS LTD
? Επίτομη ιατρική φυσική, Κωδικός Βιβλίου στον Εύδοξο: 22755181, Έκδοση: 1η έκδ./2012, Συγγραφείς: Ψαρράκος Κυριάκος, Μολυβδά - Αθανασοπούλου Ελισάβετ, Γκοτζαμάνη - Ψαρράκου Άννα, Σιούντας Αναστάσιος, ISBN: 978-960-12-2092-5, Τύπος: Σύγγραμμα, Διαθέτης (Εκδότης): UNIVERSITY STUDIO PRESS - ΑΝΩΝΥΜΟΣ ΕΤΑΙΡΙΑ ΓΡΑΦΙΚΩΝ ΤΕΧΝΩΝ ΚΑΙ ΕΚΔΟΣΕΩΝ

Eudoxus

ΑΡΕ814-2023 "Ιατρική Φυσική " 2024 8 Εαρινό 133151375 ΝΑΙ 42034 Ιατρική φυσική και ακτινοφυσική Άννινος Φώτιος Α. 9789603946663 Παρισιάνου Α.Ε. 2010 1η Σύγγραμμα Μαλακό εξώφυλλο 17x24 146 4.85 ΟΧΙ
ΑΡΕ814-2023 "Ιατρική Φυσική " 2024 8 Εαρινό 133151374 ΝΑΙ 22755181 Επίτομη ιατρική φυσική Ψαρράκος Κυριάκος, Μολυβδά - Αθανασοπούλου Ελισάβετ, Γκοτζαμάνη - Ψαρράκου Άννα, Σιούντας Αναστάσιος 9789601220925 University Studio Press 2012 1η έκδ. Σύγγραμμα

Μαλακό εξώφυλλο	[21 x 29]	512	28.18	ΟΧΙ													
ΑΡΕ814-2023	"Ιατρική Φυσική	"		2024	8	Εαρινό	133151376	ΝΑΙ	1183								
ΑΚΤΙΝΟΔΙΑΓΝΩΣΤΙΚΗ	ΙΑΤΡΙΚΗ ΦΥΣΙΚΗ-ΒΙΟ	ΙΑΤΡΙΚΗ ΤΕΧΝΟΛΟΓΙΑ	ΚΑΝΔΑΡΑΚΗΣ ΙΩΑΝΝΗΣ														
9789608976818	ΑΡΑΚΥΝΘΟΣ	2007	1	Σύγγραμμα	Μαλακό εξώφυλλο 21x29	354	18.89										
ΟΧΙ																	

COURSE OUTLINE

1. GENERAL

SCHOOL	OF SCIENCES		
DEPARTMENT	OF PHYSICS		
LEVEL OF STUDIES	Level 6		
COURSE CODE	APE813-2023	**SEMESTER**	8th
COURSE TITLE	Applications of Radiation, Dosimetry and Radiation Protection		

TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*	**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
LECTURES	3	6
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.		

COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	Area Background
PREREQUISITES:	-
TEACHING & EXAMINATION LANGUAGE:	Greek
COURSE OFFERED TO ERASMUS STUDENTS:	NO
COURSE URL:	https://eclass.emt.duth.gr/courses/PHYSICS229/

2. LEARNING OUTCOMES

Learning Outcomes

Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.

The purpose of the course is for students to understand the quantities and units of dosimetry of ionizing radiation; the internal and external irradiation of the human body; to calculate exposures and doses; to understand the principles of radiation protection and the radiobiological effects, dose limits, and relevant legislation. They will study shielding against gamma radiation and neutrons, learn the procedures for handling radioactive sources, and become familiar with nuclear and non-nuclear radiations. Students will also study and understand the wide range of their applications in geology, medicine, archaeology, industry, and agriculture.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use
Decision making
Autonomous work
Teamwork
Working in an international environment
Production of new research ideas
Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking
Promoting free, creative and inductive reasoning

- Adaptation to new situations
- Autonomous work
- Working in an international environment

- Working in an interdisciplinary environment
- Communicate effectively in a medical environment

3. COURSE CONTENT

- Nuclear radiation sources.
- Radiation and particle protection: Principles of radiation protection and international regulations.
- Dosimetry: Radiation–matter interactions — direct and indirect interactions; RBE, LET and radiation quality factor.
- Transferred and absorbed energy; definitions of dose quantities.
- Dose calculations and dosemeters for nuclear radiations.
- Dose measurement units and dosimetry methods.
- Biological effects of radiation: radiation–biological interactions; structure of biological damage (subcellular → cellular → tissues → organs); immediate and delayed outcomes.
- Modifying factors (physical and biological modifiers).
- Radioactivity (natural and artificial).
- Nuclear radiations (alpha, beta, gamma). Neutrons. Cosmic radiation.
- Nuclear radiation detectors. Radiometric dating. Geological applications.
- Industrial applications (gamma/X-ray/neutron radiography, sterilization).
- Applications for detection of illicit/dangerous materials.
- Medical applications.
- Nuclear-powered ships and submarines. Applications of depleted uranium.
- Nuclear-powered rocket engines. Nuclear weapons.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	Face to Face
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Use of ICT in Teaching Use of ICT in Communication with students
TEACHING ORGANIZATION *The ways and methods of teaching are described in detail.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc.* *The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.*	

Activity	*Workload/semester*
Lectures	70
Bibliographic research & analysis	15
Tutoring	15
Project	50
Course total (25 hours / ECTS)	**150**

STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development*	Student Assessment Languages Greek Methods (Formative or Concluding) Concluding Student Assessment Methods — Percentage Written Exam with Problem Solving — 40%

Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report,Clinical examination of a patient,Artistic interpretation, Other/Others *Please indicate all relevant information about the course assessment and how students are informed*	Multiple Choice Test, Short Answer Questions 30% Written Assignment 30%

5. SUGGESTED BIBLIOGRAPHY

- *Δοσιμετρία και βιολογικές επιπτώσεις των ακτινοβολιών, Χαραλάμπους, Σ., ΖΗΤΗ.*
- *ΑΚΤΙΝΟΠΡΟΣΤΑΣΙΑ, ΓΕΩΡΓΙΟΣ Π. ΚΟΥΤΡΟΥΜΠΗΣ, ISBN: 960-7097-70-X, ΛΥΧΝΟΣ ΓΡΑΦΙΚΕΣ ΤΕΧΝΕΣ ΕΚΔΟΤΙΚΕΣ ΕΠΙΧΕΙΡΗΣΕΙΣ ΕΠΕ, 2000. Κωδικός Βιβλίου στον Εύδοξο: 39011.*
- *Αλληλεπιδράσεις ακτινοβολιών και ύλης δοσιμετρία - θωράκιση, Λεωνίδου Δημήτρης Ι., ΑΡΗΣ ΣΥΜΕΩΝ, 1990. Κωδικός Βιβλίου στον Εύδοξο: 24792*
- *Δοσιμετρία και βιολογικές επιπτώσεις των ακτινοβολιών, Χαραλάμπους, Σ., ΖΗΤΗ.*
- *ΑΚΤΙΝΟΠΡΟΣΤΑΣΙΑ, ΓΕΩΡΓΙΟΣ Π. ΚΟΥΤΡΟΥΜΠΗΣ, ISBN: 960-7097-70-X, ΛΥΧΝΟΣ ΓΡΑΦΙΚΕΣ ΤΕΧΝΕΣ ΕΚΔΟΤΙΚΕΣ ΕΠΙΧΕΙΡΗΣΕΙΣ ΕΠΕ, 2000. Κωδικός Βιβλίου στον Εύδοξο: 39011.*
- *Πυρηνική Ενέργεια και Τεχνολογικές Εφαρμογές, Πολυζάκης Απόστολος, ΣΙΑ ΕΕ (Power Heat Cool). Κωδικός Βιβλίου στον Εύδοξο: 102117623*

COURSE OUTLINE: METEOROLOGY

1. **GENERAL**

SCHOOL	OF SCIENCES		
DEPARTMENT	OF PHYSICS		
LEVEL OF STUDIES	Level 6		
COURSE CODE	APE815-2023	**SEMESTER**	8th
COURSE TITLE	METEOROLOGY		
TEACHING ACTIVITIES *If the ECTS Credits are distributed in distinct parts of the course e.g. lectures, labs etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.*		**TEACHING HOURS PER WEEK**	**ECTS CREDITS**
LECTURES		3	6
Please, add lines if necessary. Teaching methods and organization of the course are described in section 4.			
COURSE TYPE *Background, General Knowledge, Scientific Area, Skill Development*	Scientific Area, Skills Development		
PREREQUISITES:	-		
TEACHING & EXAMINATION LANGUAGE:	Greek		
COURSE OFFERED TO ERASMUS STUDENTS:	No		
COURSE URL:	https://eclass.emt.duth.gr/modules/auth/courses.php		

2. **LEARNING OUTCOMES**

Learning Outcomes *Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.*
The purpose of the course is to provide students with general knowledge of meteorological parameters and all atmospheric phenomena. Upon successful completion of the course, the student will have acquired the ability to: • Know the definitions and the qualitative and quantitative characteristics of weather and climate. • Interpret various meteorological phenomena using the laws of Mechanics and Thermodynamics. • Analyze and forecast the weather and interpret some of the main prognostic charts. • Apply this knowledge to the solution of related complex problems.

- Demonstrate critical thinking in order to be able to evaluate, analyze, and correlate this knowledge.
- Interpret everyday life phenomena.
- Develop collaborations with other classmates to solve problems related to this course.

General Skills

Name the desirable general skills upon successful completion of the module

Search, analysis and synthesis of data and information,
ICT Use
Adaptation to new situations
Decision making
Autonomous work
Teamwork
Working in an international environment
Working in an interdisciplinary environment
Production of new research ideas
Project design and management
Equity and Inclusion
Respect for the natural environment
Sustainability
Demonstration of social, professional and moral responsibility and sensitivity to gender issues
Critical thinking
Promoting free, creative and inductive reasoning

- Search, analysis, and synthesis of data and information, using the necessary technologies.
- Autonomous work.
- Teamwork.
- Exercise of criticism and self-criticism.
- Promotion of free, creative, and inductive thinking.

3. COURSE CONTENT

Weather and climate. The structure of the atmosphere. Mechanisms of heat transfer in the atmosphere. Air temperature. Atmospheric pressure and isobaric charts. Wind, general circulation, and local circulation in the atmosphere. Air humidity. Clouds, cloud categories. Precipitation. Air masses and fronts. Depressions, anticyclones, tropical cyclones, thunderstorms. Weather forecasting.

4. LEARNING & TEACHING METHODS - EVALUATION

TEACHING METHOD *Face to face, Distance learning, etc.*	In the classroom.
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) *Use of ICT in Teaching, in Laboratory Education, in Communication with students*	Organization of material in ppt slides. Support of the learning process through the e-class electronic platform. Communication via e-mail.
TEACHING ORGANIZATION *The ways and methods of teaching are described in detail.* *Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical*	

Activity	***Workload/semester***
Lectures	120
Self-study	30

Exercise, Art Workshop, Interactive learning, Study visits, Study / creation, project, creation, project. Etc. *The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.*	Course total (25 hours/ ECTS) **150**
STUDENT EVALUATION *Description of the evaluation process* *Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report,Clinical examination of a patient,Artistic interpretation, Other/Others* *Please indicate all relevant information about the course assessment and how students are informed*	**Student Assessment Languages** Greek **Methods (Formative or Concluding)** Concluding **Student Assessment Methods** **Percentage** Written Exam with Problem Solving 100

5. SUGGESTED BIBLIOGRAPHY

- Suggested bibliography:

- Related academic journals:

- Α. Φλόκα, «Μαθήματα Μετεωρολογίας και Κλιματολογίας», Εκδόσεις Ζήτη, 1997.
- Χ. Σαχσαμάνογλου, Τ. Μακρογιάννη, Γενική Μετεωρολογία, Εκδόσεις Ζήτη, 1998.
- D. Ahrens, R. Henson, «Η Μετεωρολογία Σήμερα», Επιστ. Επιμέλεια: Ε. Φλόκα, Χ. Αναγνωστοπούλου, Κ. Τολίκα, Μ. Χατζάκη, 13η Έκδοση, Εκδόσεις Τζιόλα, 2022.
- Τ. Μακρογιάννη, Χ. Σαχσαμάνογλου «Μαθήματα Γενικής Μετεωρολογίας», Έκδοση 3η, Διαθέτης (Εκδότης): ΧΑΡΙΣ Μ.Ε.Π.Ε., 2004.
- E. Aguado, J. E. Burt, «Ο Καιρός και το Κλίμα. Εισαγωγή στη Μετεωρολογία και Κλιματολογία», Επιστ. Επιμέλεια: Αριστείδης Μπαρτζώκας, Διαθέτης (Εκδότης): ΜΑΡΙΑ ΠΑΡΙΚΟΥ & ΣΙΑ Ε.Π.Ε., 2019.

ΠΕΡΙΓΡΑΜΜΑ ΜΑΘΗΜΑΤΟΣ

(1) ΓΕΝΙΚΑ

ΣΧΟΛΗ	ΘΕΤΙΚΩΝ ΕΠΙΣΤΗΜΩΝ		
ΤΜΗΜΑ	ΧΗΜΕΙΑΣ		
ΕΠΙΠΕΔΟ ΣΠΟΥΔΩΝ	ΠΡΟΠΤΥΧΙΑΚΟ		
ΚΩΔΙΚΟΣ ΜΑΘΗΜΑΤΟΣ	**ΠΕΔΝ601**	**ΕΞΑΜΗΝΟ ΣΠΟΥΔΩΝ**	**6**
ΤΙΤΛΟΣ ΜΑΘΗΜΑΤΟΣ	ΨΥΧΟΛΟΓΙΑ ΤΗΣ ΜΑΘΗΣΗΣ		
ΑΥΤΟΤΕΛΕΙΣ ΔΙΔΑΚΤΙΚΕΣ ΔΡΑΣΤΗΡΙΟΤΗΤΕΣ *σε περίπτωση που οι πιστωτικές μονάδες απονέμονται σε διακριτά μέρη του μαθήματος π.χ. Διαλέξεις, Εργαστηριακές Ασκήσεις κ.λπ. Αν οι πιστωτικές μονάδες απονέμονται ενιαία για το σύνολο του μαθήματος αναγράψτε τις εβδομαδιαίες ώρες διδασκαλίας και το σύνολο των πιστωτικών μονάδων*	**ΕΒΔΟΜΑΔΙΑΙΕΣ ΩΡΕΣ ΔΙΔΑΣΚΑΛΙΑΣ**	**ΠΙΣΤΩΤΙΚΕΣ ΜΟΝΑΔΕΣ**	
	3	3	
ΤΥΠΟΣ ΜΑΘΗΜΑΤΟΣ *γενικού υποβάθρου, ειδικού υποβάθρου, ειδίκευσης, γενικών γνώσεων, ανάπτυξης δεξιοτήτων*	Ειδικού υποβάθρου/ειδίκευσης		
ΠΡΟΑΠΑΙΤΟΥΜΕΝΑ ΜΑΘΗΜΑΤΑ:	-		
ΓΛΩΣΣΑ ΔΙΔΑΣΚΑΛΙΑΣ και ΕΞΕΤΑΣΕΩΝ:	ΕΛΛΗΝΙΚΗ		
ΤΟ ΜΑΘΗΜΑ ΠΡΟΣΦΕΡΕΤΑΙ ΣΕ ΦΟΙΤΗΤΕΣ ERASMUS	ΟΧΙ		
ΗΛΕΚΤΡΟΝΙΚΗ ΣΕΛΙΔΑ ΜΑΘΗΜΑΤΟΣ (URL)			

(2) ΜΑΘΗΣΙΑΚΑ ΑΠΟΤΕΛΕΣΜΑΤΑ

Μαθησιακά Αποτελέσματα

Περιγράφονται τα μαθησιακά αποτελέσματα του μαθήματος οι συγκεκριμένες γνώσεις, δεξιότητες και ικανότητες καταλλήλου επιπέδου που θα αποκτήσουν οι φοιτητές μετά την επιτυχή ολοκλήρωση του μαθήματος.
Συμβουλευτείτε το Παράρτημα Α

- *Περιγραφή του Επιπέδου των Μαθησιακών Αποτελεσμάτων για κάθε ένα κύκλο σπουδών σύμφωνα με το Πλαίσιο Προσόντων του Ευρωπαϊκού Χώρου Ανώτατης Εκπαίδευσης*
- *Περιγραφικοί Δείκτες Επιπέδων 6, 7 & 8 του Ευρωπαϊκού Πλαισίου Προσόντων Διά Βίου Μάθησης και το Παράρτημα Β*
- *Περιληπτικός Οδηγός συγγραφής Μαθησιακών Αποτελεσμάτων*

Με την ολοκλήρωση του μαθήματος, ο φοιτητής αναμένεται να έχει αναπτύξει:

- Σφαιρική κατανόηση των βασικών θεωριών μάθησης, όπως ο συμπεριφορισμός, ο εποικοδομισμός, η κοινωνιογνωστική και η ανθρωπιστική προσέγγιση.
- Ανάλυση του ρόλου των συναισθημάτων και των κινήτρων στη μάθηση και στην αλληλεπίδραση μαθητή–εκπαιδευτικού.
- Δεξιότητες επιλογής και ενσωμάτωσης στρατηγικών μάθησης ανάλογα με τα χαρακτηριστικά των μαθητών και το γνωστικό αντικείμενο.
- Επίγνωση της σημασίας της μεταγνώσης και των τεχνικών ενίσχυσης της αυτορρυθμιζόμενης μάθησης.
- Κριτική προσέγγιση των παραδοσιακών και σύγχρονων αντιλήψεων για τη μάθηση, με στόχο την προσαρμογή της διδασκαλίας στις σύγχρονες ανάγκες.
- Ικανότητα διασύνδεσης θεωρητικών εννοιών με την καθημερινή εκπαιδευτική πράξη, ενισχύοντας τον ρόλο του εκπαιδευτικού ως παιδαγωγού και υποστηρικτή της μάθησης.

Γενικές Ικανότητες

Λαμβάνοντας υπόψη τις γενικές ικανότητες που πρέπει να έχει αποκτήσει ο πτυχιούχος (όπως αυτές αναγράφονται στο Παράρτημα Διπλώματος και παρατίθενται ακολούθως) σε ποια / ποιες από αυτές αποσκοπεί το μάθημα;.

Αναζήτηση, ανάλυση και σύνθεση δεδομένων και πληροφοριών, με τη χρήση και των απαραίτητων τεχνολογιών	*Σχεδιασμός και διαχείριση έργων*
Προσαρμογή σε νέες καταστάσεις	*Σεβασμός στη διαφορετικότητα και στην πολυπολιτισμικότητα*
Λήψη αποφάσεων	*Σεβασμός στο φυσικό περιβάλλον*
Αυτόνομη εργασία	*Επίδειξη κοινωνικής, επαγγελματικής και ηθικής υπευθυνότητας και ευαισθησίας σε θέματα*

	φύλου
Ομαδική εργασία *Εργασία σε διεθνές περιβάλλον* *Εργασία σε διεπιστημονικό περιβάλλον* *Παράγωγή νέων ερευνητικών ιδεών*	*Άσκηση κριτικής και αυτοκριτικής* *Προαγωγή της ελεύθερης, δημιουργικής και επαγωγικής σκέψης* *……* *Άλλες…* *…….*

Είναι ικανός/-ή να:

– Βασίζεται στις θεωρητικές αρχές της ψυχολογίας της μάθησης για να ανταποκριθεί στις απαιτήσεις του μαθήματος διδακτική της Χημείας.
– Επιλέγει από τις θεωρητικές στρατηγικές της ψυχολογίας της μάθησης αυτές που είναι πιο χρήσιμες προς εφαρμογή.
– Να έχει έλεγχο του συνόλου της διδακτικής και μαθησιακής διαδικασίας.

Πιο συγκεκριμένα, το περιεχόμενο του μαθήματος προάγει τις εξής ικανότητες:

– Αναζήτηση, ανάλυση και σύνθεση δεδομένων και πληροφοριών, με τη χρήση και των απαραίτητων τεχνολογιών.
– Εργασία σε διεθνές περιβάλλον.
– Εργασία σε διεπιστημονικό περιβάλλον.
– Σχεδιασμό και διαχείριση έργων.
– Σεβασμό στη διαφορετικότητα και στην πολυπολιτισμικότητα.
– Επίδειξη κοινωνικής, επαγγελματικής και ηθικής υπευθυνότητας και ευαισθησίας σε θέματα φύλου.
– Άσκηση κριτικής και αυτοκριτικής.
– Προαγωγή της ελεύθερης, δημιουργικής και επαγωγικής σκέψης.

(3) ΠΕΡΙΕΧΟΜΕΝΟ ΜΑΘΗΜΑΤΟΣ

1. Ορισμός της μάθησης: Σχέση μάθησης και σχολείου, διαφορές μεταξύ διδασκαλίας και μάθησης, παραδοσιακές προσεγγίσεις.
2. Θεωρίες μάθησης: Συμπεριφορισμός, εποικοδομισμός και άλλες βασικές θεωρητικές προσεγγίσεις.
3. Μέθοδοι μάθησης: Οι νόμοι της μάθησης, μορφές και τρόποι απόκτησης γνώσεων.
4. Παράγοντες που επηρεάζουν τη μάθηση: Άγχος, αυτοεκτίμηση, περιέργεια και κίνητρα.
5. Θεωρίες κινήτρων: Κίνητρα στη μάθηση, πηγές και είδη κινήτρων (εσωτερικά και εξωτερικά).
6. Η συναισθηματική διάσταση της μάθησης: Ο ρόλος των συναισθημάτων στις σχέσεις δασκάλου-μαθητή και στην τάξη.

7. Συμπεριφοριστικές θεωρίες μάθησης (μέρος 1ο): Γενικές αρχές και εφαρμογές στην τάξη (Pavlov, Watson, Thorndike).
8. Συμπεριφοριστικές θεωρίες μάθησης (μέρος 2ο): Skinner – Προγραμματισμένη διδασκαλία και η παρακμή του συμπεριφορισμού.
9. Κοινωνιογνωστικές θεωρίες: Bandura, Vygotsky, Piaget – Η γνωστική επανάσταση και η μάθηση ως επεξεργασία πληροφοριών.
10. Ανθρωπιστικές θεωρίες μάθησης: Maslow, Rogers και η σημασία της προσωπικής ανάπτυξης.
11. Στρατηγικές μάθησης: Διδακτικές πρακτικές και τεχνικές βελτίωσης της μαθησιακής διαδικασίας.
12. Μεταγνώση: Η έννοια της μεταγνώσης και η ανάπτυξη της ικανότητας «μαθαίνω πώς να μαθαίνω».
13. Σύγχρονες προσεγγίσεις στη μάθηση: Εξελίξεις και νέες τάσεις στη μαθησιακή διαδικασία.

(4) ΔΙΔΑΚΤΙΚΕΣ και ΜΑΘΗΣΙΑΚΕΣ ΜΕΘΟΔΟΙ - ΑΞΙΟΛΟΓΗΣΗ

ΤΡΟΠΟΣ ΠΑΡΑΔΟΣΗΣ *Πρόσωπο με πρόσωπο, Εξ αποστάσεως εκπαίδευση κ.λπ.*	ΠΡΟΣΩΠΟ ΜΕ ΠΡΟΣΩΠΟ
ΧΡΗΣΗ ΤΕΧΝΟΛΟΓΙΩΝ ΠΛΗΡΟΦΟΡΙΑΣ ΚΑΙ ΕΠΙΚΟΙΝΩΝΙΩΝ *Χρήση Τ.Π.Ε. στη Διδασκαλία, στην Εργαστηριακή Εκπαίδευση, στην Επικοινωνία με τους φοιτητές*	Χρήση Τ.Π.Ε. στη Διδασκαλία και στην Επικοινωνία με τους φοιτητές • ψηφιακές διαφάνειες • βίντεο • MsTeams/ e-class, webmail
ΟΡΓΑΝΩΣΗ ΔΙΔΑΣΚΑΛΙΑΣ *Περιγράφονται αναλυτικά ο τρόπος και μέθοδοι διδασκαλίας.* *Διαλέξεις, Σεμινάρια, Εργαστηριακή Άσκηση, Άσκηση Πεδίου, Μελέτη & ανάλυση βιβλιογραφία, Φροντιστήριο, Πρακτική (Τοποθέτηση), Κλινική Άσκηση,*	

Δραστηριότητα	***Φόρτος Εργασίας Εξαμήνου***
ΔΙΑΛΕΞΕΙΣ	39
ΣΥΓΓΡΑΦΗ ΕΡΓΑΣΙΑΣ	10
ΜΕΛΕΤΗ ΚΑΙ ΑΝΑΛΥΣΗ ΒΙΒΛΙΟΓΡΑΦΙΑΣ	10
ΕΞΕΤΑΣΗ (ΤΕΛΙΚΗ)	2
ΠΡΟΟΔΟΣ	1
ΩΡΕΣ ΜΕΛΕΤΗΣ ΤΟΥ ΦΟΙΤΗΤΗ	13
Σύνολο Μαθήματος	**75**

Καλλιτεχνικό Εργαστήριο, Διαδραστικη διδασκαλία, Εκπαιδευτικές επισκέψεις, Εκπόνηση μελέτης (project), Συγγραφή εργασίας / εργασιών, Καλλιτεχνική δημιουργία, κ.λπ. *Αναγράφονται οι ώρες μελέτης του φοιτητή για κάθε μαθησιακή δραστηριότητα καθώς και οι ώρες μη καθοδηγούμενης μελέτης σύμφωνα με τις αρχές του ECTS*	
ΑΞΙΟΛΟΓΗΣΗ ΦΟΙΤΗΤΩΝ *Περιγραφή της διαδικασίας αξιολόγησης, Γλώσσα Αξιολόγησης, Μέθοδοι αξιολόγησης, Διαμορφωτική ή Συμπερασματική, Δοκιμασία Πολλαπλής Επιλογής, Ερωτήσεις Σύντομης Απάντησης, Ερωτήσεις Ανάπτυξης Δοκιμίων, Επίλυση Προβλημάτων, Γραπτή Εργασία, Έκθεση / Αναφορά, Προφορική Εξέταση, Δημόσια Παρουσίαση, Εργαστηριακή Εργασία, Κλινική Εξέταση Ασθενούς, Καλλιτεχνική Ερμηνεία, Άλλη / Άλλες* *Αναφέρονται ρητά προσδιορισμένα κριτήρια αξιολόγησης και εάν και που είναι προσβάσιμα από τους φοιτητές*	Τελική (αθροιστική) Αξιολόγηση γραπτού τύπου με ερωτήσεις πολλαπλής επιλογής ή σύντομης ανάπτυξης στην ελληνική γλώσσα. Υποδείγματα των ερωτήσεων δίνονται κατά το τελευταίο μάθημα του εξαμήνου. Τελικός Βαθμός = 30% × βαθμός εργασίας + 20% × βαθμολογία προόδου + 50% βαθμολογία της τελικής εξέτασης* *Η συμμετοχή στην τελική εξέταση είναι υποχρεωτική για όλους προκειμένου να ανακοινωθεί βαθμολογία. Η γραπτή ατομική ή ομαδική (μέχρι 5 άτομα) εργασία είναι προαιρετική και γίνεται εκτενής προετοιμασία της κατά τη διάρκεια των μαθημάτων.

(5) ΣΥΝΙΣΤΩΜΕΝΗ-ΒΙΒΛΙΟΓΡΑΦΙΑ

1. Δημητρίου, 1993, Γνωστική Ανάπτυξη. Μοντέλα- μέθοδοι- εφαρμογές, Θεσσαλονίκη, Art of Text
2. Gaonach, D & Golder, C. (2003 μτφ), Εγχειρίδιο Ψυχολογίας για την εκπαίδευση, Αθήνα, Πατάκης
3. Καψάλης, Α. (2006), Παιδαγωγική Ψυχολογία, Θεσσαλονίκη, Κυριακίδης
4. Κολιάδης, Ε., (1997), Θεωρίες μάθησης και εκπαιδευτική πράξη, Αθήνα, χ.ε.ο.

City of Kavala

The prefecture of Kavala is known for its abundant natural beauty characterized by green forests, great mountainous landscapes and beaches with clear blue waters. In the prefecture lies the mountain Pageo with its ancient gold mines and the river Nestos, one of the biggest in Greece and, at the same time, a very important wetland habitat.

The prefecture of Kavala attracts many tourists thanks to its countless natural beauties, the long history of its seat, the important archaeological sites, the traditional settlements, the Byzantine monuments and its great sandy beaches.

Kavala is the capital of the regional unit of Kavala and is geographically located in Eastern Macedonia. The city of Kavala is built at the foot of Mount Symbol and is the third largest city in Macedonia. It is 680 km from Athens and 153 km from Thessaloniki. The permanent population of the city reaches 52368 inhabitants according to the 2021 census, while the total population of the municipality of Kavala is approximately 63053 inhabitants. Although Kavala is a modern urban center, it has numerous beaches, rest areas and hiking trails. It is one of the few cities in Greece that has 4 organized beaches within its urban fabric.

Transportation

Urban transport is carried out with Line No. 4 Kipoupoli

Departure Port Station (Inside Kavala customs office).

Beach Departure Station

Limanaki stop

Postal Savings Bank stop

Agricultural Bank stop

Rapsani stop
I.E.K.A. Station
Peristeri Station 1
Kalamaraki stop
Ichthyoskala stop - Courthouse
Alipasta stop
Ampelaki Kipoupolis station
Lucy stop 1
Kalamitsa Station Closed
Lathraia stop
Sarataku stop
Lidl Stop 1
Bura stop
DUTH stop Entrance
DUTH Library Stop (return by the same road)
DUTH stop Output (same as Input)
K.A.P.I. station Saint Luke
Matthew's stop
Stasi Gounari
Mykoniatiko stop
Stasi Agourakis
Old Police Station
Kipoupoli stop
Panagouda stop
Station Radio Station
Diamantis stop
Agia Paraskevi station
Fire station
Pump station - Peristeri
Loutra station
Rapsani stop (return)
Agios Ioannis stop
Papastratos stop
Stasis Club A/cs
Emporiki Bank stop
Old Beach Start Stop (return)
Port stop (return)

From 09-01-2023 and until later, the following routes are operated on Line No. 4 Kipoupoli:
Kipoupoli routes increase depending on the movement of students at the university

Schedules Monday to Friday

ΚΗΠ/ΛΗ - ΔΕΠΟΣ 04
7:00
07:20 (Δέπος)
7:40
7:55
8:15
8:35
8:55
9:15
9:35
9:55
10:15
10:35
10:55
11:15
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12:15
12:35
12:55
13:15
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13:55
14:15
14:35
14:55
15:15
15:35
15:55
16:15 (ΔΕΠΟΣ)
16:35
16:55
17:15 (ΔΕΠΟΣ)
17:35
17:55
18:15 (ΔΕΠΟΣ)
18:35
18:55
19:15 (ΔΕΠΟΣ)
19:35
19:55
20:15 (ΔΕΠΟΣ)
20:35
20:55
21:15 (ΔΕΠΟΣ)
21:45
22:05
22:45

Saturday timetables

ΚΗΠ/ΛΗ - ΔΕΠΟΣ 04
07.00
08.00
8:45
9:15 (ΔΕΠΟΣ)
9:45
10:15 (ΔΕΠΟΣ)
10:45
11:15 (ΔΕΠΟΣ)
11.45
12:15 (ΔΕΠΟΣ)
12:45
13:15 (ΔΕΠΟΣ)
13:45
14:15 (ΔΕΠΟΣ)
15:15 (ΔΕΠΟΣ)
16:15 (ΔΕΠΟΣ)
17:15 (ΔΕΠΟΣ)
18:15 (ΔΕΠΟΣ)
19:15 (ΔΕΠΟΣ)
20:15 (ΔΕΠΟΣ)
21:15 (ΔΕΠΟΣ)
22:05 (ΔΕΠΟΣ)
22:45

THEY DO NOT OPERATE ON SUNDAYS & HOLIDAYS

Monuments

Known as Neapolis in antiquity, Christoupolis in the Byzantine period, Kavala in modern times. A town at the crossroads of East and West, with a long history that is unavoidably reflected in its personality today.

KAMARES – AQUEDUCT

The most characteristic monument of Kavala is the large, arched aqueduct, known by the name “Kamares” (Arches), with a length of 270 m and a maximum height of 25 m. In the early 16th century, the arid peninsula of Panagia found a water supply in the streams that ran from the area of Old Kavala. The source of this water, which is located at an altitude of 400 m, is known as “the mother of the water”, “Soubasi” or the “three Karagatsia”. The Kamares in their present form date to the early 16th century and are attributed to Ibrahim Pasha, the vezir of Sultan Suleiman the Magnificent. They were built in 1520-1530, a period during which many infrastructure works were carried out in Kavala, with the aim of reconstructing the city after the destruction of 1391.

The Kamares are a huge structure, out of proportion to the size of the then insignificant settlement. It is believed that there had been a Roman aqueduct on this same spot, over the ruins of which the Kamares were built. This old aqueduct supplied water to the town of Kavala through the region of Suyol (su-yol: “waterway”) until the early decades of the 20th century. The Kamares are no longer of vital importance, but they maintain their beauty and grandeur and are a landmark of the town.

Imaret

In the early 19th century Mohammed Ali, founder of the final Egyptian dynasty, established an Imaret – a religious, educational and charitable institution – in his hometown of Kavala. Until 1902, it functioned as an Islamic seminary, since until 1846 the education of Muslims was directly linked to religion.

The word “Imaret” derives from the Arabic word “imara”, which means “construction”. More specifically, it comes from the Arabic root AMR and is comprised of the words ʻamr (life) and

isti'mar (the development of a region/place). An Imaret (külliye) is a complex of buildings that is comprised of a market, mosque and other charitable institutions. In Turkish, the kitchens of such an institution, which offered food to the poor, were also considered part of the Imaret. The core idea of the Imaret is life itself and its result is consolidation and growth. As Muslims characteristically say: "The Imaret is the heart of Islam's growth, around which culture blossoms".

The Kavala Imaret contains a total of two medreses (seminaries), two dershane-mescit (large domed prayer rooms), a maktab (an elementary school for boys), an Imaret (soup kitchen and home for the poor regardless of religion) and the offices of the management.

From the end of 1922 the spaces of the Imaret were used to house refugees. Later, it was converted into a museum, cafeteria and restaurant. In 2001, the Egyptian state gave it to a private entrepreneur so it could be fully restored and converted into a luxury hotel.

Palia Mousiki (Halil Bey Mosque)

The Halil Bey Mosque is located at the centre of the peninsula, near the Castle and on roads that lead to the acropolis and the gates of the peninsula walls. It is believed that the mosque was built during the reconstruction of the town, in around 1530.

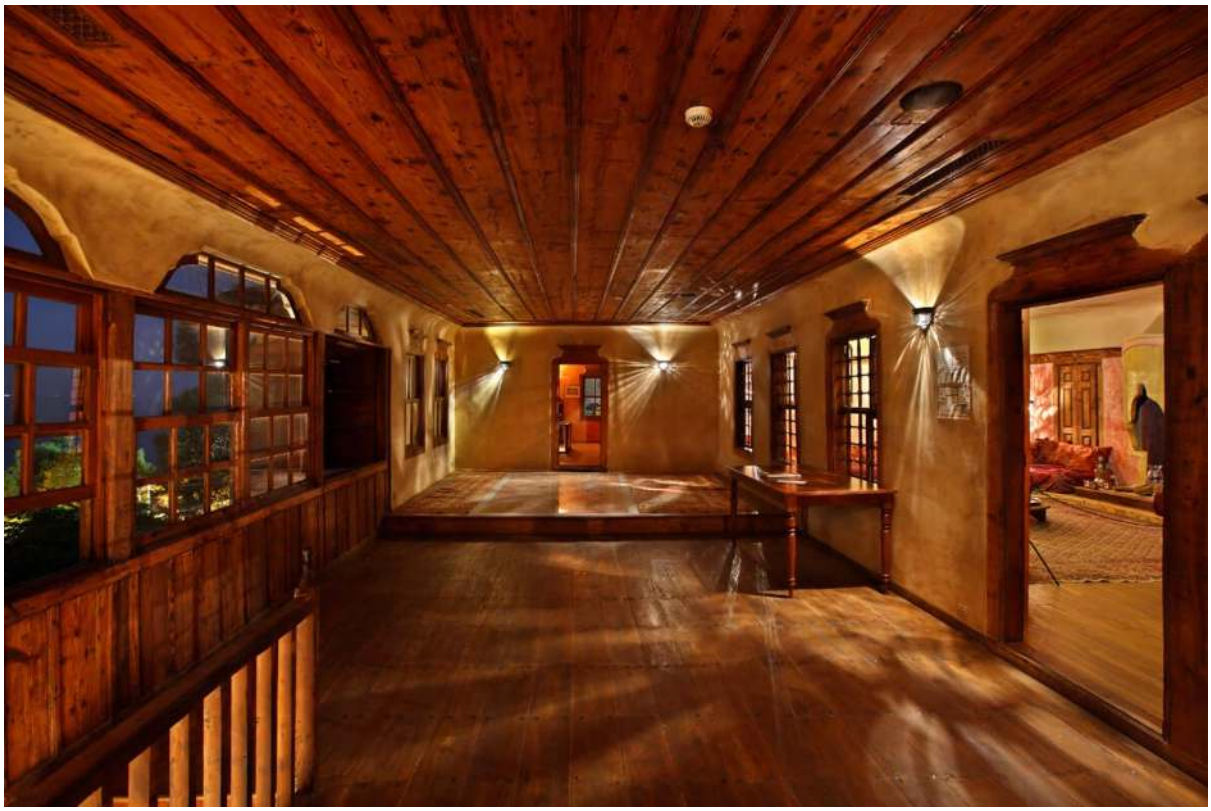
Excavations by the 12th Ephorate of Byzantine antiquities have uncovered the first Christian house of worship in the walled city on this spot, namely the three-aisled Early Christian Byzantine church of Agia Paraskevi (the remains of which can be seen through the glass floor of the mosque), as well as a small Byzantine-era cemetery. In the early centuries of Ottoman rule it was common practice for mosques to be built on the site of churches or for churches to be converted into mosques.

The mosque was part of a larger complex that also contained a madrasa (a seminary with eight rooms for the students), which also survives in a good condition.

In the early 20th century a girls' primary school was also housed in the complex. From 1930-1940 the mosque housed the Municipality's orchestra and so gained the name of "Music Mosque". Today it is known as "Palia Mousiki", that means Old Music.

After restoration and conversion work carried out by the Ephorate of Antiquities and the Municipality of Kavala, the space has now been opened to the public and it hosts many exhibitions and events both within the building and in its forecourt. The madrasa is host to folklore collections, social services and "To Kastro", the cultural association of the district of Panagia.

Mohammed Ali's Residence



In the Square named for Mohammed Ali (1769-1849), which is located in the Panagia peninsula, in the Old Town of Kavala, his residence and statue can be found. The statue is by the famous sculptor Konstantinos Dimitriadis. It was created in Paris and depicts Mohammed Ali, the general and founder of the Egyptian dynasty, with his sword in its sheath since,

according to tradition, he was returning home to rest. There is a similar sculpture in Egypt, which shows him on horseback but holding his sword up high, in an expression of glory.

Mohammed Ali's Residence is considered one of the most characteristic surviving examples of 18th-century Ottoman architecture in Greece. In its south section is the selamlik, containing the men's quarters, where the men spent their days and worked, the pasha's private room, and the reception areas for guests. In the north section is the harem, where the women's quarters are located, the bath (hamam) and the "sofa". The fitted wooden cupboards and fireplaces are particularly interesting decorative features.

Coastal wall

Its strong walls of the Thassian colony were most likely built in the early 7th century BC. The largest section of the coastal wall dates to the period of 1520-1536. After the catastrophe of 1391 and thanks also to natural wear and tear, the new 16th-century walls were built over the ruins of the earlier historical phases.

The first work to strengthen the fortress was carried out in 1425, during the hostilities between the Turks and the Venetians. The limits of the fortified city were extended to "run down" from its naturally fortified position, so as to include a flat piece of land next to the port. The walls of the town reflect the turbulent history of the 27 centuries of its continuous existence.

Today it is a wonderful place to take a walk, have a bicycle ride or just take a rest. The visitor strolling along the length of the walls will be able to admire the Imaret, the preserved buildings that are unified with the wall and also the wonderful balcony of the "House of the General".

Useful phone numbers

Emergency numbers:
Hospital: 2510292000 http://www.kavalahospital.gr
Police: 100 Police: 2510 622273-4
Traffic police: 2510622230-1 Police: 2510622264
Kavala Port Authority www.portkavala.gr/en/routes/
Coast Guard: 2513505430 -5
Coast Guard: 108 Fire Service: 2510 244444, 199
Urabn Bus: 2510 222218 https://astiko-kavalas.gr/
Bus Station: 2510 222294 https://www.ktelkavalas.gr/
Kavala Airport: 25910 52370-71-72 https://www.kva-airport.gr/en/
Olympic: 2510 223622, 2510 225577
Aegean: 2510 229000
Post office: 2510 833330

Municipality of Kavala: https://kavala.gov.gr/?lang=en-gb
Dimofelia 2510 831388 Municipal Fund 2510 451440 – 2510 223136
Municipal Conservatory 2510 222119
Mayor's Secretariat 2513 500100
General Secretary of the Municipality 2513 500231
General Manager of the Municipality 2513 500110
Municipal Police 2510 451451 Municipal Library 2510 222770

Services:
EFKA: 2510 450564
Manpower Employment Organization: 2510 229688
Municipal Kennel: 2510 837140
Animal Welfare "ΑΙΣΩΠΟΣ": 25940 21191
EUROTAXI KAVALA 2510 620911, https://eurotaxikavala.gr/
Kavala Taxi Station 693 6332677 https://www.kavalataxi.gr/