UNIVERSITY OF IOANNINA

PHYSICS DEPARTMENT

STUDY GUIDE 2023 - 2024

IOANNINA 2023

[Update: 1 February 2024]

CONTENTS

GREETING FROM THE HEAD OF THE DEPARTMENT

From the position of the Head of the Department, I would like to welcome you to the Physics Department of the University of Ioannina. The Study Guide is a publication which aims to provide in a comprehensive manner useful information about the Science of Physics, the Organization and Administration of the Department as well as information related to the undergraduate and postgraduate Study Program of the Department.

The Department of Physics was founded in 1970 and is the third oldest Department of the University of Ioannina. The mission of the Physics Department is, on the one hand, to provide quality theoretical and practical education to its students in the subject of Physics as well as in related subjects (materials technologies, chemistry, mathematics, informatics, atmospheric sciences, and pedagogy), and on the other hand, to produce original high-level scientific research. For its rich research work, the Department enjoys international recognition while it plays a very important role in the scientific development of the country.

The Department is organized in four Sections I) Astrogeophysics II) Theoretical Physics III) Atomic and Molecular Physics, Nuclear Physics and High Energy Physics IV) Solid State Physics and Physics of Materials and Surfaces, covering almost all research fields of Experimental, Theoretical and Applied Physics. It maintains modern building and laboratory infrastructures. It is manned with a remarkable human resource which consists of 33 faculty members, 9 EDIP members, 3 ETEP members and 4 administrative employees. Today it trains approximately 1600 undergraduate students, 60 postgraduate students, 50 PhD candidates and 8 postdoctoral researchers.

Studying at the Department of Physics is a four-year course and the undergraduate courses of the Study Program are divided into two categories. The core courses which ensure the necessary basic knowledge in Physics and the elective courses which cover a wide range of specialized subjects expanding the knowledge and skills of the students.

The Department of Physics operates three independent Master's Degree Programs offering the possibility of specialization both to its graduates and to graduates of other Departments.

The male and female students are an integral part of the human potential of the Department. I want them to feel that the staff of the Department is always available and willing to discuss with them and provide them with the necessary information and advice throughout their studies.

Finally, I would like to invite you to take a tour in our Department's websites (http://www.physics.uoi.gr), which are updated throughout the academic year and provide useful information for both educational and his research activities.

September 2023

Samuel Cohen
Professor

Chairman of the Physics Department

A. THE SCIENCE OF PHYSICS

1. What is Physics?

Physics is the science that studies all the phenomena of Nature. Consistent with this definition is the older name "Physical Philosophy" which was in use until the eighteenth century. Physics aims to study the components of matter and their interactions. This study is done with the observations of the corresponding phenomena and with their repetition in suitable conditions, i.e. with experiments.

Observation is the careful and critical examination of a phenomenon in which the various factors influencing it are identified and analyzed. The conditions under which the various natural phenomena occur show enormous variety. There are phenomena that appear in very specific conditions and whose observation and analysis is a very difficult process. For these reasons the experiment is necessary.

Experiment is the quantitative observation of a phenomenon under controlled conditions. The scientist adjusts these conditions in the laboratory, evaluating how they affect the phenomenon under study.

Experiment is not the physicist's only tool. Based on known relationships and the induction process, the physicist can formulate in the language of Mathematics a description (model) of physical phenomena. This model can lead to the prediction of a new phenomenon or to the finding of relationships between various known processes. This knowledge is acquired through theoretical research. It is then used by other scientists for new experiments that verify or disprove the proposed models in whole or in part. The theoretical researcher can revise the model so that there is complete agreement with the experimental information or, if this is not possible, reject it. Modern physical science proceeds by the cooperation and interdependence of theory and experiment. Furthermore, it should be noted that progress in Physics is usually the result of teamwork. The problems are so complex that solving them requires the joint efforts of many theoretical and experimental physicists. The collaborations of physicists do not always

require continuous presence in the same place. Today there are many research projects involving physicists from many different countries.

Physics occupies a special place among the Positive Sciences not only for historical reasons but mainly for the fact that it provides the conceptual and theoretical background on which the other sciences are based. At the same time, from a purely practical point of view, there is almost no science that does not use Physics techniques. It should be noted that the thinking and methodology of the Physicist scientist continues to be a model of organization for every rational function of modern human.

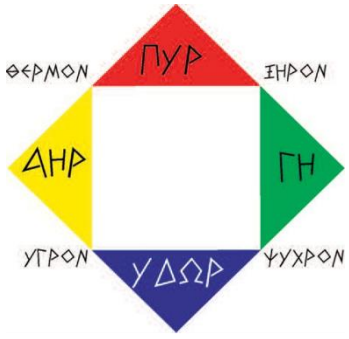
One of the defining characteristics of the human species is the curiosity with which man deals with his natural surroundings as well as his constant attempt to understand natural phenomena, i.e. to classify them and reduce them to a set of principles. The information that reaches the human brain is the subject of processing in which the various "physical concepts" such as movement, heat, light, etc. are entered as categories. The initial classification of phenomena according to the human senses with which they are directly related, such as Optics, Heat, Kinematics, Acoustics, etc., is purely conventional. Although these traditional disciplines were in the past taught as separate sciences, with a common of course methodology, they are but parts of Physics governed by common principles. In the traditional branches of Classical Physics, i.e. Mechanics, Optics, Electromagnetism and Thermodynamics, new phenomena of the microcosm were added in our century which are called by the general name "Modern Physics". It should be noted that one of the greatest achievements of our time is the unified view of Physics established after understanding the physics of the microcosm and the phenomena of Electromagnetism. The classical division is purely conventional, there are no seals and all branches are governed by the same general principles. Furthermore, modern Physics is something that is constantly renewed and enriched with new phenomena and new ideas. Both classical and modern Physics will always have to be constantly redefined, reinterpreted and revalidated. Physics is unified and its consideration should be governed by logic and consistency. The purpose of research is to find a simple series of basic principles by which all known phenomena can be understood.

2. Brief Historical Review

How was the World created? Is there order and simplicity beneath the surface of the complex and diverse World that surrounds us?

These questions mediated the Greek philosophers of the sixth and fifth centuries BC. This period constitutes the beginning of the prehistory of Physics which lasted until the seventeenth century. The Greek thinkers, free from prejudices, started from the observation of the Natural World, and with the mind process called abstraction they ended up formulating the above questions in the context of the Right Reason. Regardless of the completeness of the questions or the answers they arrived at, their great achievement was that for the first time in the history of the human species they attempted to understand the Natural World based on Logic. Until then, the explanation of physical phenomena had been included in the realm of revealed truths.

One of the topics that preoccupied the Ancients was the constitution of matter. The natural philosophers of Ionia and Magna Graecia (Thales, Anaximander, Anaximenes, Empedocles and others) submitted various proposals regarding the fundamental components of matter (water, air, etc.). Special places are occupied by Heraclitus and Pythagoras who proposed as the main element of the Cosmos, the former a process, the struggle of opposites, and the latter the concept of number. An important stage is the formulation of the Atomic Theory by Leucippus and Democritus, and later by Epicurus. According to the atomic hypothesis, matter consists of indivisible and indestructible particles, the atoms. Individuals combined in different ways with each other produce the vast variety of the sensible World. It took two millennia for the Atomic Hypothesis to be verified by experiment, which is still basically correct today. An important element which the Atomists introduced into physical thought was that simplicity in the structure of the Natural World should be sought at the microscopic level.



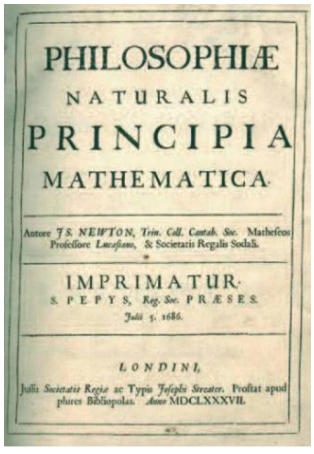
The Four Elements and Four Qualities of Empedocles

A second subject that preoccupied the ancients, perhaps even more than the first, were astronomical phenomena. Great figures, such as Aristarchus Samios, Hipparchus, Eratosthenes and others, without having at their disposal the greatest instrument of modern astronomy, the telescope, made enormous strides in the quantitative investigation of the various phenomena relating to the Earth and the heavens bodies. In the second AD century Claudius Ptolemy, after collecting all existing observational data, formulated the eponymous geocentric system for the movement of the Sun and the planets which bears his name and which was to dominate astronomical thought for the next 1400 years. A great figure of ancient science was Archimedes, whose genius led to the solution of dozens of engineering problems, among which the laws of Statics and Hydrostatics (principle of buoyancy) have a special place.

Aristotle, one of the greatest philosophers of antiquity and founder of many sciences, dealt with the problem of the movement of bodies. The mental framework of Aristotle's investigations, in contrast to the mental framework of older natural philosophers, also contained some additional purely philosophical concepts, such as e.g. the entelechy and the concept of natural movement, which caused ancient natural thinking to deviate from the tripartite observation-abstraction-logic and to be led to wrong conclusions. Aristotle's Physics dominated for two millennia or so until Galileo overturned it and marked the end of the Prehistory period of Physics.

The historical period of Physics begins with Nicolaus Copernicus who in 1543 published his famous heliocentric model. The existence of two conflicting models, the geocentric Ptolemaic one, and the revolutionary heliocentric one, led Tycho Brahe to collect astronomical observations of great accuracy for the time. Kepler then, after analyzing them in detail, formulated the famous three laws that bear his name and which quantify the heliocentric pattern.

The beginning of Physics as we understand it today happened with Galileo. Galileo was the first to systematically introduce experimental methodology into scientific research. The laws of free fall, the laws of shooting at an angle, the use of the pendulum to measure time, the observation and study of the Sun, the Moon and the sky in general with the telescope, the discovery of sunspots, the discovery of satellites of Jupiter, and many others are the first priceless gifts of the new scientific method and its exponent to mankind. The definitive completion of the methodological arsenal of Physics, however, was accomplished by Newton, who revived the ancient mathematical art of Archimedes in the formulation and description of physical laws.


PHILOSOPHIÆ
NATURALIS
PRINCIPIA
MATHEMATICA
Autore IS. NEWTON, Trin. Coll. Cantab. Soc. Matheseos Professore Lucasiano, & Societatis Regalis Sodali.
IMPRIMATUR.
S. PEPYS, Reg. Soc. PRÆSES.
Julii 5. 1686.
LONDINI,
Jussu Societatis Regiæ ac Typis Josephi Streater. Prostat apud plures Bibliopolas. Anno MDCLXXXVII.

Isac Newton's PRINCIPIA

Isaac Newton in his monumental work Principia formulated the fundamental laws of motion of terrestrial and celestial bodies (Newton's laws, law of universal gravitation). Physics acquires the ability to accurately predict quantitatively the motion of any moving body. The elliptical orbits of Kepler's laws are now a mathematical prediction of Newton's equations of motion. Newton also dealt with the phenomenon of light. He experimentally proved that white light is a mixture of different colors and studied the effects of interference. He published his studies in the project Opticks. However, in contrast to his studies on the movement of bodies and universal gravitation, which essentially founded the

discipline of Mechanics, his studies on light did not lead the corresponding discipline, Optics, to a similar stage of maturity.

Mechanics was supplemented by extending the scope of its applications to a variety of systems of particles, solids, and fluids, and reached a high level of rigor by reformulating its basic laws in the framework of the Lagrange and Hamiltonian formalisms.

Optics progressed mainly with the introduction of the wave view of light by Huygens and others. Although the phenomena of static electricity and magnetism had been observed since ancient times, it was only in the eighteenth century that their systematic experimental study began. The investigation of Electric and Magnetic phenomena proceeded at an accelerating pace throughout the nineteenth century. Faraday's experimental investigations and Maxwell's mathematical equations proved the interdependence of the two phenomena as well as the electromagnetic nature of light. Thus, during the second half of the nineteenth century Electromagnetism had reached a level of completeness and self-consistency commensurate with that of Mechanics. A multitude of seemingly unrelated physical phenomena were eventually interpreted as arising from the fundamental laws of Electromagnetism (Maxwell's equations). In particular, Optics ceased to be considered an independent branch, since it was shown that it is only a part of electromagnetic phenomena.

During the nineteenth century both in Physics and Chemistry the Atomic Hypothesis, forgotten for so many centuries, was revived. The hypothesis of the existence of microscopic atoms enabled scientists to reduce a multitude of complex phenomena of the macrocosm to the problem of the movements and interaction of atoms. The science of Thermodynamics dealing with the thermal phenomena of matter had already reached an advanced stage of completeness with a huge range of applications since the previous century. Boltzmann, as well as others, adopting the concept of atoms managed to interpret all thermodynamic phenomena by reducing them to kinetic phenomena of a large number of atoms. Thus, Thermodynamics was unified with the rest of the body of Physics as the mechanics of large numbers of particles, or, as it was called, Statistical Mechanics. Towards the end of the nineteenth century, almost all the then known phenomena were interpreted in the context of (Classical) Mechanics, Electromagnetism and Statistical Mechanics. This image was illusory and it was not long before it was overturned in a few years.

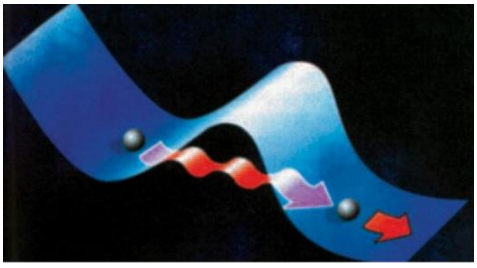
At the end of the nineteenth century a multitude of new experimental data began to accumulate which could not be interpreted with the then established framework of laws of Mechanics and Electromagnetism. The famous experiment of Michelson and Morley showed that the speed of light does not depend on the motion of the observer and the source, which is incompatible with the laws of Mechanics. More generally, the incompatibility of Newtonian Mechanics and Electromagnetism was established which eventually led Einstein to formulate the Special Theory of Relativity. The prevalence of the laws of the Special Theory of Relativity showed that Newtonian Mechanics describes the motion of bodies approximately when the velocities are much smaller than the speed of light which is a universal constant. In contrast, Electromagnetism was shown to be perfectly compatible with Relativity. The new element that Relativity introduced into Physics is the rejection of the concept of absolute time.

Time is actually relative, as is space, and physical events occur in a mathematically unified space-time continuum. Although the relativity of time has led to a plethora of "paradoxes" that defy conventional logic and have captured the public imagination, Relativistic Mechanics is conceptually so related to Newtonian Mechanics that it can be considered a its extension or, more correctly, to consider the second as an approximation of the first. Relativistic Mechanics and Electromagnetism are part of Classical Physics.

Pauli and Bohr facing the problem of angular momentum

The discovery of new physical phenomena, such as Radioactivity, Röntgen rays and others, prepared physicists for the revelation of the internal structure of atoms. Before the end of the 19th century, the lightest component of atoms, the electron, was observed experimentally. A huge role in the revelation of the new physical laws of the microcosm was played by experiments on the absorption of radiation by matter, and in particular blackbody radiation and the photoelectric effect. The first topic led Planck to the Quantum Theory in which light is absorbed and emitted by matter in discrete amounts rather than continuously as Classical Electromagnetism would require.

The photoelectric effect forced physicists to introduce the concept of the photon and to attribute particle properties to light which was, at least at first sight, in stark contrast to the wave nature of electromagnetic radiation in Classical Electromagnetism. At the same time, Rutherford's experiments finalized the planetary model of the atom with a localized nucleus and a number of orbiting electrons. The stability of Rutherford's atom, classically unexplained (since any accelerated charge would have to radiate), further exacerbated the impasse and led physicists to look for explanations in the direction of quanta theory. By de Broglie and others, but mainly by Bohr, ideas and models of the atom were proposed with the main characteristic being the established coexistence of particle and wave properties in the same object.



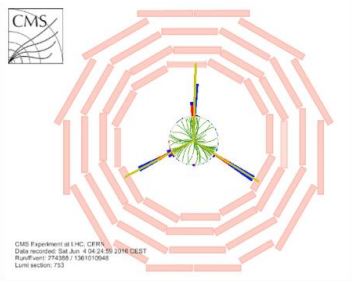
Representation of the “Tunneling Effect”

By the beginning of the 1920s, the formulation of the theory of General Relativity by A. Einstein, which is widely accepted as the classical description of the gravitational interaction, was essentially completed. Before the end of the same decade, the new Mechanics of the microcosm, Quantum Mechanics, had reached a high level of completeness to give satisfactory answers to almost all existing experimental data. Quantum mechanics, mainly the work of Heisenberg, Schrödinger, Born and Pauli, constitutes a radical departure from the established ideas of Classical Physics, according to which the trajectory and velocity of a particle can be simultaneously known with infinite precision. Quantum Mechanics establishes uncertainty as an inherent feature of Nature. Its mathematical language is the language of probability. Despite the fact that Quantum Mechanics met serious resistance to be accepted, mainly for philosophical reasons, it is today fully successful and justified by the experiment but also by the numerous technological applications based on quantum phenomena. It is worth noting that the unified theory of microscopic electromagnetic phenomena, Quantum Electrodynamics, the work of Dirac, Schwinger, Feynman and others, is one of the most accurate theories in Physics. However, despite the colossal effort in the following decades it was not possible to include gravity in this theoretical framework.

3. Physics Today

A concise enumeration of the modern branches of Physics can be done in an ascending scale of length, or equivalently in a descending scale of energy, starting from the smallest constituents of matter and ending in the Universe.

Particle Physics or High Energy Physics: This is the branch that deals with the infinitesimal particles of matter. It classifies them according to their properties, i.e. mass, charge, spin, etc. and the interactions they have.



Trajectories and jets of elementary particles (data from the CMS experiment in CERN)

Today, the electron, neutrino, photon, quarks and others are considered elementary. Especially quarks are the components of the proton and neutron from which the nuclei of the various elements are built and which until recently were considered elementary. The existence of 37 elementary particles has been established experimentally. The field of particle Physics is the largest frontier of microcosm research. The branch's theoretical tools are Relativity and Quantum Mechanics. High Energy Physics experiments are done in huge accelerators and are usually collaborative efforts of many research groups from many countries. A relatively recent achievement of particle physics is the unified theory of electromagnetic and weak nuclear forces.

Nuclear Physics: Much of the research in Nuclear Physics today focuses on radioactive exotic nuclei and stable nuclei at high energies and angular momenta. The purpose is to study new forms of nuclear matter, the synthesis of superheavy systems, and the study of the origin of elements and the production of energy in stars. A significant part of the research is spent on understanding the nuclear force in the context of a many-body problem - nucleons and hadrons and studying the participation of the nucleus in the electroweak interactions. Applied research is also carried out concerning other branches such as Medicine and Radioecology.

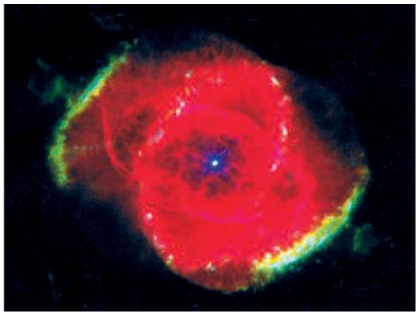
Atomic and Molecular Physics: They are the branches of Physics that study the structure and properties of atoms and molecules. Modern research here is dominated by LASERS, i.e. devices based on the phenomenon of Light Amplification by Stimulated Emission of Radiation. Atoms and molecules under the influence of the strong electromagnetic fields of the laser show new very interesting properties.

Condensed Matter Physics: This branch studies the various properties of solids or liquids formed by a large number of atoms or nuclei and electrons in a crystalline arrangement or in an amorphous state. It has a huge range of practical applications with very important consequences in the technological side of everyday's life, such as e.g. the semiconductors. It should be noted, however, that research in Condensed Matter Physics has also led to the

discovery of new fundamental physical phenomena, due to the collective action of a large number of particles, such as superconductivity.

Geophysics and Atmospheric Physics: The object of this branch is the movements of the Earth's solid crust (Seismology), the study of the Earth's magnetic field, the study of the Earth's atmosphere and its changes (Meteorology, Climatology, Physics of the Atmospheric Environment) etc.This branch has gained great importance today due to the increased interest of society in climate changes due to the effects of various anthropogenic factors on the environment.

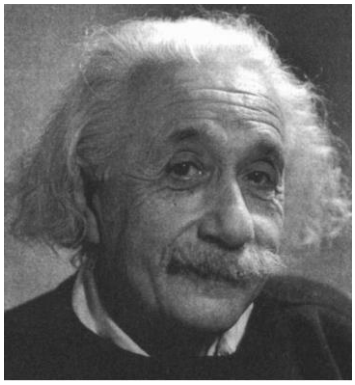
Astrophysics: This branch concerns the study of all celestial objects, i.e. the Sun, planets, stars, galaxies and the universe (Cosmology). Recently, it has shown particular development, on the one hand due to the use of new state-of-the-art experimental and high-tech observation devices, and on the other hand due to the close cooperation with other branches of modern Physics, such as Elementary Particle Physics, Nuclear Physics, etc. At the theoretical level, study of the evolution of the Universe is a common subject of Cosmology and Theoretical Physics of Elementary Particles.



The NGC 6543 nebula
(photo from the HUBBLE space telescope)

Gravitation and Cosmology: It is a key branch that often shaped the course of Physics from its origins in Newtonian gravity and the theory of General Relativity (genesis of the modern theory of gravity) until today. The traditional cosmological data base is already being reshaped by ground-breaking high-precision measurements. The object of study focuses on the minimum length scale that dominates the first moments of the Big Bang, but also extends to the maximum possible length scale in the present Universe. It already seems that a necessary condition for the understanding of Creation is the unified quantum description of gravitation with other interactions, as well as the revelation of the genesis mechanisms of space and time.

3. Education and Employment of Physicists



Albert Einstein

Constantin Caratheodori
founder of thermodynamics

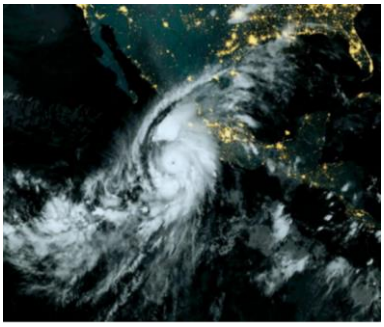
The education of physicists aims on the one hand to equip its recipients with the knowledge of the basic concepts of natural phenomena (Mechanics, Electromagnetism, Modern Physics, etc.) at the theoretical but also at the laboratory level, and on the other hand to teach them the methodology of Physics for the solving old and new problems. In the current undergraduate curriculum, structure courses, in which more emphasis is placed on methodology, and subject courses, in which more emphasis is placed on new knowledge and applications, coexist. At the same time, there are also courses in which techniques or technologies necessary in Physics are taught, such as Computers, Mathematics and Laboratory methods.

Secondary Education continues to absorb a large part of the graduates of the Department of Physics. The teacher's profession, in addition to the dedication it requires, in order to be crowned with success, mainly requires knowledge of the subject that the teacher wants to convey to the students. The Physics teacher has the great responsibility to teach the methodology of Physical Science and not only to transfer some knowledge in Physics.

Other outlets for Physics graduates are the various applied branches of Physics, either in the context of Industry or in the context of large state (or non-state) organizations such as telecommunication corporations, electrical power corporations, the meteorological service, etc. Such branches are radio-electronics, telecommunications and optical-communications, electronics and microelectronics, meteorology and climatology, medical physics etc. Most of these fields also require a Master's Degree.

Our Department offers postgraduate studies in the most basic branches of Physics, such as Theoretical and Experimental Physics, Modern Electronic Technologies and Meteorology - Climatology, which after a series of basic postgraduate courses lead to obtaining a Master's Degree.

The Department of Physics also provides a Doctoral Diploma (Doctorate of Philosophy-PhD) after preparing an original thesis on a current research topic. The majority of PhDs are destined to pursue an academic career at Universities and Research Centers in the country or abroad. Their work will not only be teaching or simply applying acquired knowledge but producing new knowledge through scientific research.



The Patricia typhon

Progress in Physics, almost as a rule, is the result of painstaking and long-term work by many individuals. Irrespective of the approach of each one to the problems and the way of work, a common characteristic of Physicists is the honesty and sincerity with which they deal with physical data. The duty of the Physicist is not only to advance our knowledge of the Natural World with the help of scientific methodology, but also to cultivate the scientific ethos and popularize the scientific method. In a rapidly changing world in which Technology gains more and more power, in which Information increases exponentially and specialization is relentless, the Physicist remains the guardian of the scientific method. Its purpose is still the understanding of the world, as in the time of the Ionian philosophers, and its method is Observation and Logic.

The beginning

The Department of Physics was founded in 1970 with No. 746/70 legislative decree (D.D.). It was the third University Department established in Ioannina, after the Department of Philosophy (1964) and the Department of Mathematics (1966), and as a result the until then branch of the Aristotle University of Thessaloniki became an independent Institution, the University of Ioannina.

The Department of Physics was housed in the old building of the University, on Domboli street, and together with the Department of Mathematics they formed the School of Physics-and-Mathematics (now the School of Positive Sciences) to which the Department of Chemistry was later added.

In 1981 the Department of Physics was the first Department of the University which was transferred to the present Campus and was housed until 1993 in the Transitional Building. Since 1993 it has been housed in its own buildings, Φ-2 and Φ-3 at the western end of the Campus.

Until 1982, the head of the Department was the Dean of the Faculty, while from 1982, with Law 1268/82, the position of the President of the Department was established.

Former Deans of the School of Physics-and-Mathematics

1970-1973	S. Karavelas
1973-1975	B. Staikos
1975-1976	K. Polydoropoulos
1976-1977	G. Tzivanidis
1977-1978	G. Andritsopoulos
1978-1979	D. Metaxas
1979-1980	D. Miliotis
1980-1981	P. Papaioannou
1981-1982	Ch. Papageorgopoulos

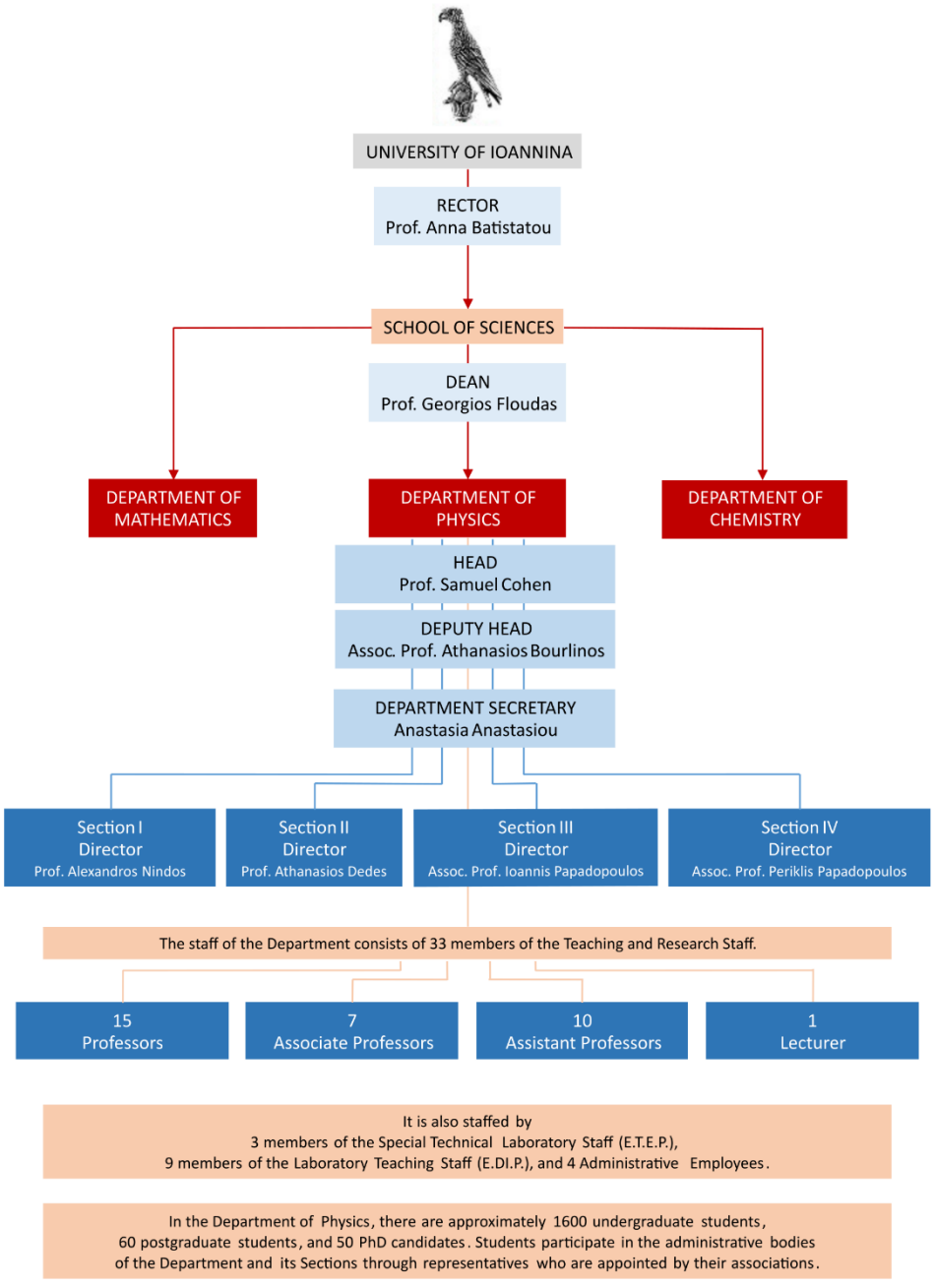
Former Deans of the School of Positive Sciences

2014-2021	C. Kosmidis
2021-	G. Floudas

Former Chairs of the Department of Physics

1982-1983	I. Vergados
1983-1986	P. Asimakopoulos
1986-1989	I. Vergados
1989-1991	Ch. Papageorgopoulos
1991-1995	P. Asimakopoulos
1995-1997	Ch. Papageorgopoulos
1997-2001	K. Tamvakis
2001-2005	A. Bolovinos
2005-2009	C. Kosmidis
2009-2013	T. Bakas
2013-2017	I. Rizos
2017-2022	P. Kokkas
2022-	S. Coen

B. STRUCTURE OF THE PHYSICS DEPARTMENT
ORGANIZATION CHART



1. Astrogeophysics Section (I)

Faculty (Teaching and Research Staff)

NINTOS ALEXANDROS, Professor, **Section's Director**
Physics of the Sun and Space

HATZIANASTASIOU NIKOLAOS, Professor
Natural Meteorology and Natural Climatology

ARCHONTIS VASILIOS, Professor
Astrophysics

PATSOURAKOS SPYRIDON, Associate Professor
Plasma Astrophysics of the Sun and Interplanetary Space

LOLIS CHRISTOS, Associate Professor
Meteorology - Climatology

BAKAS NIKOLAOS, Assistant Professor
Meteorology

Laboratory Teaching Staff

MARKOU MARINA

Laboratories

Astronomy Laboratory
Laboratory of Meteorology and Climatology

Research activities

The research interests of the Astronomy laboratory include Solar and Space Physics as well as the study of stars. The physical processes that occur in the Sun are studied both observationally and theoretically. The observational material is collected by ground-based and space-based telescopes and spans practically the entire electromagnetic spectrum (from hard X-rays to metric radio waves). The study covers all layers of the solar atmosphere and extends from the "calm Sun" to the centers of action and violent explosive phenomena. The effect of solar explosive phenomena on Earth is also studied. Finally, the equilibrium, stability and transport phenomena of astrophysical and laboratory plasma are studied.

The research interests of the members of the Meteorology and Climatology Laboratory include phenomena related to Meteorology, Climatology, Atmospheric and Environmental Physics, and their behavior in space and time. Emphasis is given on climate changes on a global scale, in the Greek area but also locally in the region of Ioannina. Also: 1) the long-range transport and role of aerosols and atmospheric pollutants at the planetary level, at the NE Europe, at the Mediterranean and at the Greek area, 2) the solar (total, infrared and diffuse) and the terrestrial radiation, 3) biometeorological issues and 4) the dynamics of movements in the atmosphere are studies. Finally, a weather forecast for the region of Epirus is carried out on a 2x2 km grid and an extreme weather forecast bulletin is issued to inform the public and the authorities of the region.

2. Theoretical Physics Section (II)

Faculty (Teaching Research Staff)

PERIVOLAROPOULOS LEANDROS, Professor
Theoretical Physics, Cosmology

RIZOS IOANNIS, Professor
Theoretical High Energy Physics

KANTI PANAGIOTA, Professor
Theoretical Particle Physics, Cosmology

DEDES ATHANASIOS, Professor, **Section's Director**
Theoretical Physics of Elementary Particles

FLORAKIS IOANNIS, Assistant Professor
Theoretical Physics of Elementary Particles

Laboratory Teaching Staff

ECONOMOU A.
YOUTSOS D.

Special Technical Laboratory Staff

FOUZA-IKONOMOU FOFO, Secretary

Laboratories

1st Laboratory of Theoretical Physics
2nd Laboratory of Theoretical Physics

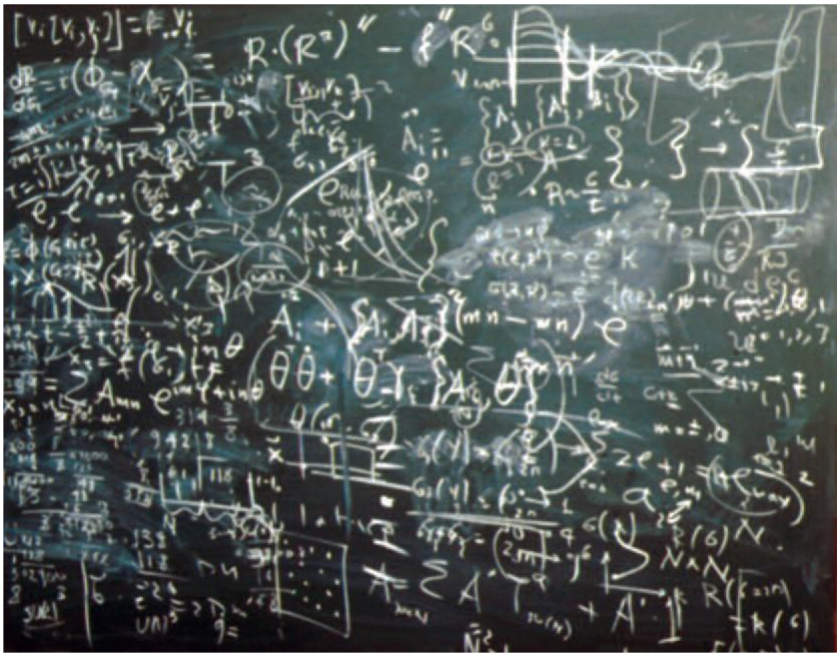
Research activities

The research activities of the members of the Theoretical Physics Section cover a wide range of topics. Theoretical Physics of Elementary Particles is a main interest of many members of the Department. In particular, modern Gauge Theories, Supersymmetry, Superstring Theories and the unification of the fundamental interactions between elementary particles are the object of study. The phenomenological analysis of the models derived from these theories leads to predictions comparable to the experimental data. The cosmological consequences of the models for the elementary particles, but also Cosmology as such is also a research object of the Section (Black Holes, Inflationary Universe, etc.).

The Department's research topics include Theoretical Physics of Condensed Matter. The developing activity in this area concerns the electronic structure of atoms, molecules and

solids, the study of crystalline and amorphous materials, topics of localization theory in non-periodic systems, topics of magnetism and nonlinear dynamics.

Members of the Department develop research activity in Theoretical Nuclear Physics. In particular, semileptonic reactions with nuclei, conventional and exotic, such as neutrino-nucleus, nuclei with cold dark matter particles, double and single β-de-excitation, etc. are studied.



3. Atomic and Molecular Physics, Nuclear Physics and High Energy Physics Section (III)

Faculty (Teaching Research Staff)

KOSMIDIS CONSTANTINOS, Professor
Molecular Physics

FOUNTAS KONSTANTINOS, Professor
High Energy Experimental Physics

KOKKAS PANAGIOTIS, Professor
High Energy Experimental Physics

COHEN SAMUEL, Professor, **Head of the Department**
Experimental Atomic and Molecular Laser Spectroscopy

PATRONIS NIKOLAOS, Professor
Experimental Nuclear Physics, Nuclear Reactions

PAPADOPOULOS IOANNIS, Associate Professor, **Section's Director**
High Energy Experimental Physics

BENIS EMMANUEL, Associate Professor
Atomic and Molecular Experimental Physics

OKIADIS ARISTEIDIS, Assistant Professor
Experimental Optoelectronics

STROLOGAS IOANNIS, Assistant Professor
High Energy Experimental Physics

KAZIANNIS SPYRIDON, Assistant Professor
Experimental Molecular Physics

SOFIKITIS DIMITRIOS, Assistant Professor
Atomic and Molecular Physics

Laboratory Teaching Staff

DANAKAS SOTIRIOS
PAPACHRISTODOULOU CHRISTINA
STAMOULIS KONSTANTINOS

Special Technical Laboratory Staff

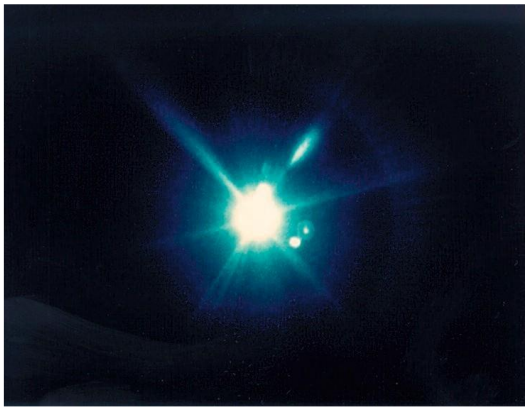
PAPADOPOULOU FOTEINI, Secretary

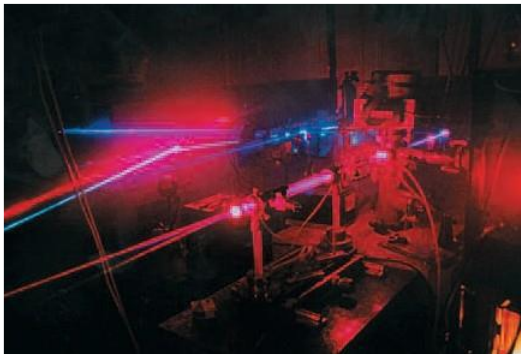
Laboratories

2nd Physics Laboratory (High Energies and Applications)
3rd Physics Laboratory (Atomic and Molecular Physics)
6th Physics Laboratory (Nuclear Physics)

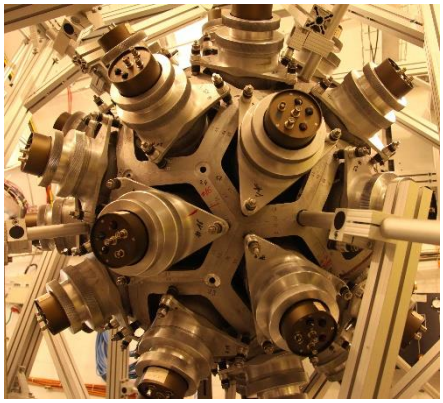
Research activities

The object of the research activity of the Laboratory of Atomic and Molecular Physics is the study of the atomic and molecular structure as well as the development of applications based on laser technology. With the use of spectroscopic techniques, highly excited and self-ionized atomic states and nonlinear phenomena (generation of harmonics, optical phase conjugation, etc.) are studied. Electronic molecular states and their dynamics are studied with mass spectrometry techniques. Also, an activity is developed with the object of understanding the interaction of strong laser fields with molecules and the utilization of the processes involved for the development of new techniques (alignment of molecules, etc.). At the same time, members of the Laboratory are engaged in theoretical calculations related to the above activity. Applied research includes the degradation of materials, the development of analytical techniques, the development of Bragg barriers in optical fibers, the construction of optical fiber sensors and similar applications of photonics in the fields of telecommunications and industrial production.

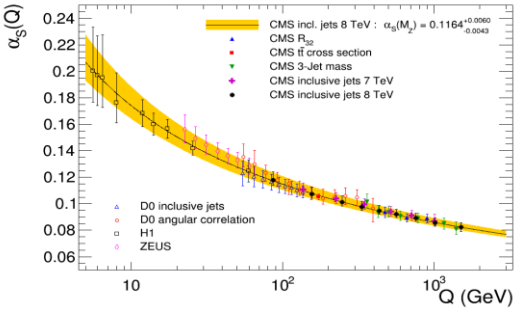


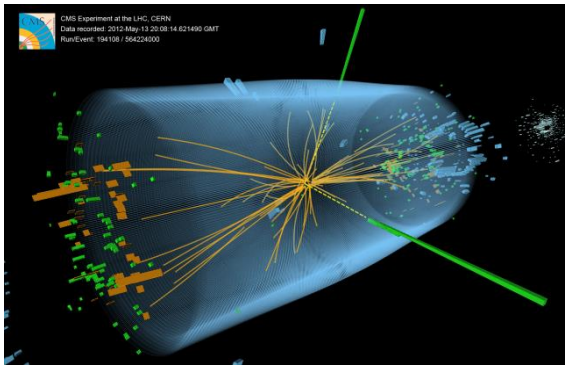


The Laboratory of Nuclear Physics research activities are focused in the study of the nuclear structure, the nuclear reaction mechanisms and the nuclear fusion with stable and radioactive beams. The experiments are carried out in various European and/or International Nuclear Research Centers (GANIL, ISOLDE, CERN, INFN Legnaro and Catania) as well as in other European Laboratories that have accelerator facilities. Among the research interests of the Laboratory are also topics of Applied Nuclear Physics, such as nuclear microanalysis and radioecology (study of the mechanisms of radioactive contamination in the environment).



The High Energy Physics Laboratory (HEP) participates in the CMS experiment at the European Center for Particle Physics CERN, which studies pp interactions at a center of mass energy of 14 TeV. In particular, the HEP Laboratory participates in the design, development and manufacture of silicon detector systems and electronic-microelectronic systems for HEP experiments. As part of the CMS experiment, the members of the HEP Laboratory develop trigger systems and analyze data with jets of particles for the study of physics within the Standard Model and beyond.





4. Solid State Physics and Physics of Materials and Surfaces Section (IV)

Teaching Research Staff

GEORGIOS FLOUDAS, Professor
Experimental Solid State Physics

DELIGIANNAKIS IOANNIS, Professor
Physical Chemistry of Materials and Environment

ALEXIOS DOUVALIS, Professor
Experimental Solid State Physics: Electronic & Magnetic Properties of Solids

EVANGELOU EVANGELOS, Associate Professor,
Physics of Semiconductors

BOURLINOS ATHANASIOS, Associate Professor, **Deputy Head of the Department**
Experimental Solid State Physics: Electronic & Magnetic Properties of Nanostructured Solids

PAPADOPOULOS PERIKLIS, Associate Professor, **Section's Director**
Experimental Solid State Physics: Polymer Physics

VLACHOS DIMITRIOS, Associate Professor
Experimental Physics of Solid Surfaces

TSELEPI MARINA, Assistant Professor
Experimental Solid State Physics, Thin Films

CHRISTOFILAKIS VASILIOS, Assistant Professor
Telecommunications: Signal propagation

MARKOU ANASTASIOS, Assistant Professor
Experimental Solid State Physics: Electronic and Magnetic Properties of Materials

KATSANOS DIMITRIOS, Lecturer
Condensed Matter Physics

Laboratory Teaching Staff

POLYMEROS ALEXANDROS
BALDOUMAS GEORGIOS

Administrative staff

GALANI ELENI

Special Technical Laboratory Staff

GEORGIOS TSOUMANIS, Electronics

Laboratories

1st Physics Laboratory (Mössbauer Spectroscopy and Physics of Materials)
4th Physics Laboratory (Surface Physics)
Electronics - Telecommunications and Applications Laboratory
5th Physics Laboratory (Condensed Matter Physics and Materials Science)

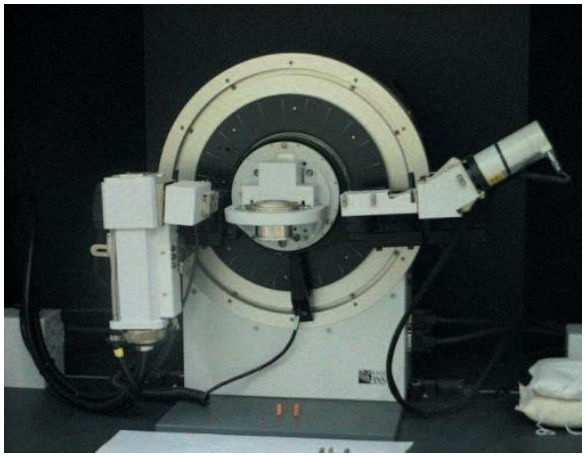
Research activities

The members of the Mössbauer Spectroscopy and Physics of Materials Laboratory are involved in the study of the magnetic and electronic properties of matter, the characterization of materials with Mössbauer Spectroscopy, EPR and X-ray diffraction, the preparation and study of magnetic materials, thin films, nanoparticles, clays, layered materials, synthetic molecular compounds and catalysts.

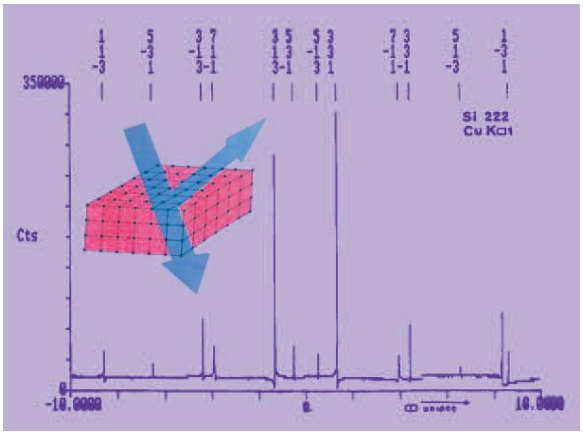
In the Surface Physics Laboratory, the properties of the surfaces and interfaces of the condensed matter are studied, as well as the interactions of the surfaces with monolayer fraction deposits up to thin films in ultra-high vacuum conditions (10^{-11} torr). The studies concern crystalline and amorphous surfaces and are done with the basic techniques of studying surface phenomena using low energy electron diffraction (LEED), Auger electron spectroscopy (AES), energy loss spectroscopy (EELS), mass spectroscopy (QMS) and work function measurements (WF).

In the Electronics-Telecommunications and Applications Laboratory, the study and electrical characterization of thin films, semiconductor materials and devices are carried out. For these purposes, the following techniques are used: Deep Trap Spectroscopy (DLTS) of complex conduction as well as measurements of characteristic electrical quantities (I-V, C-V). Thin films are also developed. Materials are also studied with Molecular Dynamics and Monte-

Carlo simulations, based either on semi-empirical interaction potentials, or on potentials constructed from first principles within the framework of Tight-Binding and Augmented Plane Wave (APW) theory. Other activities include: Development of analogue and digital systems (Low noise, Read out, Data acquisition, Interfacing etc.). Telecommunication systems, Optical signal transmission, Digital signal processing (DSP), Digital signal transmission, Software Radio, Beam Forming, Smart Antennas etc.



The members of the Condensed Matter and Materials Science Laboratory are involved in:



1. The study of the structure and dynamics of materials known as "soft" matter (synthetic and biological macromolecules, colloids, liquid crystals) using a) X-ray scattering, b) Dielectric Spectroscopy, c) Rheology.

2. With calculations of electronic structure of solids from first principles (ab-initio), structural and dynamic properties of solids and surfaces with simulation methods.

3. With Condensed Matter Physics, γ, X-ray Spectroscopy and the Electronic Structure of Metal-Hydrogen Systems.

5. Laboratory Teaching Staff of the Department

BLETSAS DIMITRIOS-EFSTATHIOS

6. Faculty members from other Departments and retired Professors teaching at the Physics Department's Study Programs

GARAVELAS KONSTANTINOS, Assistant Professor (Philosophy Department)
EMFIETZOGLOU DIMITRIOS, Professor (Department of Medicine)
EVANGELOU IOANNIS, Retired Professor (Physics Department)
ZAGOS CHRISTOS, Assistant Professor (Philosophy Department)
KAVVADIAS KOSMAS, Associate Professor (Department of Mechanical Engineering, PADA)
KASSOMENOS PAULOS, Retired Professor (Physics Department)
KOLIOS STAVROS, Asst. Professor (Dept. of Aerospace Science & Technology, EKPA)
MANTHOS NIKOLAOS, Retired Professor (Physics Department)
MITROU NIKOLAOS, Professor (School of Electrical & Computer Engineering, NTUA)
MICHALOPOULOS NIKOLAOS, Professor (Department of Chemistry, University of Crete)
MICHOU EIKATERINI, Assistant Professor (Philosophy Department)
BARTZOKAS ARISTEIDIS, Emeritus Professor (Physics Department)
TAMVAKIS KYRIAKOS, Emeritus Professor (Physics Department)
GEORGIOS TSIATOUCHAS, Professor (Department of Computer Engineering and Informatics)

7. Foreign Language Teachers

Evgenia Evmoiridou (English)

8. Honorary Members of the Department of Physics

Emeritus Professors

NIKOLAOS-HERAKLIS GAGAS
GEORGIOS BANOS
GEORGIOS ANDRITSOPOULOS
DIONYSIOS METAXAS
NIKOLAOS ALEXANDROPOULOS †
VASILIOS KATSOULIS †
FRIXOS TRIANTIS
IOANNIS VERGADOS
ATHINA PAKOU
KONSTANTINOS VAGIONAKIS
KONSTANTINOS ALYSSANDRAKIS
THEOCHARIS KOSMAS
KYRIAKOS TAMVAKIS
NIKOLAOS BATAKIS
THOMAS BAKAS
PANAGIOTIS KOSTARAKIS
GEORGIOS LEONTARIS
GEORGIOS EVANGELAKIS

Honorary Doctorates

IOANNIS ILIOPOULOS
JONATHAN ELLIS
VASILIOS PONTIKIS
HANS-JÜRGEN BUTT
EIFHYMIOS KAXIRAS

Honorary Professors

DIMITRIOS NANOPOULOS

9. Committees of the Department

1) Committee of Programme of Studies

A. BOURLINOS (Chair)
P. KOKKAS
P. KANTI
I. PAPADOPOULOS
H. LOLIS

The Head of the Department may participate as observer.

2) Studies Guide, Website and Promotion Committee of the Department

I. PAPADOPOULOS (Chair)
A. DOUVALIS
E. BENIS
P. PAPADOPOULOS
I. STROLOGAS
B. GRIGOROPOULOU (Personal Data Protection Communication Officer)
E. NAKOU

3) CIE (Internal Assessment Team)

I. RIZOS (Chair)
N. HATZIANASTASIOU
P. PAPADOPOULOS
N. BAKAS
I. STROLOGAS
I. FLORAKIS

The Head AND Deputy Head of the Department may participate as observers.

4) Seminars Committee

L. PERIVOLAROPOULOS (Chair)
S. PATSOURAKOS
S. KAZIANNIS
A. MARKOU
F. FOUZA

5) Committee of Calendar for Teaching and Exams

B. ARCHONTIS (Chair)
D. VLACHOS
B. CHRISTOFILAKIS
F. PAPADOPOULOU
Student Representative

6) **Buildings and Safety Committee**
H. LOLIS (Chair)
A. MARKOU
A. OIKIADIS
G. BALTOUMAS

7) **Committee of Enlistment**
S. COHEN (Chair)
K. FOUNTAS
A. NINTOS
I. PAPADOPOULOS
P. PAPADOPOULOS
D. VLACHOS
N. BAKAS

8) **Freshman Reception Committee**
D. VLACHOS (Chair)
I. STROLOGAS
S. KAZIANNIS
D. SOFIKITIS
K. STAMOULIS

9) **Committee of Experiments Demonstration Halls**
A. DOUVALIS (Chair)
A. BOURLINOS
E. BENIS
A. MARKOU
A. POLYMEROS

10) **Committee for Receipt of Purchased Items, Instruments, etc.**
Regular Members
D. VLACHOS (Chair)
D. SOFIKITIS
H. PAPACHRISTODOULOU
Substitute Members
N. PATRONIS (Deputy President)
A. BOURLINOS
S. DANAKAS

11) **Cleanliness Committee**
G. BALTOUMAS

12) **Committee for Withdrawal of Old Instruments of the Department**
E. EVANGELOU (Chair)
E. BENIS
G. TSOUMANIS

13) **Freshman Academic Progress Monitoring Committee**
The staff members teaching in the 1st year of studies together with the members of the Department Management Board.

14) **Counselors for Persons with Special Needs (PWSN)**
P. KANTI
N. PATRONIS

15) **Doctoral Studies Committee**
A. DEDES (Chair)
G. FLOUDAS
H. LOLIS
E. BENIS

The Head of the Department may participate as observer.

16) **Strategic Planning Committee**
C. KOSMIDIS (Chair)
G. FLOUDAS
K. FOUNTAS
I. DELIGIANNAKIS
P. KANTI
B. ARCHONTIS
B. CHRISTOFILAKIS

The President of the Department may participate as an observer.

17) **Steering Committee of the Graduate Program in Physics**
I. DELIGIANNAKIS (Director)
A. NINTOS
N. PATRONIS
D. SOFIKITIS
I. FLORAKIS

18) **Steering Committee of the Graduate Program in Atmospheric Sciences and the Environment**
N. HATZIANASTASIOU (Director)
A. NINTOS
S. PATSOURAKOS
H. LOLIS
N. BAKAS

19) **Steering Committee of the Graduate Program in Modern Electronic Technologies**
I. PAPADOPOULOS (Director)
K. FOUNTAS
E. EVANGELOU
B. CHRISTOFILAKIS
I. STROLOGAS

10. Representatives of the Department in University Committees

1) **Research Committee (Representative of the School of Positive Sciences-SPS)**
   I. DELIGIANNAKIS (Regular member of the SPS)

2) **Graduate Studies Committee**
   G. FLOUDAS

3) **Senate Library Committee**
   D. SOFIKITIS (Regular member)
   P. KANTI (Substitute member)

4) **Internship Committee**
   E. BENIS (Scientific manager)
   V. CHRISTOFILAKIS (Deputy)
   S. KAZIANNIS (Regular member)
   Ch. Lolis (Substitute member)
   D. VLACHOS (Substitute member)
   A. MARKOU (Substitute member)

5) **Erasmus+ Committee**
   N. HATZIANASTASIOU (Regular member)
   B. ARCHONTIS (Substitute member)

6) **U-MULTIRANK program**
   L. PERIVOLAROPOULOS

7) **Hydrobiological Research Center (HRC)**
   N. HATZIANASTASIOU
   N. BAKAS

8) **Committee of the Holy Church of Agios Georgios of Peristeras Douroutis Monastery**
   N. HATZIANASTASIOU

11. Physics Department Secretariat

The Secretariat accepts students for every secretarial procedure and provision of information throughout their studies. It is located in the Administration building and receives students daily between 11:00 and 13:00. In exceptional cases, such as registration periods, course declarations or other procedures required by the implementation of the study program, different working hours apply, which are set by the Secretariat according to the needs of the specific period.
Electronic Mail - e-mail: gramphys@uoi.gr

Secretariat staff
ANASTASIOU ANASTASIA, Department's Secretary
NAKOU EUGENIA
GRIGOROPOULOU VASILIKI

12. Student Reading Room - Library

The student Reading Room-Library of the Department of Physics is located on the 3rd floor of the Φ2 building and operates daily between 09.00 and 15.00. Most of the book collection (about 15,000 titles), as well as the entire collection of scientific journals (about 80) are located in the Central Library of the University of Ioannina (1st and 2nd floor), from where students can borrow them. The subjects of the books falls within the research interests of Physicists, while in many of them it is adapted to the bibliographical needs of the Department's curriculum. There are also popular science books, as well as books on the history, philosophy and pedagogy of the Positive Sciences. In the Reading Room-Library there one can connect on-line to bibliographic databases and to the available electronic scientific journals through the Central Library of the University. The student Reading Room-Library is also interconnected with the Greek National Network of Libraries, through which the possibility of extensive bibliographic searches and ordering of copies is provided.

In the student Reading Room, students can access (study - photocopy) the books of the collection that is held there in the Department, the number of which will increase in the future. Also, in the Reading Room-Library, there are two small IT "islands" with about 20 computers, through which students can also carry out their practical training in courses that require computers and internet access. In addition, a screening room operates in the same space, while the Department's Seminar and Meeting rooms are also located there.

In the Reading Room there is also wireless network available that allows students and visitors to connect to the internet with their personal computer.

The contact phone number is 26510 08510.

13. Experiments Demonstration Halls

The Physics Department has Experiments Demonstration Halls (Rooms Φ3-126/122/123). In these rooms various arrangements for demonstration of Classical Physics experiments divided into different thematic sections which include: Mechanics, Mechanics and Sound Waves, Thermodynamics, Electromagnetism, Light and Electromagnetic Waves as well as arrangements for various demonstration experiments of Modern Physics and Physical Chemistry are installed. Each device has an interactive character, with the aim that its users, following the suggested instructions present in each experiment, can carry out the experimental process, understand the physical principles on which its operation is based and explain the results.

The use and operation of the experiments in the rooms contributes to the support of undergraduate courses, and helps to make Physics attractive to secondary school students. The room can be used to demonstrate Physics and Physical Chemistry experiments to school and high school students, who can visit it in groups after their responsible teacher has arrange such a visit in agreement with the Coordinating Committee of Experiments Demonstration Halls. The rooms can also be used by undergraduate students and are equipped with relative hardware and software for conducting and demonstrating Virtual Physics Experiments on a Computer. In these rooms there is also appropriate space for conducting seminars for a limited number of attendants.

The creation of the room was financed within the framework of the Postgraduate Program in "New Technologies and Research in Physics Education" through the EPEAEK program of the Ministry of Education, as well as by the Department of Physics.

14. Computer Laboratories

The Department of Physics has two modern Computer Laboratories with a total capacity of 70 personal computers. The Computers are equipped with Windows and Linux operating systems. The IT courses of the Department are taught in these laboratories. The laboratories are open and available at specific times on a daily basis for student practice.

C. UNDERGRADUATE STUDIES IN THE DEPARTMENT OF PHYSICS

1. Learning outcomes of the Study Program

The Undergraduate Program in Physics (UPP) of the Physics Department of the University of Ioannina aims at strong Learning Outcomes which, indicatively, are structured along the following axes.

- solid understanding of the fundamental phenomena and principles of Physics based on either scale (subatomic, atomic, cosmological), energy (low energies, high energies), or methodological approach-analysis (classical, quantum, relativistic)
- deepening the use of mathematical tools for the analysis-description and understanding of the phenomena and principles of Physics
- use and development of experimental methods and computational tools for the productive understanding and utilization of the phenomena and principles of Physics
- the application of experimental and theoretical knowledge and skills in modern fields with an interdisciplinary dimension (energy, materials science, optoelectronics, microelectronics, nanotechnology, space physics, laser physics, environment, medical physics, nuclear technology, computational physics)
- training in Physics Education with pedagogical methodologies suitable for the first levels of education.

The learning outcomes for each course taught at the UPP are given in detail in the corresponding *Course Outline*. The outlines of the courses are posted on the website of the Department and in particular on the links http://www.physics.uoi.gr/el/node/411 and http://www.physics.uoi.gr/el/node/412.

2. Study regulations

Generally

The Study Program (UPP) of the Department of Physics has a duration of four years (8 semesters) and leads to obtaining a Degree in Physics. The Undergraduate Study Program of the Department includes 26 core courses, which cover the basic knowledge in the field, as well as approximately 48 elective courses which cover a wide range of specialized subjects. To obtain a Degree in Physics the student must successfully attend 26 of the core courses and a number of elective courses (approximately 13) so as to complete the required number

of 240 European Credit Transfer and Accumulation System (ECTS) credit units [1]*. Elective courses include the Diploma Thesis as well as the Internship. The duration of all courses is six months with the exception of the Diploma Thesis (which is annual) and the Internship (which is at least 2 months).

Studying

The academic year begins on September 1st and ends on August 31st of the following year. The educational work of each academic year is structured in two semesters (winter, spring). Each semester includes at least 13 full weeks of teaching and 2-4 weeks for examinations. Every student is obliged to participate during his studies in the educational process, as it is defined by the law and the decisions of the institutions of the University and the Department.

Registrations - Course declarations - Textbooks

The status of a student is acquired upon registration in the Department and, except for special cases of suspension/interruption of studies or disciplinary punishment, lasts until the receipt of the degree. The first registration takes place within a specified period after the publication of the results of the General Examinations. The registration is renewed every year with the declaration of the courses. Course registration is mandatory and takes place electronically within a specified time period at the beginning of the winter and spring semesters. The maximum number of courses that the student can register and be examined in each semester is eight (8). These include, by priority, the core courses of the corresponding semester (winter or spring) which the student owes from previous years. If a student fails an elective course, he can either repeat it or replace it with another elective course from the ones offered in a following semester, when this course is offered.

The student, after making a declaration of courses, is entitled to a textbook for each of them. For this purpose, he must submit a relevant statement to the on-line "Eudoxos" Electronic Document Management Service, https://eudoxus.gr.

Students who have not submitted a course declaration cannot receive textbooks, are not admitted to the exams, and if for any reason they take part in them, their performance is not graded and, if it is graded despite this, the grade they may have received is not taken into account and is not is registered in any examination period.

[1] In its General Assembly (G.A.) No. 361/30-11-2009, the Department of Physics of the University of Ioannina adopted, in accordance with the Law No. 3374 (2/8/2005), the M.D. No. 1466/13-8-2007 and Law No. 160/2008, the European Credit Transfer and Accumulation System - ECTS and assigned credits to all the core and elective courses of the curriculum. ECTS allows credit units to be recognized in European Higher Education Institutions facilitating the mobility of students in Europe. One ECTS credit corresponds to a student workload of 25-30 hours.

Suspension of studies

Students who have not exceeded the upper duration limit of their studies may, after filling a relative application to the Department Secretariat, interrupt their studies for a period of time that does not exceed two (2) years. The right to studies interruption may be applied once or partially for a period of at least one (1) academic semester, but the total duration of the interruption may not cumulatively exceed two (2) years if it is granted partially. The student status is suspended during the interruption of studies and participation in any educational process is not allowed.

Maximum duration of study

The maximum duration of studies in a first-cycle study program with a minimum duration of eight (8) academic semesters for the award of the degree, is this time increased by four (4) academic semesters.

After completing the maximum period of study, the Board of Directors of the Department issues a deed of deletion.

Examinations

The exams are held at the end of each semester and are attended by students who have registered and attended the respective courses taught. In September, before the start of the winter semester courses, repeat exams are held in the courses of both semesters (winter and spring). Since the academic year 2016-17, the implementation of optional intermediate preliminary exams has been included in the program of each semester during which there are no classes. For the examination periods of the current academic year consult the Academic Calendar. The student's grade in each course is determined by the teacher, who

may at his/her discretion organize written and/or oral exams and/or base the student's performance on theoretical or laboratory exercises during the semester.

The exam schedule for each semester is determined by decisions of the Department and its start date is announced at least one month before the start of each exam period. For courses that are divided into two sections of student groups (according to ending even or odd registration number), and when joint exams are not foreseen, the student is examined exclusively in the section that corresponds to his ending registration number. In these courses, the teachers alternate every year between the two groups.

If the student fails more than three times in a course, after filling a relative application, and with the decision of the School's Dean, he is examined by a three-member committee of Professors of the Faculty who have the same or related subject and are appointed by the Dean. The teacher and person in charge of the exam are excluded from the committee.

Students who complete their first year of study having taken less than 3 courses are required to contact their Advisor.

During the exams, it is forbidden to copy or chat or in any way collaborate between students as well as the possession of any unauthorized material (eg notes, notebooks, solutions to exercises). The use of mobile phones or portable electronic devices (eg ipads, tablets, laptops) for any purpose (including use as a calculator or watch) is also prohibited. Students who do not respect the rules for conducting examinations, in addition to the immediate nullification of the written paper, may be subject to sanctions that include the suspension of student status for one or more semesters.

Maximum Number of Courses - Degree Grade

In order to obtain a degree, the student must attend the courses offered by the Department for at least eight (8) semesters during which he must successfully attend a series of courses from which he must accumulate at least 240 ECTS credit units. For students who have been successfully examined in more courses, the elective courses with the highest contribution (ratio of grade to ECTS credit units) are considered in the degree grade. Of the remaining elective courses that were not included in the degree, a maximum of two may, upon request by the student, be listed in the analytical grade statement and the Diploma Supplement.

The degree grade is calculated as a fraction, with the numerator being the sum of the products of the grade received by each student in each course with the corresponding ECTS credit units and the denominator being the total number of ECTS credit units required to obtain a degree.

For students who have been successfully examined in courses that correspond to more than 240 ECTS credit units, the elective courses with the highest contribution (ratio of grade to ECTS credit units) and up to 240 or the nearest next integer which replaces the denominator

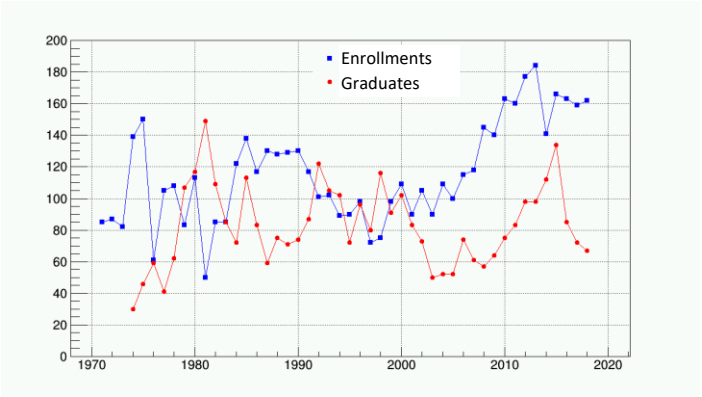
are included in the degree grade of the above fraction. In case the student has taken part in an Internship, the credit units corresponding to it are subtracted from the denominator of the fraction as there is no corresponding grade for Internship.

The degree is calculated with an accuracy of two decimal places.

CUMULATIVE DATA OF THE PHYSICS DEPARTMENT'S GRADUATES DEGREE GRADES

Academic years	Quantity	Average	A (>90%)	B (90%-65%)	C (65%-35%)	D (35%-10%)	E (<10%)
2013/14 - 2017/18	470	6.30	7.27 - 10.00	6.39 - 7.26	5.96 - 6.38	5.66 - 5.95	5.00 - 5.65
2012/13 - 2016/17	501	6.33	7.20 - 10.00	6.41 - 7.19	5.97 - 6.40	5.66 - 5.96	5.00 - 5.65
2010/11 - 2014/15	500	6.30	7.12 - 10.00	6.40 - 7.11	5.99 - 6.39	5.73 - 5.98	5.00 - 5.72
2009/10 - 2013/14	441	6.31	7.07 - 10.00	6.42 - 7.06	6.02 - 6.41	5.76 - 6.01	5.00 - 5.75
2008/09 - 2012/13	408	6.33	7.04 - 10.00	6.43 - 7.03	6.04 - 6.42	5.77 - 6.03	5.00 - 5.76
2007/08 - 2011/12	375	6.31	7.01 - 10.00	6.41 - 7.00	6.05 - 6.40	5.78 - 6.04	5.00 - 5.77
2006/07 - 2010/11	367	6.32	6.95 - 10.00	6.39 - 6.94	6.06 - 6.38	5.77 - 6.05	5.00 - 5.76
2005/06 - 2009/10	324	6.31	6.92 - 10.00	6.37 - 6.91	6.06 - 6.36	5.77 - 6.05	5.00 - 5.76
2004/05 - 2008/09	299	6.30	6.83 - 10.00	6.35 - 6.82	6.06 - 6.34	5.77 - 6.05	5.00 - 5.76
2003/04 - 2007/08	295	6.28	6.77 - 10.00	6.32 - 6.76	6.05 - 6.31	5.77 - 6.04	5.00 - 5.76
2002/03 - 2006/07	310	6.31	7.00 - 10.00	6.36 - 6.99	6.06 - 6.35	5.72 - 6.05	5.00 - 5.71
2001/02 - 2005/06	313	6.23	6.89 - 10.00	6.31 - 6.88	5.97 - 6.30	5.64 - 5.96	5.00 - 5.63
2000/01 - 2004/05	369	6.23	6.94 - 10.00	6.31 - 6.93	5.94 - 6.30	5.64 - 5.93	5.00 - 5.63
1999/00 - 2003/04	411	6.19	6.94 - 10.00	6.29 - 6.93	5.88 - 6.28	5.59 - 5.87	5.00 - 5.58
1998/99 - 2002/03	464	6.16	6.93 - 10.00	6.26 - 6.92	5.83 - 6.25	5.54 - 5.82	5.00 - 5.53
1997/98 - 2001/02	452	6.09	6.71 - 10.00	6.20 - 6.70	5.79 - 6.19	5.53 - 5.78	5.00 - 5.52
1996/97 - 2000/01	472	6.10	6.74 - 10.00	6.20 - 6.73	5.80 - 6.19	5.54 - 5.79	5.00 - 5.53
1995/96 - 1999/00	445	6.07	6.72 - 10.00	6.18 - 6.71	5.78 - 6.17	5.52 - 5.77	5.00 - 5.51
1994/95 - 1998/99	454	6.07	6.65 - 10.00	6.15 - 6.64	5.83 - 6.14	5.54 - 5.82	5.00 - 5.53
1993/94 - 1997/98	417	6.08	6.65 - 10.00	6.15 - 6.64	5.86 - 6.14	5.55 - 5.85	5.00 - 5.54
1992/93 - 1996/97	339	6.10	6.70 - 10.00	6.15 - 6.69	5.89 - 6.14	5.56 - 5.88	5.00 - 5.55

A, B, C, D, and E correspond to the ECTS grading scale, which is defined within the framework of the European Credit Transfer and Accumulation System



Number of enrolled students and graduates per academic year.

Grades correspondence to the ECTS grading scale

Grades Area	Quantity	Percentage (%)	ECTS rating
7.28 – 10.0	38	10,19	A
6.49 - 7.27	94	25.47	B
6.04 - 6.48	110	29.49	C
5.68 - 6.03	92	25.66	D
5.00 - 5.67	38	10,19	E

Based on the analysis of the degree grades corresponding to a five-year period of the academic years from 2015-16 to 2019-20 (total quantity of 372).

Foreign language

The Foreign Language course is included in the elective courses. The student chooses one of the foreign languages offered by the Department (English/French/German). This is a one semester course since its main goal is for the student to learn the terminology of Physics in a Foreign Language.

Diploma Thesis

Students who are at least in the 7th semester of studies and have been successfully examined, up to the last examination before the course is declared, in courses that correspond to at least 120 ECTS credit units, can choose the "Diploma Thesis" course which

is annual (declared at the beginning of the academic year) and corresponds to 10 ECTS credits.

The student can elaborate a "Diploma Thesis" with a Supervisor from another Department of the University after approval by the General Assembly of the Department.

Internship

From the 6th semester, students can be employed for a certain period in Greek or international public and private sector organizations and companies (e.g. electrical power and telecommunication companies, technology and education-related businesses in Greece and in various research bodies, organizations, companies and businesses abroad), with the aim of their practical training and specialization in subjects related to the subject of Physics. This is done in the context of the Internship (Practical Exercise), an activity established by the decision of the General Assembly of the Department number 462/22-02-2016. Internships in Greek organizations are supported by the National Strategic Reference Framework (NSRF-ΕΣΠΑ) program, while in foreign organizations by the Erasmus+ (placement) program.

The Internship is an opportunity for the students of the Department of Physics to work, for a short period of time, in a real work environment. It enables students to transfer their scientific knowledge to real situations. It allows them to try a possible future career field and explore their career interests. Another possibility is to meet and network with agencies or Research Institutes and their staff. Ultimately, the Internship can help them get their careers off to a smooth start.

- **Internship in Greece**

Within the framework of the NSRF program, the available positions per academic period are announced by the Internship Office of the University of Ioannina and their announcement proceeds (usually in November). Indicatively, for the 2019-20 academic year, they were forty-three positions available. Students who, during the academic year of submission, are in their 3rd or higher year of studies have the right to submit an application for an internship. In addition, they are required to have passed at least 50% of the courses of the first two years of the study program. Eligible periods as well as instructions for finding a company/structure for employment are given by the Internship Office and the International Relations office as well as by the responsible Physics Department faculty members for the Internship. The supporting documents required for the Internship application are those mentioned in the respective notice for Internship.

Students with a disability (SwD), who suffer from serious illnesses, as defined in the legislation for admission to higher education (as shown by the data kept in the accessibility unit and/or the Registry's file) occupy 5% of the intended internship positions of the Department, provided that they show a corresponding Health Committee Certificate when submitting their application, in accordance with the currently applicable disability certification system, which is in force during the year of application submission. In the event that the number of applications is greater than the number of positions corresponding to the

percentage of 5%, the evaluation among the candidates of the special category is carried out based on the measurable criteria defined by the Department's Regulations. Finally, in the event that the number of special category applications is less than the prescribed positions, these can be filled by general category candidates and vice versa.

For the students who are selected for an Internship in Greece (NSRF-ΕΣΠΑ program), the search and finding of the institution carrying out the Internship is their sole responsibility. The Internship Office (http://gpa.uoi.gr) and the Internship responsible faculty member of the Physics Department (Associate Professor Emmanuel Benis) are at their disposal with a series of activities and personal contacts to help them in their choice.

After their selection for an Internship in Greece, a suitable faculty member is designated as a supervising Professor, who monitors them and cooperates with them and with the Internship Implementation Agency. After the end of the Internship, the student, in collaboration with the supervisor, submits a report accompanied by a relevant certificate from the organization. The report is evaluated by the Board of Directors of the Department. In the event of a positive evaluation, the student is granted 3 ECTS credits, which count towards the 240 required to obtain a degree without a corresponding grade.

- **Internship abroad**

In the context of the Erasmus+ (placement) program, the International Relations Office of the University of Ioannina advertises Internship positions abroad per academic term (usually, but not bindingly, during the April-May period and indicatively for approximately 15 positions for the Department). Students who, during the academic year of submission, are in the 4th or higher semester of their studies have the right to submit an application for such an internship. In addition, a necessary condition is that they have been successfully examined in 75% of the courses of the first three semesters of the study program. The eligible periods, as well as the instructions for searching and finding a host for employment are given by the International Relations Office, as well as by the Erasmus+ responsible faculty member of the Department of Physics (Professor Nikolaos Hadjianastasiou). The search and finding of the institution carrying out the Internship is done in time during the period before the submission of the application (indicatively from January to March in the case of submitting the application in April) by the students themselves, in collaboration with the responsible faculty member of the Department of Physics. Finding an organization abroad and receiving an official letter of acceptance from it, in which the title and duration of the Internship are mentioned, is a necessary document to be submitted along with the relative application. The remaining supporting documents required for the Internship application are those mentioned in the respective announcement for participation in student mobility for the purpose of the Erasmus+ Internship. Additionally, the following are also required for the Erasmus+ internship: 1. A short curriculum vitae and 2. A cover letter of interest addressed to the Department, in which the reasons for participating in the Internship are documented. It is pointed out that it is possible to carry out an Erasmus+ Internship abroad for students who have graduated, provided that their application has been submitted and approved before receiving their degree.

After the selection of the students for Internship abroad, within the framework of the Erasmus+ program, a supervisor is appointed by the host institution, who monitors and cooperates with them during their Internship. After the end of the Erasmus+ Internship, the supervisor of the Internship submits a progress report accompanied by a relevant certificate from the organization for the completion of the Internship. This report is evaluated by the Department's Erasmus+ Internship responsible faculty member (Professor Nikolaos Hadjianastasiou), who recommends to the Department the recognition of the Internship. The final evaluation and recognition of the Internship is done by the Board of Directors of the Department. In the event of a positive evaluation, the student is awarded 3 ECTS credits, which count towards the 240 required to obtain a degree without a corresponding grade.

- **Ranking criteria for student candidates for Internship**

The ranking criteria for students applied for internships in Greece and abroad are as follows:

K1 : Current grade point average (specific criterion weight: 0.3).

K2 : Regularity of attendance, defined as the ratio of the sum of ECTS credits of the courses in which the student has been successfully examined to the sum of ECTS credits of the courses in which the student should have been successfully examined if the student had attended completely regularly, based on the semester of studies in which the student is (specific weight of criterion: 0.4).

K3 : Degree of completion of the study program, defined as the quotient of the sum of ECTS credits of the courses in which the student has been successfully examined to the total of the ECTS credits of the undergraduate study program required to obtain a degree (specific criterion weight: 0.3).

The calculation of evaluation points ($M \in [0,10]$) for the selection of students (algorithm) is as follows:

$$M = K1 \times 0.3 + K2 \times 10 \times 0.4 + K3 \times 10 \times 0.3$$

In the event of a tie during the evaluation, the students are selected by lottery. The draw is made by three regular members in the presence of students with equal grades.

Pedagogical and Teaching Sufficiency

For students who are enrolled in the academic year 2023-2024, the determination of the relevant procedure is expected to be determined by the Ministry of Education.

The Study Guide will be updated as soon as the relevant decisions are made.

Credit units

Of the total 240 ECTS credits, 178 must come from the Department's Compulsory Core Courses (Category A), at least 20 must come from the elective courses of the General Directions (Category B) and the remaining 42 from a combination of elective courses of the

Categories B and C and D and/or the elaboration of a Diploma Thesis and/or Internship. Compulsory Core courses include one of two courses with Codes 405 (Environmental Physics) and 408 (Introduction to Astrophysics [2]).

In the event that an elective course is registered by less than 8 students, the course is offered to the students only if there is relevant capability to be fulfilled according to decision made from the respective Section.

Diploma Appendix

With the decision of the General Assembly number 439/2-6-2014 and according to Φ5/72535/Β3 Official Gazette: 1091/10-8-2006 ΤΒ, the Department grants students a Diploma Supplement.

[2] In the event that the number of students who have registered for these courses exceeds 2/3, an order of registration priority is applied. Those who are excluded can take the course they wish as an elective course.

Course categories

During their studies, the students attend courses which are divided into the following categories:

Category A: Compulsory Core Courses

In this category belong 26 compulsory core courses which are also the most basic courses of the Department from which the students must collect 178 ECTS credits. These courses are offered by the Department every academic year either in the winter or spring semester. Students must successfully complete 26 of these courses (choosing one of two courses: Environmental Physics or Introduction to Astrophysics).

Category B: Elective courses - General Directions

This category includes 13 elective courses from which students must choose at least four during their studies that correspond to at least 20 credits. In the above four courses, the course selected as compulsory from the courses Environmental Physics / Introduction to Astrophysics is not counted.

Category C: Elective Courses - Special Topics in Physics

The elective courses concerning Special subjects of Physics belong in this category, which correspond to 4 ECTS credits.

Category D: Elective courses - Various subjects

This category includes elective courses related to the cycle of Teaching Physics, courses which correspond to 3 credit units as well as courses from other Departments for which no credit units have been assigned.

Category E: Elective courses – Diploma Thesis

Students who are at least in the 7th semester of their studies and have been successfully examined, up to the last examination before the declaration of the course, in courses that correspond to at least 120 ECTS credit units, can choose the course "Diploma Thesis" which is annual and corresponds to 10 ECTS credits.

Category F: Elective courses - Internship (http://www.physics.uoi.gr/el/node/52)

From their 3rd year of their studies, the students can be employed for a certain period (2 months in Greece and up to 4 months abroad) in Greek or international organizations and companies of the public and private sector, with the aim of practical training and specialization in subjects related to the subject of Physics. In case of a positive evaluation, the student is granted 3 ECTS credits. These units are counted towards the 240 required to obtain a degree, but without a corresponding grade.

“Erasmus +” mobility program (http://www.physics.uoi.gr/el/node/156)

Within the framework of the "Erasmus+" program, it is possible to carry out a period of study (up to two academic semesters) abroad (in Universities of specific countries with which the

Department has bilateral agreements and can be seen in a relevant list posted on the Department's website), with recognition of the courses, which are agreed after the acceptance of their candidacy and before the departure of the students to the University abroad, in which the male and female students are successfully examined. Their participation in the specific program is possible by submitting their application (usually in the period of April-May of each year), accompanied by supporting documents specified in the relevant announcement and its subsequent evaluation by the Board of Directors of the Department. Among the required supporting documents, it is important to draw up and submit a Learning Agreement between the Department and the body (University) abroad, in which a study program abroad (with 30 ECTS credits) is drawn up, which includes courses that correspond to courses of the Department. Upon completion of the period of study abroad, a certificate of the student's study period is submitted by the University abroad, as well as a detailed formal analytical list of grades for the courses taken during the semester(s) of their studies. Based on these, the Erasmus+ responsible faculty member of the Department (Professor Nikolaos Hadjianastasiou) submits to the Department a proposal for recognition of the courses which the students have passed the relative exams abroad and finally the Board of Directors of the Department decides on the recognition of the period of study abroad and the ascription of the ECTS credits of the courses included in the agreement. Information about the whole process and the preparation of the application is provided by the responsible faculty member of the Department of Physics for the Erasmus+ program (Professor Nikolaos Hadjianastasiou).

List of courses that may be taught in English

Undergraduate Courses

s/n	Code	Title in Greek	Title in English	Semester	Core/Elective
1	23	Εργαστήρια Μηχανικής	Laboratory Courses in Mechanics	2	Core
2	25	Γλώσσες Προγραμματισμού Η/Υ	Programming Languages	2	Core
3	53	Αναλογικά Ηλεκτρονικά	Analog Electronics	5	Core
4	103	Στοιχειώδη Σωμάτια	Elementary Particles	7	Elective
5	104	Εισαγωγή στη Θεωρία Πεδίου	Introduction to Field Theory	7	Elective
6	105	Κοσμολογία	Cosmology	6, 8	Elective
7	106	Βαρύτητα και Γενική Θεωρία Σχετικότητας	Gravity and General Theory of Relativity	7	Elective
8	108	Διαφορική Γεωμετρία	Differential Geometry	6, 8	Elective
9	110	Κβαντική Θεωρία Πληροφορίας	Quantum Theory of Information	6, 8	Elective
10	201	Ατομική Φυσική και Lasers	Atomic Physics and Lasers	7	Elective
11	209	Εργαστήρια Νεότερης Φυσικής	Laboratory Courses in Modern Physics	6, 8	Elective
12	212	Δομικός και Χημικός Χαρακτηρισμός Υλικών	Structural and Chemical Characterization of Materials	6, 8	Elective
13	218	Πολυμερικά Στερεά	Polymer Solids	7	Elective
14	220	Βιοφυσική	Biophysics	7	Elective

15	402	Φυσική της Ατμόσφαιρας	Physics of the Atmosphere	6, 8	Elective
16	404	Μηχανική Ρευστών	Fluid Mechanics	6, 8	Elective
17	406	Φυσική Κλιματολογία	Physical Climatology	7	Elective
18	508	Μαγνητισμός και Μαγνητικά Υλικά	Magnetism and Magnetic Materials	8	Elective
19	701	Διπλωματική Εργασία	Diploma Thesis	7	Elective
20	702	Πρακτική Άσκηση	Internship	6, 7, 8	Elective

Graduate Courses (Msc Program in Theoretical and Experimental Physics)

s/n	Code	Title in Greek	Title in English	Semester	Core/Elective
1	M122	Βαρύτητα, Κοσμολογία	Gravity and Cosmology	2	Elective
2	M121	Μαθηματικές Μέθοδοι Φυσικής	Mathematical Methods in Physics	2	Elective
3	M127	Φυσική Υψηλών Ενεργειών	High Energy Physics	2	Elective

Transitional provisions

- The maximum number in the declaration of courses (eight) applies to all students regardless of the academic year of admission to the Department of Physics.
- The calculation of the degree grade according to the credits system applies to students enrolled from the 2010-11 academic year onwards. For students with admissions in previous academic years, the calculation method of the degree grade indicated in the respective Study Guide is applied.
- The current allocation of credits per course as well as the requirement for a minimum of 20 credits from elective General Directions courses (Category B) applies to students enrolled from the 2010-11 academic year onwards.

From the educational excursion of the students of the Department to the lignite mines of Ptolemais and the Steam-Electrical Power Station (ΑΗΣ) Kardias.

3. Student Care

Accommodation : Accommodation is available in the University's student residences, on the campus, as well as in rooms of the National Youth Foundation (EIN) Hostel on Peribleptos hill in Ioannina.

Lunching and Dining : Undergraduate and graduate students may take lunch and dinner in the University's Student Restaurant, which is located on campus on the ground floor of the Student Club building. It is fully equipped and operates from September 1st to June 30th, all days of the week, with a 14-day break at Christmas and Easter vacations respectively. It has the capacity to feed at least 4,000 students per day.

Medical Care : The students of the first, second and third cycle study programs of the Higher Educational Institutions (AEI) who do not have other medical, pharmaceutical and hospital care, are entitled to full medical, pharmaceutical and hospital care in the National Health System (ΕΣΥ) with coverage of the relevant costs by the National Organization for the Provision of Health Services (Ε.Ο.Π.Υ.Υ.), according to the corresponding legislation of article 33, Law 4368/2016 (A' 83). The more specific terms, conditions and procedure for the provision of medical care are determined by a joint decision of the Ministers of Finance, Education and Religious Affairs and Health.

Students can obtain more information from the link: https://www.uoi.gr/panepistimiaki-zoi/foititiki-merimna/

4. Sports

The University Gym offers a wide range of sports programs that cover the sporting interests of every student and are aimed at people with different needs, interests, abilities and levels, in the following areas:

- Organized sports activities – lessons (athletics, shooting, tennis, traditional dance, volleyball, beach-volley, etc.)
- Indoor leagues and tournaments (basketball 5X5 & 3X3, futsal, 11X11 football, table tennis)
- Recreational activities (hiking, skiing)
- Fitness programs (running for everyone, running, cross fit, exercise for everyone - use of University Gym equipment and exercise programs)
- Competitive sports (Panhellenic Student Championships)

5. Academic ID

The student receives an Academic Identity Card (pass), after submitting an electronic application on the website : http://paso.minedu.gov.gr , which is checked and validated by the Department's Secretariat. In case of loss of the Academic ID, the student should immediately submit a relevant Declaration to the Secretariat of the Department. In case of suspension of studies, the student is obliged to submit the Academic ID to the Secretariat.

6. Seminars

The institution of Physics Seminars is one of the oldest in our Department. The institution is implemented by inviting researchers from Research Centers and Universities in Greece and abroad who present a lecture on a topic of their choice. The topic of the lecture is usually within the guest's recent research activities.

The Seminars aim to inform the Department and supply it with new ideas. They are necessary to maintain the research strength of the Department. It is worth noting that the Latin word seminarium, from which the term seminar comes, originally meant "nursery". Indeed, the seminar should act as a nursery of ideas. In order for the institution of seminars to function effectively, similar resources are necessary, especially for the University of Ioannina, which is located in a geographically isolated position. However, the success of the Department's seminars is not only a matter of resources, but also requires proper planning and some alertness to attract speakers.

The Physics Seminars are addressed both to faculty members and students. It is worth noting that those seminars that attract a large audience of students are considered successful. This of course depends a lot on the topic of the lecture. For the above reasons, it has been sought to establish Speeches that aim to reach a wider audience, mainly students. At the same time, an effort has been made to always have a "general" part even in the specialized speeches. Here too, planning and financing play a very important role. The number of such general lectures cannot be high, and should be sought to be given by highly experienced researchers and teachers mainly from other domestic and foreign universities.

The program of Physics Seminars is announced on the website of the Department: www.physics.uoi.gr/el/node/46 .

7. Studies Program Overview

Core courses are assigned a 2-digit code number where the 1st digit corresponds to the teaching semester, while elective courses are assigned a 3-digit code number where the 1st digit corresponds to the course field. The course category and the ECTS credits are given in parentheses.

CORE COURSES			
1st SEMESTER	3rd SEMESTER	5th SEMESTER	7th SEMESTER
11. MECHANICS (A-8) 12. DIFFERENTIAL AND INTEGRAL CALCULUS (A-8) 13. LINEAR ALGEBRA AND ELEMENTS OF ANALYTICAL GEOMETRY (A-7) 14. PROBABILITY, STATISTICS AND ELECTRONIC COMPUTERS (A-7)	31. WAVE PHYSICS (A-6) 32. MODERN PHYSICS I (A-6) 33. CLASSICAL MECHANICS I (A-6) 34. COMPLEX NUMBERS CALCULUS AND INTEGRAL TRANSFORMATIONS (A-6) 35. LABORATORY COURSES IN ELECTROMAGNETISM (A-6)	51. QUANTUM THEORY I (A-8) 53. ANALOG ELECTRONICS (A-7) 54. GENERAL CHEMISTRY (A-5) · ONE (1) OF THE FOLLOWING: 405. ENVIRONMENTAL PHYSICS (A-6) 408. INTRODUCTION TO ASTROPHYSICS (A-6) · ELECTIVE COURSES CORRESPONDING TO AT LEAST 4 ECTS CREDITS	71. STATISTICAL PHYSICS (A-8) 72. SOLID STATE PHYSICS I (A-8) · ELECTIVE COURSES OR/AND A DIPLOMA THESIS CORRESPONDING TO AT LEAST 14 ECTS CREDITS
2nd SEMESTER	4th SEMESTER	6th SEMESTER	8th SEMESTER
21. ELECTROMAGNETISM (A-8) 23. LABORATORY COURSES IN MECHANICS (A-7) 24. VECTOR CALCULUS (A-8) 25. PROGRAMMING LANGUAGES (A-7)	41. THERMODYNAMICS AND LABORATORIES IN HEAT (A-6) 42. MODERN PHYSICS II (A-6) 43. CLASSICAL MECHANICS II (A-6) 44. LABORATORY COURSES IN WAVE PHYSICS AND OPTICS (A-6) 45. DIFFERENTIAL EQUATIONS (A-6)	61. QUANTUM THEORY II (A-8) 62. CLASSICAL ELECTRODYNAMICS I (A-8) · ELECTIVE COURSES CORRESPONDING TO AT LEAST 14 ECTS CREDITS	· ELECTIVE COURSES OR/AND A DISSERTATION CORRESPONDING TO AT LEAST 30 ECTS CREDITS

ELECTIVE COURSES		
I. FIELD OF THEORETICAL PHYSICS	**II. FIELD OF EXPERIMENTAL AND APPLIED PHYSICS**	**III. FIELD OF DIDACTICS IN PHYSICS**
103. ELEMENTARY PARTICLES (B-5) 104. INTRODUCTION TO FIELD THEORY (B-5) 105. COSMOLOGY (B-5) 106. GRAVITY AND GENERAL THEORY OF RELATIVITY (C-4) 108. DIFFERENTIAL GEOMETRY (C-4) 109. COMPUTATIONAL METHODS IN PHYSICS (C-4) 110. QUANTUM THEORY OF INFORMATION (C-4) 111. PLASMA PHYSICS (B-5) 112. MATHEMATICS FOR PHYSICISTS (C-4) 113. MATHEMATICS AND PHYSICS WITH COMPUTERS (C-4) 114. CLASSICAL ELECTRODYNAMICS II (B-5)	201. ATOMIC PHYSICS AND LASERS (B-5) 202. MOLECULAR PHYSICS (B-5) 203. INTRODUCTION TO NUCLEAR PHYSICS (B-5) 204. NUCLEAR PHYSICS AND TECHNOLOGY (C-4) 205. SOLID STATE PHYSICS II (B-5) 209. LABORATORY COURSES IN MODERN PHYSICS (B-6) 211. MATERIALS SCIENCE (B-5) 212. STRUCTURAL AND CHEMICAL CHARACTERIZATION OF MATERIALS (C-4) 215. PHYSICAL CHEMISTRY (C-4) 218. POLYMER SOLIDS (C-4) 219. MEDICAL PHYSICS-RADIOPHYSICS (C-4) 220. BIOPHYSICS (D-3)	301. HISTORY AND PHILOSOPHY OF PHYSICAL SCIENCES (D-4) 304. DIDACTICS OF PHYSICAL SCIENCES (D-4) 305. CONCEPTUAL PHYSICS AND TEACHING EXPERIENCE IN PHYSICS EDUCATION (D-5) 306. INTRODUCTION TO PEDAGOGICS (D-4) 307. DIDACTIC METHODOLOGY (D-4) 308. NEW TECHNOLOGIES IN THE TEACHING OF PHYSICAL SCIENCES (D-4) 309. EDUCATIONAL PSYCHOLOGY (D-4) 310. EDUCATIONAL SOCIOLOGY (D-4)

ELECTIVE COURSES		
IV. FIELD OF ENVIRONMENTAL, ATMOSPHERIC AND SPACE PHYSICS	**V. FIELD OF NEW TECHNOLOGIES**	**COURSES WHICH BELONG TO ALL FIELDS OF STUDIES**
401. GENERAL METEOROLOGY (B-5) 402. PHYSICS OF THE ATMOSPHERE (C-4) 403. DYNAMICAL METEOROLOGY (C-4) 404. FLUID MECHANICS (C-4) 405. ENVIRONMENTAL PHYSICS (B-6) 406. PHYSICAL CLIMATOLOGY (C-4) 408. INTRODUCTION TO ASTROPHYSICS (B-6) 409. SPACE WEATHER (C-4) 410. GALAXIES AND COSMOLOGY (C-4) 411. OBSERVATIONAL ASTROPHYSICS (C-4) 413. SOLAR PHYSICS (C-4)	502. DIGITAL ELECTRONICS (C-4) 504. INTRODUCTION TO DIGITAL TELECOMMUNICATIONS (C-4) 506. OBJECT-ORIENTED PROGRAMMING LANGUAGES (C-4) 508. MAGNETISM AND MAGNETIC MATERIALS (C-4) 509. MEASUREMENTS AND AUTOMATICS USING ELECTRONIC COMPUTERS (C-4) 510. MODERN PROGRAMMABLE ELECTRONICS (C-4)	601. COURSE FROM ANOTHER DEPARTMENT 602. COURSE FROM ANOTHER DEPARTMENT 701. DIPLOMA THESIS (E-10) 702. INTERNSHIP (F-3) 703. FOREIGN LANGUAGE (C-4)

8. Teaching Timetable

ΠΑΝΕΠΙΣΤΗΜΙΟ ΙΩΑΝΝΙΝΩΝ - ΤΜΗΜΑ ΦΥΣΙΚΗΣ

ΠΡΟΓΡΑΜΜΑ ΔΙΔΑΣΚΑΛΙΑΣ ΧΕΙΜΕΡΙΝΟΥ ΕΞΑΜΗΝΟΥ 2023-24

	ΑΙΘΟΥΣΑ - ΩΡΕΣ	09-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20
ΔΕΥΤΕΡΑ	Αμφ 4	M	M	M	M	M		12		14Θ (Η/Υ)		
	Φ3 005-007	Αναπλήρωση Μαθημάτων Α&Β εξαμ.		Γ&Δ εξαμ.		405						
	Φ3 010-013	Αναπλήρωση Μαθημάτων Α&Β εξαμ.		Γ&Δ εξαμ.				33Π		31		
	Φ3 015-018			X	X			33Α				
	Φ2 120	X	X								406	
	Φ2 122											
	Φ2 119											
	Φ2 121	ΠΜΣ ΦΥΣ	ΠΜΣ ΦΥΣ	ΠΜΣ ΦΥΣ	ΠΜΣ ΦΥΣ	ΠΜΣ ΦΥΣ						
	Εργ. Αν. Φ2-131									53		
	Εργ. Η/Υ Φ2-136											
	Εργ. ΗΜ Φ2-230											
ΤΡΙΤΗ	Αμφ 4	72Α		34				52		51		
	Φ3 005-007	32		11								
	Φ3 010-013			53Θ								
	Φ3 015-018											
	Φ2 120	408										
	Φ2 122	72Π										
	Φ2 119											
	Φ2 121	ΠΜΣ ΦΥΣ	ΠΜΣ ΦΥΣ	ΠΜΣ ΦΥΣ	ΠΜΣ ΦΥΣ	ΠΜΣ ΦΥΣ						
	Εργ. Αν. Φ2-131											
	Εργ. Η/Υ Φ2-136			506		506		14 (Η/Υ)		14 (Η/Υ)		
	Εργ. ΗΜ Φ2-230							35				
	ΑΙΘΟΥΣΑ - ΩΡΕΣ	09-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20
ΤΕΤΑΡΤΗ	Αμφ 4	13		14Θ								
	Φ3 005-007			54		405						
	Φ3 010-013	31		33Π				305				
	Φ3 015-018	71		33Α								
	Φ2 120					203						
	Φ2 122									201		
	Φ2 119											
	Φ2 121	ΠΜΣ ΦΥΣ	ΠΜΣ ΦΥΣ	ΠΜΣ ΦΥΣ	ΠΜΣ ΦΥΣ	ΠΜΣ ΦΥΣ						
	Εργ. Αν. Φ2-131									53		
	Εργ. Η/Υ Φ2-136							14 (Η/Υ)		14 (Η/Υ)		
	Εργ. ΗΜ Φ2-230							35				
	Εργ. ΝΦ Φ2-237							209				
ΠΕΜΠΤΗ	Αμφ 4	12			51			M	M	M	M	M
	Φ3 005-007	34		32				11				
	Φ3 010-013	52						72Α				
	Φ3 015-018											
	Φ2 120					X		408				
	Φ2 122							72Π		201		
	Φ2 119											
	Φ2 121	ΠΜΣ ΦΥΣ	ΠΜΣ ΦΥΣ	ΠΜΣ ΦΥΣ	ΠΜΣ ΦΥΣ	ΠΜΣ ΦΥΣ				510		
	Εργ. Αν. Φ2-131									53		
	Εργ. Η/Υ Φ2-136				14 (Η/Υ)					14 (Η/Υ)		
	Εργ. ΗΜ Φ2-230							35				
	ΑΙΘΟΥΣΑ - ΩΡΕΣ	09-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20
ΠΑΡΑΣΚΕΥΗ	Αμφ 4	13										
	Φ3 005-007	54		53Θ		35Θ						
	Φ3 010-013			71				305				
	Φ3 015-018											
	Φ2 120	203		406								
	Φ2 122											
	Φ2 119											
	Φ2 121	ΠΜΣ ΦΥΣ	ΠΜΣ ΦΥΣ	ΠΜΣ ΦΥΣ	ΠΜΣ ΦΥΣ	ΠΜΣ ΦΥΣ						
	Εργ. Αν. Φ2-131			53								
	Εργ. Η/Υ Φ2-136							14 (Η/Υ)				
	Εργ. ΗΜ Φ2-230							35				

Μαθήματα Κορμού

ΕΤΟΣ Α' ΕΞΑΜΗΝΟ 1ο	11	Μηχανική
	12	Διαφορικός και Ολοκληρωτικός Λογισμός
	13	Γραμμική Άλγεβρα και Στοιχεία Αναλυτικής Γεωμετρίας
	14	Πιθανότητες, Στατιστική και Ηλεκτρονικοί Υπολογιστές
ΕΤΟΣ Β' ΕΞΑΜΗΝΟ 3ο	31	Κυμάνσεις
	32	Σύγχρονη Φυσική Ι
	33	Κλασική Μηχανική Ι
	34	Μιγαδικός Λογισμός & Ολοκληρωτικοί Μετασχηματισμοί
	35	Εργαστήρια Ηλεκτρισμού και Μαγνητισμού
ΕΤΟΣ Γ' ΕΞΑΜΗΝΟ 5ο	51	Κβαντική Θεωρία Ι
	52	Κλασική Ηλεκτροδυναμική Ι
	53	Αναλογικά Ηλεκτρονικά
	54	Γενική Χημεία
	405	Φυσική Περιβάλλοντος
	408	Εισαγωγή στην Ιατροφυσική
ΕΤΟΣ Δ' ΕΞΑΜΗΝΟ 7ο	71	Στατιστική Φυσική Ι
	72	Φυσική Στερεάς Κατάστασης Ι

Μαθήματα Επιλογής

ΜΑΘΗΜΑΤΑ ΕΠΙΛΟΓΗΣ ΕΞΑΜΗΝΟ 7ο	201	Ατομική Φυσική και LASERS
	203	Εισαγωγή στην Πυρηνική Φυσική
	209	Εργαστήρια Νεότερης Φυσικής
	305	Οι Έννοιες της Φυσικής και Πρακτική Άσκηση στην
	406	Φυσική Κλιματολογία
	506	Αντικειμενοστραφείς Γλώσσες Προγραμ. C++
	510	Σύγχρονα Προγραμματιζόμενα Ηλεκτρονικά

Α: Τμήμα Αρτίων, **Π:** Τμήμα Περιττών, **Θ:** Θεωρία, **Ε:** Εργαστήριο
Μ: Δέσμευση από Τμ. Μαθηματικών και **Χ:** από Τμ. Χημείας

Οι ώρες διδασκαλίας των μαθημάτων επιλογής που δεν εμφανίζονται στο παρόν πρόγραμμα θα καθοριστούν κατόπιν συνεννόησης με τους διδάσκοντες
(Παρακαλούνται οι διδάσκοντες να ενημερώσουν τον Β. Χρηστομάλακη)

A: Even groups
Π: Odd groups according to the last digit of the registration number of the student

Additional teaching hours are noted with a star (*).

The teaching schedule of elective courses that do not appear in the program will be determined after consultation with the teachers.

The reservation of the teaching room by another Department (Mathematics-M, Chemistry-X) is marked in gray.

ΠΑΝΕΠΙΣΤΗΜΙΟ ΙΩΑΝΝΙΝΩΝ - ΤΜΗΜΑ ΦΥΣΙΚΗΣ
ΠΡΟΓΡΑΜΜΑ ΔΙΔΑΣΚΑΛΙΑΣ ΕΑΡΙΝΟΥ ΕΞΑΜΗΝΟΥ 2023-24

	ΑΙΘΟΥΣΑ - ΩΡΕΣ	09-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18	18-19	19-20
ΔΕΥΤΕΡΑ	Αμφ 4	M	M	M	M	M		24	24	24	43	43
	Φ3 005-007			44	44	41					401	401
	Φ3 010-013											
	Φ3 015-018								113	113		
	Φ2 120								212	212	111	111
	Φ2 122					215	215					
	Φ2 119											
	Φ2 121			504	504							
	Εργ. Μηχ. Φ2 134											
	Εργ. Η/Υ Φ2 136											
	Εργ.Κ&Ο Φ2 231											
	Εργ.Ψηφ. Φ2 137			502	502							
	ΚΕΝΤΡΟ ΞΕΝΩΝ ΓΛΩΣΣΩΝ ΑΙΘ. 222	22(Αγγλ)	22(Αγγλ)									
ΤΡΙΤΗ	Αμφ 4	M	M	M					61	61	62	62
	Φ3 005-007	41	41	41	21	21						
	Φ3 010-013				45	45						
	Φ3 015-018											
	Φ2 120		211	211					508	508		
	Φ2 122				502	502						
	Φ2 119											
	Φ2 121			204	204	404	404					
	Εργ.Θερ. Φ2 131								41Π	41Π		
	Εργ. Μηχ. Φ2 134	23	23	23								
	Εργ. Η/Υ Φ2 136								25	25	25	25
	Εργ.Κ&Ο Φ2 231							44Α	44Α	44Α	44Α	
	Εργ.Ψηφ. Φ2 137								502	502		
ΤΕΤΑΡΤΗ	Αμφ 3	43	43	M	M	M	M	M	M	M	M	M
	Αμφ 4	24	24									
	Φ3 005-007			42	42	42		304	304	304		
	Φ3 010-013	X	X									
	Φ3 015-018			113	113							
	Φ2 120			212	212	205	205				111	111
	Φ2 122	112	112	105	105						215	215
	Φ2 119											
	Φ2 121											
	Εργ. Θερ. Φ2 131								41Α	41Α		
	Εργ. Μηχ. Φ2 134											
	Εργ. Η/Υ Φ2 136								25	25	25	25
	Εργ.Η&Μ Φ2 230			509	509	509						
	Εργ.Κ&Ο Φ2 231							44Π	44Π	44Π	44Π	
	Εργ. ΝΦ Φ2 237							209	209	209	209	
ΠΕΜΠΤΗ	Αμφ 4	62	62	61	61							
	Φ3 005-007	41	41									
	Φ3 010-013			X	X							
	Φ3 015-018											
	Φ2 120	25 (Θ)	25 (Θ)			205	205					
	Φ2 122					105	105					
	Φ2 119									202	202	202
	Φ2 121					404	404	204	204			
	Εργ.Θερ. Φ2 131				41	41	41	41				
	Εργ. Μηχ. Φ2 134			23	23	23						
	Εργ. Η/Υ Φ2 136			25	25			504	504		25	25
	Εργ. Κ&Ο Φ2 231							44	44	44	44	
	Εργ.Ψηφ. Φ2 137			502	502						502	502
ΠΑΡΑΣΚΕΥΗ	Αμφ 4				23	23						
	Φ3 005-007	21	21	21	401	401						
	Φ3 010-013	42	42	45	45	45						
	Φ3 015-018											
	Φ2 120		508	508	211	211						
	Φ2 122							112	112			
	Φ2 119											
	Φ2 121											
	Εργ. Μηχ. Φ2 134											
	Εργ. Η/Υ Φ2 136											
	Εργ. Κ&Ο Φ2 231							44	44	44	44	
	Εργ. ΝΦ Φ2 237							209	209	209	209	
	ΚΕΝΤΡΟ ΞΕΝΩΝ ΓΛΩΣΣΩΝ ΑΙΘ. 222							22(Αγγλ)	22(Αγγλ)			

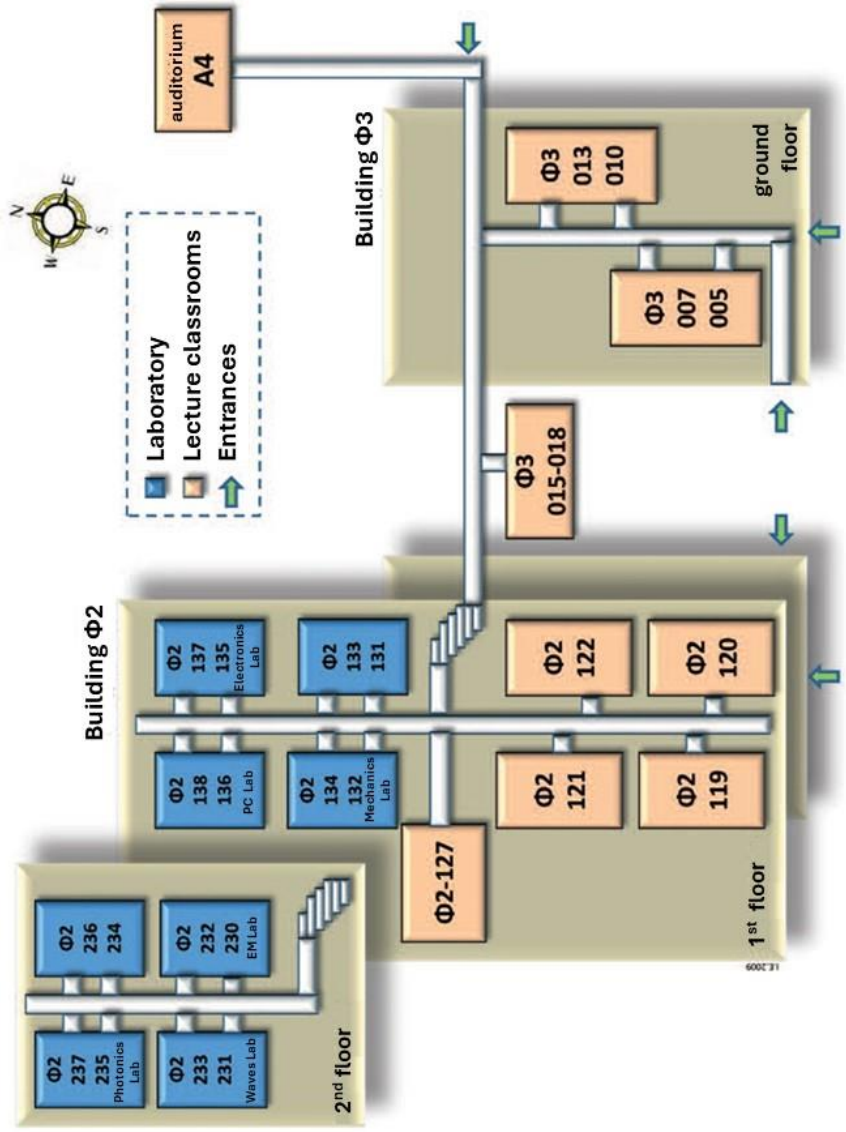
Α: Άρτιοι, **Π**:Περιττοί και **Μ**: δέσμευση από το Τμήμα Μαθηματικών, **Χ**: Τμήμα Χημείας

ΕΤΟΣ Α' ΕΞΑΜΗΝΟ 2ο	21	Ηλεκτρισμός και Μαγνητισμός
	22	Αγγλικά
	23	Εργαστήρια Μηχανικής
	24	Διανυσματικός Λογισμός
	25	Γλώσσες Προγραμματισμού Η/Υ
ΕΤΟΣ Β' ΕΞΑΜΗΝΟ 4ο	41	Θερμοδυναμική και Εργ. Θερμότητας
	42	Σύγχρονη Φυσική ΙΙ
	43	Κλασική Μηχανική ΙΙ
	44	Εργαστήρια Κυμάνσεων και Οπτικής
	45	Διαφορικές Εξισώσεις
ΕΤΟΣ Γ' ΕΞΑΜΗΝΟ 6ο	61	Κβαντική Θεωρία ΙΙ
	62	Κλασική Ηλεκτροδυναμική ΙΙ

Μαθήματα Επιλογής 6ου και 8ου εξαμήνου	105	Κοσμολογία
	111	Φυσική Πλάσματος
	112	Μαθηματικά για Φυσικούς
	113	Μαθηματικα για Φυσικούς με Η/Υ
	202	Μοριακή Φυσική
	204	Πυρηνική Φυσική και Τεχνολογία
	205	Φυσική Στερεάς Κατάστασης ΙΙ
	209	Εργαστήρια Νεότερης Φυσικής
	211	Επιστήμη των Υλικών
	212	Δομ.και Χημ. Χαρακτηρισμός των Υλικών
	215	Φυσικοχημεία
	304	Διδακτική των Φυσικών Επιστημών
	401	Γενική Μετεωρολογία
	404	Μηχανική των Ρευστών
	502	Ψηφιακά Ηλεκτρονικά
	504	Εισαγωγή στις Τηλεπικοινωνίες
	508	Μαγνητισμός και Μαγνητικά Υλικά
	509	Μετρήσεις και Αυτοματισμοί με Η/Υ

Το πρόγραμμα διδασκαλίας μαθημάτων επιλογής τα οποία δεν εμφανίζονται στο παρόν πρόγραμμα θα καθοριστεί μετά από συνεννόηση των φοιτητών με τους διδάσκοντες (Παρακαλούνται οι ***διδάσκοντες*** *να ενημερώσουν τον Β. Χριστοφιλάκη)*

9. Lecture and Laboratories Classrooms



Laboratory classrooms:

Φ2 131/133: Heat

Φ2 135/137: Modern Programmable Electronics

Φ2 230/232: Electromagnetism

Φ2 235/237: Photonics

Φ2 132/134: Mechanics

Φ2 136/138: Computers

Φ2 231/233: Wave Physics and Optics

10. Courses and Teaching Staff Catalogue

Semester	Code number	Course Title	Prerequisite Courses	Category	ECTS	Weekly hours	Teaching Staff
1	11	Mechanics		C	8	(4,1,0)	D. Vlachos
1	12	Differential and Integral Calculus		C	8	(3,2,0)	A. Nindos
1	13	Linear Algebra and Elements of Analytical Geometry		C	7	(4,1,0)	S. Patsourakos
1	14	Probability, Statistics and Electronic Computers		C	7	(3,0,2)	D. Vlachos (Theory), A. Douvalis (Theory), P. Papadopoulos (Lab), M. Tselepi (Lab), V. Christofilakis (Lab), A. Polymeros (EDIP) (Lab), C. Papachristodoulou (EDIP) (Lab), M. Markou (EDIP) (Lab)
2	21	Electromagnetism		C	8	(4,1,0)	Κ. Φουντάς, Ι. Παπαδόπουλος
2	23	Laboratory Courses in Mechanics		C	7	(1,0,3)	D. Vlachos, E. Evangelou, A. Bourlinos, M. Tselepi, P. Papadopoulos, A. Polymeros (EDIP), G. Baldoumas (EDIP), C. Papachristodoulou (EDIP), M. Markou (EDIP)
2	24	Vector Calculus		C	8	(3,1,0)	N. Bakas
2	25	Programming Languages		C	7	(2,0,2)	I. Papadopoulos, J. Strologas, E. Bletsas (EDIP)
3	31	Wave Physics		C	6	(4,1,0)	S. Cohen, J. Strologas
3	32	Modern Physics I		C	6	(4,1,0)	P. Kokkas, C. Kosmidis
3	33	Classical Mechanics I		C	6	(3,1,0)	P. Kanti, D. Gioutsos (EDIP)
3	34	Complex Numbers Calculus and Integral Transformations		C	6	(3,2,0)	A. Economou (EDIP)
3	35	Laboratory Courses in Electromagnetism	21	C	6	(1,0,3)	S. Kaziannis, A. Ikiades, N. Patronis, J. Strologas, E. Bletsas (EDIP), S. Danakas (EDIP), K. Stamoulis (EDIP)
4	41	Thermodynamics and Laboratories in Heat		C	6	(3,0,2)	D. Vlachos [Theory & Lab], M. Tselepi, P. Papadopoulod, A. Markou, A. Polymeros (EDIP), G. Baldoumas (EDIP), C. Papachristodoulou (EDIP), M. Markou (EDIP) [Labs]
4	42	Modern Physics II		C	6	(4,1,0)	P. Kokkas, E. Benis

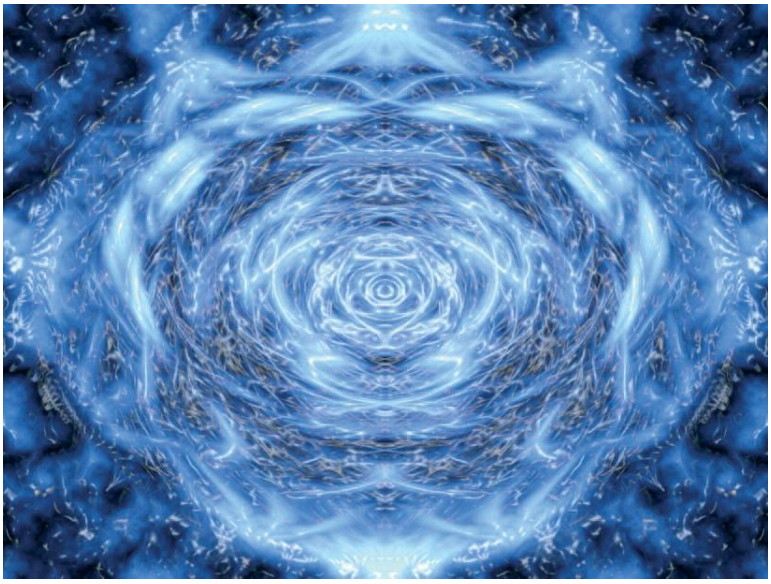
Semester	Code number	Course Title	Prerequisite Courses	Category	ECTS	Weekly hours	Teaching Staff
4	43	Classical Mechanics II		C	6	(3,1,0)	A. Dedes, I. Rizos
4	44	Laboratory Courses in Wave Physics and Optics		C	6	(1,0,4)	S. Cohen (coord.), S. Kaziannis, C. Kosmidis, E. Benis, A. Ikiadis, S. Danakas (EDIP), C. Papachristodoulou (EDIP), K. Stamoulis (EDIP)
4	45	Differential Equations		C	6	(3,2,0)	V. Archontis
5	51	Quantum Theory I		C	8	(3,1,0)	I. Florakis
5	53	Analog Electronics	21	C	7	(2,1,2)	E. Evangelou, D. Katsanos, A. Polymeros (EDIP), G. Baldoumas (EDIP)
5	54	General Chemistry		C	5	(3,1,0)	A. Bourlinos
5 (YE), 7 (E)	405	Environmental Physics		C/E	6	(3,1,0)	N. Chatzianastasiou, N. Bakas
5 (YE), 7 (E)	408	Introduction to Astrophysics		C/E	6	(3,1,0)	A. NIndos
6	61	Quantum Theory II		C	8	(3,1,0)	I. Rizos, D. Gioutsos (EDIP)
5	62	Classical Electrodynamics I	21	C	8	(3,1,0)	L. Perivolaropoulos
7	71	Statistical Physics		C	8	(3,1,0)	P. Kanti, A. Dedes
7	72	Solid State Physics I		C	8	(3,1,0)	A. Douvalis (o.), G. Floudas (e.)
7	103	Elementary Particles		E	5	(3,1,0)	C. Foudas
7	104	Introduction to Field Theory	51, 61	E	5	(3,1,0)	I. Rizos, D. Gioutsos (EDIP)
6, 8	105	Cosmology		E	5	(4,0,0)	L. Perivolaropoulos, P. Kanti
7	106	Gravity and General Theory of Relativity	33, 62	E	4	(4,0,0)	L. Perivolaropoulos
6, 8	108	Differential Geometry		E	4	(3,1,0)	I. Florakis
6, 8	109	Computational Methods in Physics		E	4	(2,0,2)	G. Evangelakis
6, 8	110	Quantum Theory of Information		E	4	(3,1,0)	A. Dedes
6, 8	111	Plasma Physics	31, 62	E	5	(3,1,0)	A. Nindos, S. Patsourakos
6, 8	112	Mathematics for Physicists		E	4	(2,1,1)	A. Economou (EDIP)

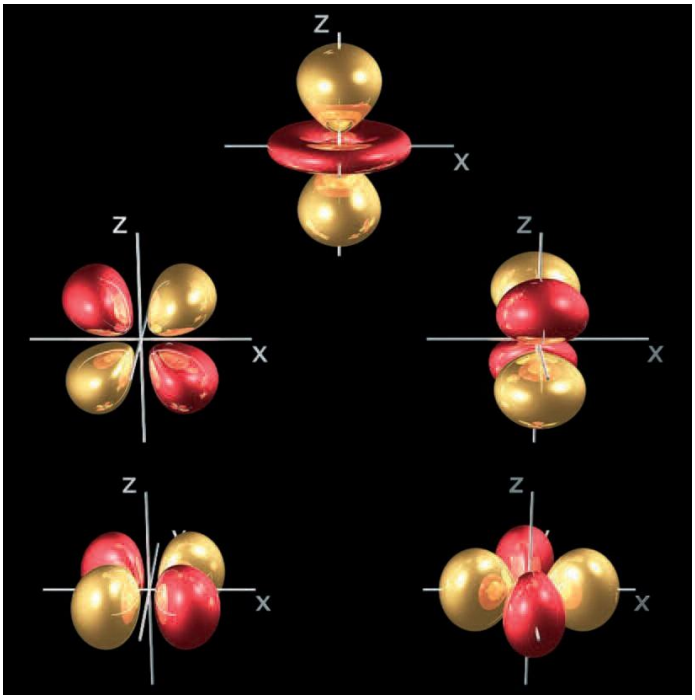
Semester	Code number	Course Title	Prerequisite Courses	Category	ECTS	Weekly hours	Teaching Staff
6, 8	113	Mathematics and Physics with Computers		E	4	(1,0,3)	I. Rizos, A. Economou (EDIP)
7	114	Classical Electrodynamics II	62	E	5	(3,1,0)	A. Dedes, L. Perivolaropoulos
7	201	Atomic Physics and Lasers		E	5	(3,1,0)	E. Benis
6, 8	202	Molecular Physics		E	5	(3,1,0)	D. Sofokitis
7	203	Introduction to Nuclear Physics		E	5	(3,1,0)	N. Patronis
6, 8	204	Nuclear Physics and Technology		E	4	(3,1,0)	N. Patronis, K. Stamoulis (EDIP)
6, 8	205	Solid State Physics II	72	E	5	(3,1,0)	G. Floudas
7, 8	209	Laboratory Courses in Modern Physics	23, 32, 35, 42, 44, 53	E	6	(1,0,4)	S. Kaziannis, S. Cohen, P. Kokkas, C. Kosmidis, A. Ikiadis, N. Patronis, D. Sofikitis, A. Douvalis, E. Evangelou, A. Markou
6, 8	211	Materials Science		E	5	(3,1,0)	A. Markou
6, 8	212	Structural and Chemical Characterization of Materials		E	4	(3,1,0)	I. Deligiannakis
6, 8	215	Physical Chemistry		E	4	(3,1,0)	A. Bourlinos
7	218	Polymer Solids	41, 63, 71	E	4	(3,1,0)	G. Floudas
6, 8	219	Medical Physics – Radiophysics		E	4	(3,0,1)	D. Emfietzoglou
7	220	Biophysics		E	3	(3,1,0)	P. Papadopoulos
6, 8	301	History and Philosophy of Physical Sciences		E	4	(4,0,0)	
6, 8	304	Didactics of Physical Sciences		E	4	(4,0,0)	E. Evangelou
7	305	Conceptual Physics and Teaching Experience in Physics Education		E	5	(3,0,1)	P. Kokkas, C. Kosmidis, E. Benis
6, 8	306	Introduction to Pedagogics		E	4	(4,0,0)	K. Gkaravelas (Department of Philosophy)
7	307	Didactic Methodology		E	4	(4,0,0)	K. Gkaravelas (Department of Philosophy)

Semester	Code number	Course Title	Prerequisite Courses	Category	ECTS	Weekly hours	Teaching Staff
6, 8	308	New Technologies in the Teaching of Physical Sciences		E	4	(1,0,3)	
7	309	Educational Psychology		E	4	(4,0,0)	A. Michou (Department of Philosophy)
6, 8	310	Educational Sociology		E	4	(4,0,0)	C. Zagkos (Department of Philosophy)
6, 8	401	General Meteorology		E	5	(3,1,0)	C. Lolis
6, 8	402	Physics of the Atmosphere		E	4	(3,0,1)	N. Chatzianastasiou (Theory-Lab), C. Lolis – M. Markou (EDIP) (Lab)
7	403	Dynamical Meteorology	401	E	4	(3,1,0)	C. Lolis
6, 8	404	Fluid Mechanics	24	E	4	(3,1,0)	N. Bakas
7	406	Physical Climatology		E	4	(3,1,0)	N. Chatzianastasiou
6, 8	409	Space Weather	408, 413	E	4	(3,1,0)	S. Patsourakos
6, 8	410	Galaxies and Cosmology	408	E	4	(3,1,0)	A. Nindos
6, 8	411	Observational Astrophysics		E	4	(3,1,0)	S. Patsourakos
7	413	Solar Physics	408	E	4	(3,1,0)	V. Archontis
6, 8	502	Digital Electronics		E	4	(2,1,2)	V. Christofilakis, D. Katsanos, A. Polymeros (EDIP), G. Baldoumas (EDIP)
6, 8	504	Introduction to Digital Telecommunications		E	4	(2,0,2)	V. Christofilakis, D. Katsanos
7	506	Object-Oriented Programming Languages (C++)		E	4	(2,0,2)	I. Papadopoulos
8	508	Magnetism and Magnetic Materials	72	E	4	(4,0,0)	A. Douvalis
6, 8	509	Measurements and Automatics using Electronic Computers		E	4	(2,0,2)	J. Strologas, E. Bletsas (EDIP)
7	510	Modern Programmable Electronics		E	4	(1,3,0)	C. Foudas, V. Christofilakis, E. Bletsas (EDIP)
7	701	Diploma Thesis		E	10		Selected by the student

Semester	Code number	Course Title	Prerequisite Courses	Category	ECTS	Weekly hours	Teaching Staff
6, 7, 8	702	Internship		E	3		Selected by the student
6, 8	703	Foreign Languages		E	4	(4,0,0)	E. Eumeridou (English)

C/E: C=Core, E=Elective
Teaching hours are presented as: (theory, excersises, laboratory)
For the courses which are divided in two groups: {e}= even, {o}=odd (according to the last digit of the registration number of the student)
EDIP=Laboratory Teaching Staff





[Update: 1 February 2024]

11. Courses Description

A brief description of the content of the courses (core and elective) offered within the curriculum of the Department of Physics is given below. Each course is characterized by a unique code number. The course category and the corresponding number of ECTS credits are given in parentheses after the course title. At the end of the course description, the breakdown of teaching hours (theory, exercises, laboratory) is given in parentheses, with the codes of indicatively prerequisite courses underlined. The appointed teaching staff members are listed in table 10.

CORE COURSES

1st SEMESTER

11. MECHANICS (A-8)

Motion in one dimension. Motion in two dimensions. Particle dynamics. Work and energy. Energy conservation. Momentum conservation. Collisions. Kinematics of rotation. Angular momentum conservation. Balance of rigid bodies. Oscillations. Gravitational force. Fluid statics and dynamics. (4, 1, 0)

12. DIFFERENTIAL AND INTEGRAL CALCULUS (A-8)

Real functions of one variable. Limits and continuity. Derivative and differential. Applications of derivatives. Indefinite, definite and generalized integral. Applications of integrals. Sequences, series, power series, Taylor power series. (3,2,0)

13. LINEAR ALGEBRA AND ELEMENTS OF ANALYTICAL GEOMETRY (A-7)

Matrices, determinants, solution of system of linear equations. Eigenvalues, eigenvectors, diagonalization of matrices. Basic algebra of vectors. Algebra of complex numbers, Euler's formula. Basic concepts of Analytical Geometry in cartesian and polar coordinates. Equations of line, conic sections, plane. Applications in Physics. (4,1,0)

14. PROBABILITY, STATISTICS AND ELECTRONIC COMPUTERS (A-7)

The Role of Probability in Physics. Statistical description of measurement results. Theory and operations on probability. Conditional probability. Random variables and probability distributions. Parameters of distributions. Basic theoretical distributions (binomial, Poisson, Normal, Maxwell) and applications. Sampling distributions (t, $\chi 2$). Parameter estimates, confidence intervals. Hypothesis testing for the mean of one or more populations. Data goodness-of-fit check. Introduction to personal computers (PCs). Basic and advanced formatting in a text editor. Data entry, processing and visualization. Mean value and errors. Least Squares Theory (applications to: linear, power, exponential, logarithmic relation, finding parameters without and with weight functions). Laboratory reports on PC. Statistical distribution functions in PC. (3, 0, 2)

2nd SEMESTER

21. ELECTROMAGNETISM (A-8)

Electric charge and matter. Electric field and Gauss's law. Electric potential. Capacitors and dielectrics. Electrical properties of matter. Current and resistance. Electromotive force and circuits. Magnetic field. Laws of Biot-Savart and Ampere Faraday. Self-induction. Magnetic properties of matter. Alternating current (AC) and RCL circuits. Maxwell's equations and electromagnetic waves. (4,1,0)

23. LABORATORY COURSES IN MECHANICS (A-7)

Mechanics: Instruments for measurement of basic quantities, length-mass-time. Measurement of velocity and acceleration. Study of rectilinear and accelerated motion. Newton's law. Impulse-Momemtum, momentum conservation – collisions. Work-Energy, Energy conservation. Study of circular motion. Oscillations, harmonic, digressive and forced oscillation. Fluids, measurement of the density of fluids and solids by the buoyancy method, motion of solids in liquids. (1,0,3)

24. VECTOR CALCULUS (A-8)

Scalar functions of many variables, limits, continuity, partial derivative, differential, directional derivative, slope, Taylor's theorem, extremes. Vector functions of one variable, curves and applications in Mechanics (Frenet trihedron). Surfaces, tangent plane and perpendicular vector. Analysis of scalar and vector fields in curvilinear coordinates (cylindrical, spherical). Vector fields, divergence, vorticity, Laplacian to Cartesian and curvilinear coordinates. Double and triple integrals, change of variables. Curved integrals and potential calculation. Surface integrals. Applications of integrals in Physics. Fundamental integral theorems for inclination, divergence and vorticity with applications in Physics. (3,1,0)

25. PROGRAMMING LANGUAGES (A-7)

Introduction to the C programming language. Introduction to the Linux operating system. Simple input-output commands. Types-operators-expressions. Program flow control commands. Functions and program structure. Indexes and tables. Structures. (2,0,2)

3rd SEMESTER

31. WAVE PHYSICS (A-6)

Waves in elastic media. Wave types, wave quantities, wave equation. Harmonic waves. Interference, standing waves, dispersion. Transmission velocity in various elastic media. Resistance of medium. Acoustic waves. Maxwell equations and electromagnetic waves. Nature and propagation of light. Reflection, refraction. Interference, diffraction, spectra. Polarization, birefringence. (4,1,0)

32. MODERN PHYSICS I (A-6)

Relativity theory: Galileo transformations. The Michelson-Morley experiment. Special Relativity theory. Lorentz transformations. Energy and momentum. Elements of General Relativity. Quantum-mechanics: black-body radiation. Photoelectric effect. Compton effect. Pair production and annihilation. The Bohr model of the atom. The Davison-Germer experiment. De Broglie waves. Heisenberg uncertainty principle. Wavefunctions. Schroedinger equation. (4,1,0)

33. CLASSICAL MECHANICS I (A-6)

Motion of a body in orbit. Principles of Newtonian Mechanics. Solving Newton's equations. Types of trajectories in One-Dimensional Dynamics. Oscillations, coupled and non-linear oscillations. Central Dynamics. Orbits in Gravitational Potential, Kepler's Laws. Elastic scattering. Particle systems and variable mass systems. Gravitational Field of Finite Dimensional Bodies. (3,1,0)

34. COMPLEX NUMBERS CALCULUS AND INTEGRAL TRANSFORMATIONS (A-6)

Functions of a complex variable. Derivation, Cauchy - Riemann conditions, analytic functions, harmonic functions. Elementary complex functions. Conformal representations and their applications in Physics. Integration on the complex level, Cauchy – Goursat theorem, Cauchy integral formulas. Laurent series. Integral residuals and their applications. Fourier analysis. Elements of generalized functions, the δ(x) distribution. Elements of Hilbert spaces. (3,2,0)

35. LABORATORY COURSES IN ELECTROMAGNETISM (A-6)

Experiments in electromagnetism: electric current, resistance measurement, electromotive force, useful electrical power, ohmmeter, D' Arsonval galvanometer. Zero measurement methods and bridges. Potentiometers. Magnetic field, induction. Oscilloscope. Transitional phenomena. Alternating current. RC, RL, RCL circuits. Impedance. Frequency filters. (1,0,3). 21 (this prerequisite is compulsory)

4th SEMESTER

41. THERMODYNAMICS AND LABORATORIES IN HEAT (A-6)

Basic thermodynamic concepts. Microscopic/macroscopic description. Definition and measurement of temperature, ideal gas thermometer. Constitutive quantities, perfect differentials, thermodynamic equilibrium. Gas laws, constitutive equation of state of ideal gas, Van der Waals equation and real gases. P-V and P-T diagrams. Work on hydrostatic and non-hydrostatic systems, semi-static and reversible processes. Heat and thermal internal energy, first law of thermodynamics. Calorimetry, specific heats cp, cv, adiabatic processes. Convection. Work-heat conversions, heat and refrigerating engines, efficiency of heat and refrigerating engines. Second law of thermodynamics, Carnot cycle. Entropy and measurement of its changes, Clausius theorem and inequality, entropic principle. Absolute zero and the third law of thermodynamics. Thermodynamic potentials, Maxwell relations, TdS and internal energy thermodynamic relations. HEAT LABORATORIES: 1. Thermocouple Calibration. 2. Study of thermal expansion of solids and liquids. 3. Specific heat of liquids and solids, Dulong-Petit law for metals. 4. Gas laws, measurement of absolute zero in °C. 5. Measurement of the adiabatic coefficient γ=cp/cv of the air. (3,1,1)

42. MODERN PHYSICS II (A-6)

Atomic structure: The Hydrogen atom. Electron spin. Stern-Gerlach experiment. Multielectron atoms. Pauli exclusion principle and periodic system. Stimulated light emission and laser. Molecules and solids: molecular bonds. Spectra of diatomic molecules. Basics of band theory and conduction. Nuclear structure: classification of nuclei. Nuclear structure models. Alpha and beta decay. Fission and fusion. Elementary particles: fundamental forces. Particle classification. The Standard model description. (4,1,0)

43. CLASSICAL MECHANICS II (A-6)

Non-inertial reference frames. Rigid body mechanics: Systems of point particles and continuous systems, inertia tensor, principal axes, Euler equations. Calculus of variations, the 'brachistochrone' problem. Lagrange formalism: generalized coordinates, equations of motion, conserved quantities, Noether theorem. Hamilton formalism: canonical equations, phase-space. Poisson brackets. Canonical transformations. (3,1,0)

44. LABORATORY COURSES IN WAVE PHYSICS AND OPTICS (A-6)

Experiments in visible light optics with lasers and with classical sources: Reflection, refraction, polarization, scattering, incidence, diffraction, wavelength and speed of light propagation, lenses, optical fibers, holography, optical spectroscopy, emission spectra, absorption spectra. Microwave optics experiments: Intensity distribution in space, wavelength, reflection, refraction, polarization, reflection and diffraction of microwaves,

optical waveguides. Ultrasound acoustics experiments: Spectral distribution, intensity distribution in space, wavelength, propagation speed, contribution and diffraction of ultrasound. (1,0,4)

45. DIFFERENTIAL EQUATIONS (A-6)

First order ordinary differential equations - linear and separable variables. Higher order differential equations – homogeneous and non-homogeneous linear equations. Systems of differential equations. Applications of ordinary differential equations and systems in Physics. Solution of differential equations in the form of power series - Frobenius method. The basic classical functions as solutions of differential equations. Partial differential equations in Physics. Characteristic surfaces and boundary conditions. Solving first order equations – transfer equation. Separation of variables method, Sturm-Liouville problems. Study of the Laplace equation, the wave equation, the diffusion equation and the Schrödinger equation in Cartesian and curvilinear coordinates. (3,2,0)

5th SEMESTER

51. QUANTUM THEORY I (A-8)

Basic concepts: probability amplitude, operators, wavefunction. Schrödinger equation. One-dimensional potentials. Simple two-state systems. Harmonic oscillator. Symmetries. Angular momentum, spin. (3,1,0)

53. ANALOG ELECTRONICS (A-7)

Principles of circuit theory, semiconductors, PN junction, properties. Solid state diodes (zener, varicap, LASER, LED, photodiodes, etc.), operation, circuits and applications. Dipole transistors, equivalent circuits, transfer models. Field Effect Transistors (FET), study, analysis, applications. Amplifiers with transistors, models for small signal amplification. FET amplifiers. Amplifiers of multiple outputs, output levels (A,B,AB,C,D). Current sources, active loads. Thyristor, Diac, Triac, UJT, etc, analysis, operation, applications. Circuit transfer functions, determinations of zero poles. Frequency response of amplifiers. Differential amplifier, study, analysis, operation. Operational amplifier, ideal, non-ideal. Applications of operational amplifiers, special circuits. Active filters, study, applications. Transistor models for high frequencies. (2,1,2) 21 (this prerequisite is compulsory)

54. GENERAL CHEMISTRY (A-5)

Introduction: historical facts, evolution of chemistry, significance of chemistry in the modern world, physics in chemistry. Chemical language & calculations: chemical symbols, nomenclature, introduction to the periodic table of elements, mole & atomic/molecular weights, Avogadro's number, stoichiometry. Basic inorganic chemistry: reactions of metals, ionic reactions, industrial reactions, metallurgy, air & water technologies, radioisotopes & applications, activity of radioisotopes, nuclear energy. Basic organic chemistry:

nomenclature, homologous series, petrochemicals, classic organic reactions, polymers, thermochemistry, molecular geometry, quantum models & applications in organic chemistry (particle-in-a-box, Woodward-Hoffmann rules), organic chemistry in everyday life. Experiments demonstration room: demonstration of science experiments (exothermic reactions, energy, microwaves, polymers, advanced materials). (3,1,0)

405. ENVIRONMENTAL PHYSICS (A-6)

Planet Earth and the origins of our environment. Formation of solid, liquid and gaseous elements. The terrestrial atmosphere, hydrosphere and lithosphere. Physical principles of environmental problems. Natural forces. Air pollution. Atmospheric cycles of the main pollutants. Aerosols. Chemical reactions of gaseous pollutants. Ozone in earth's atmosphere. Ozone layer hole. Size distributions of particles. Mechanisms of removal of atmospheric pollutants. Boundary layer. Mixing-length theory. Turbulent flow. Reynolds number. Air pollution and Meteorology. Models of transport, diffusion and deposition. Influence of temperature stratification on diffusion. Influence of meteorological parameters. Pollution drains. Acid rain. Influence of pollution on weather and climate. Influence of pollution on health, plant and animal environment. Radioactive pollution. Noise pollution. Physics and pollution of water (sea, lake, river). Diluted gases. Chemical cycles. Chemical reactions. Bacteriological water pollution. Chemical pollution. Energy and pollution. Environmental impact. Physics of soils and soil pollution. (3,1,0)

408. INTRODUCTION TO ASTROPHYSICS (A-6)

Mechanisms of emission and absorption of radiation. Radiation transfer. Stellar magnitudes and distances. Stellar spectra and classification, Hertzsprung-Russell diagram. Internal structure, formation and evolution of stars. Final states: white dwarfs, neutron stars and black holes. Overview of the Sun. The solar system. Variable and singular stars. Stellar groups and clusters. Interstellar matter. Our Galaxy. Other Galaxies. Cosmology. (3,1,0)

6th SEMESTER

61. QUANTUM THEORY II (A-8)

Central potential. Hydrogen-like atoms. Degeneracy. Fine and hyperfine structure. Perturbation theory. Scattering theory. Identical particles. Pauli's principle. (3,1,0)

62. CLASSICAL ELECTRODYNAMICS I (A-8)

Electrodynamics: Coulomb's law, electric field and potential. Poisson's equation and Laplace's equation. Work and energy in electrostatics. Conductors. Solving Laplace's equation in one, two and three dimensions. Multipolar development. Polarization. Electric displacement. Linear dielectrics. Magnetostatics: the Lorentz force law. The Biot-Savart law. Ampere's law. The vector potential. Magnetization. The field H. Ohm's law. Faraday's law. Maxwell's Equations. (3,1,0) 21 (this prerequisite is mandatory)

7th SEMESTER

71. STATISTICAL PHYSICS (A-8)

Summary of conclusions of classical thermodynamics. Basic concepts of Statistics and Probability. Statistical study of isolated system (microcanonical ensemble). Thermal systems of constant number of molecules (canonical ensemble). Applications: classical ideal gas, paramagnetic material. Thermal systems of variable number of molecules (grand canonical or macrocanonical ensemble). Quantum statistics of identity particles. Applications in condensed matter physics, astroparticle physics and cosmology. Real gas (growth of clusters, van der Waals equation of state). Phase changes of the 1st and 2nd kind. (3,1,0)

72. SOLID STATE PHYSICS I (A-8)

Introduction. Crystal structure (lattice, Bravais lattices, simple crystal structures, non-crystalline structures-glasses). Reciprocal lattice (diffraction, Bragg's and von Laue determination and their equivalence). Amplitude of the diffracted wave, Brillouin zones, geometrical and atomic structure factor. Classification of solids- lattice types-Mechanical Properties. Inert gas crystals, ionic-covalent-metallic Crystals. Phonons-Lattice vibrations. Strain, stress, elastic modulus, compressibility. Phonons- Thermal Properties. Phonon specific heat capacity (Einstein and Debye models). Anharmonicity, thermal conductivity. Metals (free electron model, Drude model, Sommerfield, Fermi-Dirac distribution, successes and failures of the models). Electric conductivity of metals, dielectric constant, plasma frequency, motion in magnetic field, thermal conductivity. Electronic states in periodic potential. Bloch theorem, Kronig-Penney model. Formation of energy gap, energy bands, metals and insulators. Electrons in weak periodic potential. Electron energy states near a Bragg plane, Fermi energy and Brillouin zones, effective mass. Semiconductor crystals. Equations of

motion, concentration and mobility of carriers, electrical properties controlled by impurity addition, p-n junctions (solar cells, photovoltaics). (3,1,0)

ELECTIVE COURSES

I. FIELD OF THEORETICAL PHYSICS

103. ELEMENTARY PARTICLES (B-5)

Introduction. Basic concepts and experimental methods. Symmetries and conservation laws. Weak, electromagnetic and strong interactions. Introduction to gauge theories. Unified theories. Astroparticle physics. (3,1,0)

104. INTRODUCTION TO FIELD THEORY (B-5)

Dirac equations. Klein-Gordon equations. Quantization of electromagnetic radiation. Simple applications of relativistic field theory. (3,1,0) 51, 61

105. COSMOLOGY (B-5)

Introduction to the standard cosmological model. Basic assumptions (homogeneity, isotropy). General relativity, Robertson-Walker metric, perfect fluid distribution, Einstein and Friedmann equations. Flat and curved cosmological models, cosmological constant. Cosmological observational data: redshift, Hubble expansion, age of universe, dark matter, nucleosynthesis. Physics of the primordial Universe, background microwave radiation. Problems in the big-bang theory: the cosmological constant, flatness and horizon problems, dark matter, baryogenesis, primordial perturbations. Inflating universe: solution of basic problems. Inflation models. Evolution of primordial perturbations: structure formation in the universe. (4,0,0)

106. GRAVITY AND GENERAL THEORY OF RELATIVITY (C-4)

Introduction to differential geometry and Riemann geometry. Fundamental concepts of general relativity and Einstein equations. Elementary solutions, Newtonian limit and classical tests of the theory. Introduction to geometry and physical interpretation of black holes. Schwarzschild formula. Introduction to Robertson-Walker cosmological models. (4,0,0) 33, 62

108. DIFFERENTIAL GEOMETRY (C-4)

Curvature and torsion. Theory of curves. First and second fundamental form. Theory of surfaces. Tensor calculus. Internal geometry. (3,1,0)

109. COMPUTATIONAL METHODS IN PHYSICS (C-4)

Root determination of algebraic equations. Calculation of determinants. Matrix diagonalization. Numerical integration. Interpolation methods. Monte-Carlo integration. Solution of first and second order differential equations. Schrödinger-type differential equations. Solution of integral equations in physics. Minimization methods. Simulation methods (Monte-Carlo, molecular dynamics). (2,0,2)

110. QUANTUM THEORY OF INFORMATION (C-4)

Quantum Entanglement. Multiple qubits. Quantum Cryptography. Bloch sphere. Density matrix (operator). Decoherence. Bell Inequalities. Quantum no-cloning theorem. Introduction to Quantum Computation. Quantum gates and algorithms. NMR as a quantum computer. Quantum dots. Teleportation. Shannon entropy and von Neumann entropy. Quantum error corrections. (3,1,0)

111. PLASMA PHYSICS (B-5)

Introductory concepts. Single particle motion. Elements of Kinetic theory. Plasma as a fluid. Wave phenomena, plasma diffusion and conductivity. Equilibrium and stability. Non-linear phenomena. Introduction to controlled fusion. (3,1,0) 31, 62

112. MATHEMATICS FOR PHYSICISTS (C-4)

Finite linear vector spaces. Infinite linear vector spaces. Curved coordinate systems. Integral transformations. Conformal transformations. Distributions theory. Differential equations and classical functions. The Sturm-Liouville problem. Solution of differential equations through the Green method. Integral equations. Basic concepts of group theory. (2,1,1)

113. MATHEMATICS AND PHYSICS WITH COMPUTERS (C-4)

Introduction: historical facts, symbolic calculations and relevant software. Basic concepts: Simple algebraic and numerical calculations, functions, derivatives, integrals and roots of equations. Graphical representations: graphical representations of functions in two and three dimensions, graphical representations of data, graphical representation of vector fields, animation. Complex problems: Linear Algebra, Eigenvalues, Eigenfunctions, Series, Differential equations, Numerical calculations. Calculational packages. Applications in Mathematics and Physics. (1,0,3)

114. CLASSICAL ELECTRODYNAMICS II (B-5)

Maxwell's equations in vacuum and in matter. Conservation of Energy (Poynting's theorem), momentum and angular momentum conservation in ED. Electromagnetic waves in vacuum

and in matter. Absorption and scattering. Waveguides. Potentials and fields. Gauge transformations. Continuous distributions (lagged potentials). Point charges (Lienard-Wiechert potentials). Electromagnetic Radiation of electric and magnetic dipole. Radiation of point charges. Radiation feedback. Relativistic Electrodynamics: magnetism as a relativistic phenomenon, field transformations. The unification of Electricity and Magnetism: unification of forces model. (3,1,0) 62 (this prerequisite is compulsory)

II. FIELD OF EXPERIMENTAL AND APPLIED PHYSICS

201. ATOMIC PHYSICS AND LASERS (B-5)

Principles of operation and description of the Laser. Gaussian beams and propagation. Constant wavelength (CW) lasers, population rate equations. Pulsed Lasers, Q-switching, Mode-locking. Types of Lasers. One electron atomic systems. Interaction of one electron atomic systems with Laser radiation, absorption, emission, transitions, dipole approximation, selection rules, spectra, lifetimes, spectral distributions of states, broadening mechanisms. Fine and Hyperfine structure. Atoms in external fields, Zeeman and Stark effects. Two electron atomic systems, wavefunctions, notation, excited states. Many electrons atomic systems, Central Field Approximation, Slater determinants, Hartree-Fock method, LS coupling, Hund rules, Periodic Table. Alkali spectra, X-ray spectra. Special Topics of Atomic Physics and experimental methods: photoionization, Rabi oscillations, interaction with strong laser fields. (3,1,0)

202. MOLECULAR PHYSICS (B-5)

Review of Atomic Physics and Quantum Description of Molecular Bonding. Electronic degrees of freedom: Born-Oppenheimer approximation, Morse potential, diatomic molecules, polyatomic molecules, delocalization and hybridization. Vibrational degrees of freedom: Description in the context of the Harmonic Oscillator, transitions and selection rules. Combination with electronic transitions and Franck-Condon principle. Deviations from harmony. Rotational degrees of freedom, diatomic molecules and robust rotator approximation, classification of polyatomic molecules. Combination with rotational degrees of freedom and vibrational-rotational transitions. Interaction with light: dipole moment, polarizability. Deexcitation by emission of radiation (fluorescence - phosphorescence) - Non-radiative deexcitation, Ionization - Molecular dissociation, Multiphoton resonant and non-resonant excitation processes - Multiphoton ionization of molecules. Laser and spectroscopic equipment, spectrometers, interferometers and light detection. Doppler-limited spectroscopy, Doppler-free spectroscopy, high-sensitivity spectroscopic methods, Raman spectroscopy, spectrum interpretation. Elements of group theory. (3,1,0)

203. INTRODUCTION TO NUCLEAR PHYSICS (B-5)

Properties of nuclei (charge distribution, mass, angular momentum, parity, isotopic spin, electromagnetic torques). Instability of nuclei. Alpha-beta-gamma decay. Nuclear potential. (3,1,0)

204. NUCLEAR PHYSICS AND TECHNOLOGY (C-4)

Introduction to the properties of the nucleus and scattering. Coulomb scattering of heavy ions and electrons. Mechanisms of nuclear reactions. Particle accelerators. Production of radioisotopes by nuclear reactions. Radiation - matter interaction. Nuclear radiation detectors. Nuclear energy. Nuclear reactor physics and technology. Neutron physics and applications. Methods of trace element analyses. Applications of radioisotopes in research

and industry. Radio-dating methods. Radioecology. Dosimetry. Radiation shielding. Applications of Geophysics. Medical applications of radioisotopes: gamma photography, positron-electron tomography (PET), nuclear magnetic resonance (NMR). (3,1,0)

205. SOLID STATE PHYSICS II (B-5)

Semiconductors. P-n junctions and Field Effect Transistor (FET/MOSFET). Organic and inorganic photovoltaic. Electric and dielectric properties of solids. Energy storage (ion-lithium batteries, supercapacitors). Transfer of electromagnetic radiation in solids. Photon and phonon crystals. Left-handed materials. Surface plasmons. Magnetic materials and their properties. Ferroelectric materials (Curie temperature, organic and inorganic ferroelectric materials, ferroelectric capacitors-junctions-transistors, applications to memory devices). Piezoelectric materials. Thermoelectric materials (thermoelectric power, quantum confinement and effective mass). Quantum dots (quantum confinement and its role in nanotechnology, density of states and energy gap, applications-emphasis on light emission, photovoltaic, hybrid photovoltaics). Physics of carbon and graphene compounds. Physics of liquid crystals. (3,1,0) 72

209. LABORATORY COURSES IN MODERN PHYSICS (B-6)

Experiments of Atomic-Molecular Physics, Optics, Solid State Physics, Nuclear and Particle Physics: the Franck-Hertz experiment, emission and absorption spectroscopy, photoelectric effect, Michelson interferometer, holography, X-rays (diffraction from crystalline materials, analysis of the X-ray diffraction pattern, generation and absorption from materials, scattering, determination of the Plank constant), thermal and electrical conductivity of metals, semiconductor measurements, the Hall effect in p- and n-Germanium, optoelectronics, optical fibers and sensors, gamma spectroscopy, positron-electron annihilation, cosmic radiation - lifetime of the muon. (1,0,4) 23, 32, 35, 42, 44, 53

211. MATERIALS SCIENCE (B-5)

Atomic and electronic structure of solids, atom and ion bonds. Basic crystal structures and configurations, amorphous materials, polycrystalline materials and monocrystals. Atomic packing. Imperfections and diffusion in solids. Mechanical properties of solids. Phase equilibrium diagrams. Electrical, thermal, magnetic and optical properties of solids. Metallic materials, ceramic materials and glasses. Thermoelectric materials. Carbon, nanostructured and hybrid materials. Polymeric materials (“polymeric “and “plastic”, classes of polymers, chain modulation, start-end distance. (3,1,0)

212. STRUCTURAL AND CHEMICAL CHARACTERIZATION OF MATERIALS (C-4)

Introduction. Interactions of radiation with matter. Basic theory of Elastic Scattering. Elastic scattering from single atoms. Crystal diffraction. Basic theory of electron diffraction. Secondary emission. Radiation production, detection and measurement. Applications of X-ray diffraction and neutron diffraction in crystal solids. High and low energy electron

diffraction from thin films. Elemental analysis through X-ray fluorescence spectroscopy. Electron spectroscopy in surface analysis. X-ray absorption spectroscopy and electron loss spectroscopy. Secondary ion mass spectroscopy in surface analysis. Transmission Electron Microscopy (TEM). Scanning Transmission Electron Microscopy (STEM). Scanning Tunneling Microscopy (STM). (3,1,0)

215. PHYSICAL CHEMISTRY (C-4)

Isotopes & nuclear structure: definitions, nuclear shell model, nuclear spin and applications. Electromagnetic radiation & atoms: electromagnetic spectrum, Bohr's atomic model & applications, exotic atoms. Electronic configuration: aufbau principle, electronic structure & chemical reactivity, periodic table. Crystal field theory: octahedral & tetrahedral geometry, high spin/low spin systems, d-d transitions (Laporte rule, spin-allowed/spin forbidden), Jahn-Teller effect, optical & magnetic properties. Molecular orbitals: molecular orbital theory for diatomic molecules & conjugated polyenes as a prediction tool of molecules & properties, particle-in-a-box. Molecular geometry: Lewis structure, VSEPR theory, hybridization, dipole moment. Crystal structure: simple, body- and face-centered cubic structure, diamond & graphite structure, theoretical density calculations, lattice energy, F-centers. States of matter: Clausius-Clapeyron relation & kinetic theory of gases. Thermochemistry: energy value of fuels, biological fuels, nuclear energy. Chemical thermodynamics: Gibbs free energy change ΔG of chemical reactions, effect of temperature and pressure on ΔG. Chemical kinetics: speed of reaction, integrated rate laws. Electrochemistry: electrolytic cells, products of electrolysis, Faraday's law, galvanic cells, electrochemical potentials, batteries, cathodic protection. (3,1,0)

218. POLYMER SOLIDS (C-4)

Introduction, plastics and polymers, classification of polymers, polymers configuration, size and shape of macromolecules, glass transition of polymers, polymer dynamics near the glass point, crystallization of polymers, kinetics of crystallization, semi-crystal polymers dynamics, liquid-crystal polymers, chemical/physical structure (phases) and applications. (3,1,0) 41 or 63 or 71

219. MEDICAL PHYSICS - RADIOPHYSICS (C-4)

Introduction to Medical Physics and the physics of ionizing radiation. Biological effects of ionizing radiation. Elements of radioprotection against ionizing radiations. X-ray production, interaction with matter and applications in Radiology and Radiotherapy. Interaction of charged particles with matter and applications in Radiotherapy. Radioactive decays and applications in Nuclear Medicine. (3,0,1)

220. BIOPHYSICS (D-3)

Thermodynamics of biological systems. X-ray diffraction. Spectroscopy techniques for materials of biological interest (Infrared, Raman, circular dichroism, nuclear magnetic resonance (NMR)). Microscopy techniques for materials of biological interest (optical

microscopy, confocal microscopy, ultra-resolution microscopy). Quantitative analysis of three-dimensional images. Molecular dynamics simulations. Optical and magnetic tweezers. Movement of microorganisms. (3,1,0)

III. FIELD OF DIDACTICS IN PHYSICS

301. HISTORY AND PHILOSOPHY OF PHYSICAL SCIENCES (D-4)

Historiography of Science form antiquity to the present day. Social dimension of Science. Science and the problem of truth. Nature in ancient Greek philosophy. The dispute of Aristotelean Physics in Renaissance. Evolutions of ideas after the Renaissance. First scientific revolution-Galileo. Second scientific revolution- discovery of X-rays. Contemporary developments. Logical Empiricism and its criticism. The problem of the method. The progress of scientific theories. Relativism and scientific rationalism. (4,0,0)

304. DIDACTICS OF PHYSICAL SCIENCES (D-4)

The nature of Physical Sciences and Learning. Procedures of the scientific method and methods of teaching Physics. Alternative student views and their impact on teaching. Teaching with experiments. The role of experiment in conceptual change. The constructivist model of learning. Pre-existing student ideas on the various concepts of Physics. Examples of constructive approach. (4,0,0)

305. CONCEPTUAL PHYSICS AND TEACHING EXPERIENCE IN PHYSICS (D-5)

Physical Sciences. Scientific method. Theory-Observation. Concepts in Physics: Mechanics-Newton's law-Momentum-Energy-Gravity-Matter. Properties of Matter: Solids, liquids, gases, plasma, temperature-expansion. Heat: transport, phase transitions, thermodynamics. Sound: Vibrations, waves. Sound: musical sound. Electromagnetics: electrostatics, electric current, magnetism, induction. Light: properties, color, reflection, refraction, light waves, emission-light propagation, quanta. Atomic Physics-Nuclear Physics-Elementary Particles Physics: the atom and quantum, nucleus and radioactive decay, nuclear fusion, nuclear fission, nuclear interactions, atomic structure, particle accelerators. Relativity: special theory of relativity, general theory of relativity. Students experimentation and practical work on teaching and microteaching with new technologies. Practical work on developing experiments for education (specialized experiment didactic), presentation of projects-experiments to groups of primary and secondary education students. (4,0,0)

306. INTRODUCTION TO PEDAGOGICS (D-4)

Pedagogy and Education Science: Conceptual clarifications and epistemological progress. Discourse and pedagogical knowledge (Savoir). Pedagogical ideology and educational reality. The development and formation of Autocratic Methods of Teaching: historical overview-versions of autocratic method in education-Critical view of contemporary perspectives/practice of autocratic method. The New Education Movement and its effects in Modern Greek Education: education theory and practice in the classroom. (4,0,0)

307. DIDACTIC METHODOLOGY (D-4)

Topics and themes of didactic methodology. Learning theories. Education theories. Teacher-student relations. The role of the teacher. Interplay of theory and practice in Education Science. Contemporary Education Science Theories. Education Science and postmodernism. Contemporary issues and the role of Education Science. Educational relationship and communication in the classroom. (4,0,0)

308. NEW TECHNOLOGIES IN THE TEACHING OF PHYSICAL SCIENCES (D-4)

Introduction: historical overview. Computers in the service of education. Use of computers. Categories of educational applications: computer-aided teaching/learning. Digital educational games. Use of simulations and multimedia in teaching of simple and advanced concepts. Software to create multimedia applications and presentations. Software for analytical calculations for physics problems. Internet in education. Diffusion of courses in the world-wide-web. Software of modern tele-education. E-learning software (teleconferences). (1,0,3)

309. EDUCATIONAL PSYCHOLOGY (D-4)

Theory of learning: (i) Behavioral learning theory. Classical conditioning. Operant conditioning. (ii)Theory of purposive behaviorism, (iii) Social cognitive learning theory, (iv) Cognitive learning theories. Information processing theory. Constructivism (atomic constructivism, socio-cultural constructivism). Contextual views of learning. (4,0,0)

310. EDUCATIONAL SOCIOLOGY (D-4)

Education and Social Inequalities: The Sociology as Science and the founders of the sociological reasoning. Sociology of Education: themes and research methodology. Education and equal opportunities. Education and social inequalities: interpretative approaches. School performance and social inequalities. Choice of studies and social inequalities. (4,0,0)

IV. FIELD OF ENVIRONMENTAL, ATMOSPHERIC AND SPACE PHYSICS

401. GENERAL METEOROLOGY (B-5)

Weather and climate. Branches of Meteorology. Composition, evolution, height and vertical structure of the atmosphere. Solar radiation and mechanisms of heat propagation in the atmosphere. Air temperature. Atmospheric pressure and isobar maps. Wind, general circulation and local circulations in the atmosphere. Air humidity. Atmospheric stability. Clouds and small-scale condensation. Rain. Air masses and fronts. Earthquakes, anticyclones, tropical cyclones, storms and siphons. Basics of weather analysis and forecasting. Visit to the weather station of the University. (3,1,0)

402. PHYSICS OF THE ATMOSPHERE (C-4)

Structure, composition and thermodynamics of the atmosphere. Atmospheric pressure, density and composition of the atmosphere. Variable atmospheric gases. Temperature structure. Free atmosphere. Equation of State. Variation of pressure with height. Water in the atmosphere. The first Law of Thermodynamics for the atmosphere. Radiation. Orbital parameters. Earth's orbit, seasonal and daily effects. Sun-set, sun-rise and twilight. Definition of radiative flux, basics of radiation. Radiation balance at Earth's surface. Physics of clouds. Cloud formation, cloud sizes, fractal structure of clouds. Processes of cloud saturation. Clouds and fog, other types of fog. Precipitation and ice crystals, nucleation of liquid drops and ice crystals. Development and growth of drops and ice crystals by diffusion. Collision and collection of drops. Precipitable water. (3,0,1)

403. DYNAMICAL METEOROLOGY (C-4)

Basic principles and laws of classical thermodynamics. Thermodynamics of dry and moist air. Saturated water vapor pressure. Constants of moist air. Adiabatic changes in the atmosphere. Graphic representation of changes – Thermodynamic diagrams. Hydrostatic balance. Gravity. Vertical balance of the atmosphere. Relative and absolute motion. The forces in the relevant frame of reference. The general equations of motion. Special traffic cases. Representation of the field of meteorological parameters. Dynamic and rheumatic function. Continuity flow, divergence and equalization. Differential properties of the velocity field. Practical calculation of deflection and vorticity. Absolute and relative vorticity. The deviation in the physical coordinates of the spherical flow. (3,1,0) 401

404. FLUID MECHANICS (C-4)

The fundamental concepts of fluid mechanics. Statics of fluids. Kinematics of moving fluids. Fluid motion equations. Two-dimensional flows and three-dimensional flows. Flow of viscous fluids. Stress components in real fluid. Equations of motion of real fluids. Dimensional analysis. Dimensionless parameters (Reynolds number, Froude number, Richardson

number). Compressible flow. Thermodynamics of fluids. Elements of magnetohydrodynamics. Applications. (3,1,0) 24

405. ENVIRONMENTAL PHYSICS (B-6)

Planet Earth and the origins of our environment. Formation of solid, liquid and gaseous elements. The terrestrial atmosphere, hydrosphere and lithosphere. Physical principles of environmental problems. Natural forces. Air pollution. Atmospheric cycles of the main pollutants. Aerosols. Chemical reactions of gaseous pollutants. Ozone in earth's atmosphere. Ozone layer hole. Size distributions of particles. Mechanisms of removal of atmospheric pollutants. Boundary layer. Mixing-length theory. Turbulent flow. Reynolds number. Air pollution and Meteorology. Models of transport, diffusion and deposition. Influence of temperature stratification on diffusion. Influence of meteorological parameters. Pollution drains. Acid rain. Influence of pollution on weather and climate. Influence of pollution on health, plant and animal environment. Radioactive pollution. Noise pollution. Physics and pollution of water (sea, lake, river). Diluted gases. Chemical cycles. Chemical reactions. Bacteriological water pollution. Chemical pollution. Energy and pollution. Environmental impact. Physics of soils and soil pollution. (3,1,0)

406. PHYSICAL CLIMATOLOGY (C-4)

Solar radiation. Distribution of solar radiation in the Earth-atmosphere system. Terrestrial radiation. Distribution of terrestrial radiation. Radiation balance. Boundary friction layer. The influence of turbulence on meteorological parameters. Heat dispersion in the soil. Hydrologic circle. Energy balance of Earth. Energy balance of atmosphere. Energy balance of soil-atmosphere system. Atmosphere and climate evolution and change. (3,1,0)

408. INTRODUCTION TO ASTROPHYSICS (B-6)

Mechanisms of emission and absorption of radiation. Radiation transfer. Stellar magnitudes and distances. Stellar spectra and classification, Hertzsprung-Russell diagram. Internal structure, formation and evolution of stars. Final states: white dwarfs, neutron stars and black holes. Overview of the Sun. The solar system. Variable and singular stars. Stellar groups and clusters. Interstellar matter. Our Galaxy. Other Galaxies. Cosmology. (3,1,0)

409. SPACE WEATHER (C-4)

Introduction to the Physics of the interplanetary plasma. Waves in plasmas. Magnetic reconnection. Shock waves. Solar activity. Solar wind. Interplanetary Coronal Mass Ejections. The terrestrial magnetosphere and its dynamics. Aurora. Space weather and human activities. (3,1,0) 408, 413

410. GALAXIES AND COSMOLOGY (C-4)

Distribution of stars in the Galaxy. Kinematics of the Galaxy. Morphology of the Galaxy: disk, bulge and halo. Indications of dark matter in the Galaxy. Structure and physical

characteristics of other galaxies. Morphological classification of galaxies. Radiation in radio, infrared and X-rays. Dark matter searches. Supermassive black holes. Elements of galactic dynamics. The nature of spirals in galaxies. Evolution of galaxies. Interactions between galaxies. Active galaxies and quasars. Hubble's law and cosmological assumptions. Observations with cosmological significance. Evolutionary models of the Universe. Open issues: singularity and dark energy. (3,1,0) 408

411. OBSERVATIONAL ASTROPHYSICS (C-4)

Introduction. The influence of Earth's atmosphere and its correction. Aperture theory. Collection of radiation and image formation. Telescopes of various types. Radiation detectors. Spectroscopic analysis. Polarimetric measurements of radiation. Neutron and gravitational radiation detectors. Practical work. (3,1,0)

413. SOLAR PHYSICS (C-4)

Solar observations. Diagnostics of solar plasma. Interaction of solar plasma with the magnetic field. One-dimensional models of the solar atmosphere. Solar wind. Oscillations and helioseismology. Fine structure of the solar atmosphere. Solar active regions. Solar activity: flares, Coronal Mass Ejections. Chromospheric and coronal heating. Influences of the Sun on the space environment. (3,1,0) 408

V. FIELD OF NEW TECHNOLOGIES

502. DIGITAL ELECTRONICS (C-4)

Number systems, Binary arithmetic – Basic operations. Bool Algebra – Logic Circuits, Digital signals – creation principles. Basic gates (AND, NAND, OR, NOR, XOR, XNOR), conversions – combinations. Characteristics – specifications of the CMOS, TTL, ECL PECL gates. Assembler (serial parallel), Flip Flop, Shift Register, Counters, Multiplexer-Demultiplexer, Serial Interfaces. Timing-clock circuits. Representation circuits, Generators of pulse-series, Semiconductor memories and products (RAM, ROM, PROM, EPROM, EEPROM). Modern high-integration circuits (PAL, PLD, CPLD, etc). ADC, DAC. Introduction to languages describing digital circuits (VHDL). Examples of its use in the description – execution of logical processes. (2,1,2)

504. INTRODUCTION TO DIGITAL TELECOMMUNICATIONS (C-4)

Representation of digital signals in time and frequency, pulse spectra. Network communications, network hierarchy. Coupling elements (channel, signal, noise, interpolation, distortion, etc.). Data broadcast, channel capacitance, data broadcasting in basic zone, intersymbol interference, filtering, Nyquist response. Eye diagram, cosine filters, Nyquist filters, adaptive filters. Gain-phase distortion, interference-noise. Two-level digital modulations (ASK, FSK, PSK) and multiple levels (ASK, FSK, PSK, QPSK, DQPSK, OPQSK, QAM, APK). Encoding of source, channel, block, etc. Multi-users modulation techniques (FDMA, TDMA, CDMA, FH-CDMA, DS-CDMA, etc.), examples, applications. (2,0,2)

506. OBJECT-ORIENTED PROGRAMMING LANGUAGES (C-4)

Learning C++ programming language. Input-output commands. Program control and flow commands. Objects, functions, classes, inheritance, polymorphism. Introduction to object-oriented programming (ROOT). Histograms, graphics, data fitting. (2,0,2)

508. MAGNETISM AND MAGNETIC MATERIALS (C-4)

Magnetism of electrons, atomic-ionic magnetic moments and magnetization in solids. Hund's rules. Diamagnetism and paramagnetism of localized, delocalized and conduction electrons Paramagnetism and Brillouin and Langevin theories. Crystal field and magnetism of 3d and 4f electrons. Pauli paramagnetism and Landau diamagnetism. Mean field theory, band magnetism, Stoner criterion. Direct exchange, superexchange, double exchange and RKKY interactions. Exchange interactions and magnetic ordering: ferromagnetism, antiferromagnetism, ferrimagnetism and special magnetic ordering. Strong and week ferromagnetic metallic materials. Magnetic anisotropy. Hard and soft magnetic materials. Magnetic domains, single domain particles, Bloch and Néel walls, hysteresis and magnetization inversion mechanisms, Stoner-Wohlfarth model. Magnetization relaxation and superparamagnetism. Magnetic nanomaterials and nanoscale magnetism.

Magnetoresistance and spintronics, half-metallic magnetic materials. Modern magnetic materials and their applications. Characteristics and properties of superconducting materials and basic theories for their interpretation. (4,0,0) 72

509. MEASUREMENTS AND AUTOMATICS USING ELECTRONIC COMPUTERS(C-4)

Detectors and sensors. Analog and digital systems. Analog to digital signal conversion. Analog and digital measuring instruments. Computer architecture. Platforms for applications development. Basic of data acquisition systems. Computer instruments connection techniques. Introduction to instruments connection to computers using the LabVIEW package. Acquisition and processes of images (2,0,2)

510. MODERN PROGRAMMABLE ELECTRONICS (C-4)

Theory and applications of programmable integrated circuits (FPGA) and microcontrollers (μC). Introduction to Electronic Design Automation (EDA) and Integrated Development Environment (IDE) and basic input/output applications. Measurements with modern programmable electronic circuits, photodiodes/switches connections, visualization applications, serial/parallel data transfer, coding/decoding, multiplexing, memory circuits, registers, counters, timing issues, arithmetic logic unit, theory and operation of interrupts, branch commands, subroutines, stack and pointers. (1,0,3)

COURSES WHICH BELONG TO ALL FIELDS OF STUDIES

701. DIPLOMA THESIS (E-10)

The course is annual and it is offered to students of the 7th and 8th semester. Students interested in the course should be addressed to the faculty member relevant to the topic of the thesis.

702. INTERNSHIP (F-3)

The course is offered only to students of the 6th, 7th and 8th semester and is of 2 months duration for domestic and up to 4 months duration for placement abroad. The student is supervised by faculty member of the Department for Internship in Greece and by the designated person in charge of the host institution abroad.

703. FOREIGN LANGUAGE (C-4)

English, French or German (4,0,0)

12. Courses offered to other Departments

Department of Mathematics

1. Meteorology (2,1,0) Lolis C. (8th semester)
2. Astronomy (2,1,0) Archontis V. (8th semester)

Department of Chemistry

3. Physics (3,1,0) Markou A. (1st semester)
4. Didactics of Physical Sciences (3,1,0) Evangelou E. (2nd semester)

Department of Computer Science and Engineering

5. General Physics (5,0,0) Papadopoulos P. (1st semester)

Department of Biological Applications and Technologies

6. General Physics (3,2,0) Kaziannis S. – Sofikitis D. (1st semester)

Department of Materials Science and Engineering

7. Materials and Environment (3,0,0), Deligiannakis I. (5th semester)

Interdepartmental (Dept. of Chemistry – Dept. Materials Science and Engineering) Postgraduate Studies in "Chemistry and Technology of Materials"

8. Materials Characterization Techniques – Analytical Techniques (2,0,1) Deligiannakis I., Douvalis A. (1st semester)
9. Materials Structure – Solid State Physics and Chemistry (3,0,0) Markou A. (1st semester)
10. Advanced Materials – Micro- and nano-scale Materials Technology (3,0,0) Bourlinos A. (1st semester)
11. Material Properties- Lab Exercises (2,0,3), Deligiannakis I., Douvalis A. (2nd semester)

D. POSTGRADUATE STUDIES

The possibility of obtaining a Doctorate Degree from the Department of Physics of the University of Ioannina dates to its beginnings. However, the advancement of academic studies, the progress in research and the role of universities to national development, necessitated the establishment of systematic postgraduate studies.

Today, the Department of Physics operates three Postgraduate Studies Programs: (i) in Physics with specializations in Theoretical and Experimental Physics, (ii) in Atmospheric Sciences and the Environment and (iii) in Modern Electronic Technologies, which lead to obtaining a Master's Degree. All programs have a three-semester duration and award a postgraduate Diploma. The degree of the Diploma is calculated on the basis of the ECTS credits accumulated through courses and the Diploma Thesis. Within the framework of the Erasmus Program, postgraduate students can move to another European country for a period of up to five (5) months, to carry out part of their studies or to do an internship.

1. Postgraduate Studies in Physics with specializations in Theoretical and Experimental Physics

The Postgraduate Program in Physics with specializations in Theoretical and Experimental Physics was established in 1993, was re-established in 2018 and was modified in 2023 (Official Government Gazette 1556/B/2023).

The subject of the Postgraduate Program in Physics with Specializations in Theoretical and Experimental Physics is the Science of Physics (basic and applied).

The purpose of the Program twofold:
1. The training of scientists at postgraduate level according to international standards, so that they have the possibility to perform independent and autonomous scientific research.
2. The specialization of scientists in basic and applied cutting-edge fields, so that they prove productive in a rapidly changing technological environment.

The Program awards a Postgraduate Diploma in Physics with the following specializations:
1. "Postgraduate Diploma in Physics with Specialization in Theoretical Physics".
2. "Postgraduate Diploma in Physics with Specialization in Experimental Physics"

For admission to the Postgraduate Program, candidates should be graduate students from Departments of Natural Sciences (Physics, Chemistry, Mathematics, Computer Science, Materials Science and Biology) and Polytechnic Universities in Greece, or holders of equivalent degrees from foreign countries.

The duration of studies is 3 semesters at minimum, including the time required for the submission and defense of the thesis. The maximum permitted duration of studies is set to 6 semesters. Upon completion of the 1st semester of their studies, students have to select either one of the specializations available and follow the corresponding elective courses.

Teaching, essays/homework, exams and writing the MSc thesis can be done in Greek or/and English.

Candidates are required to take written exams that take place during the first two weeks of October. The selection of candidates is a responsibility of the Program Steering Committee and includes:

1. Written exams in topics of General and Modern Physics
2. Written exams in a foreign language (English, French or German)

In addition, candidates are required to pass an oral interview with the Steering Committee.

Candidates having exceptional grades (as specified in the call), as well as candidates holding an MSc in Physics or in a related field are exempted from the exams in General Physics.

Graduates of foreign universities are admitted based on their performance in (a) the first cycle of studies and (b) in international tests, as well as on the basis of letters of recommendation. They are also required to pass an oral interview with the Steering Committee. The required level of language knowledge for this category of candidates is C1 ("very good knowledge"). To be awarded the Program degree, candidates should see to the academic recognition of the first cycle of studies degree by the DOATAP Center.

Courses and Lecturers Catalogue

1st SEMESTER

Code	Core Courses	ECTS	Weekly hours	Lecturer
M111	Quantum Mechanics	10	5	D. Sofikitis
M112	Experimental Physics	10	5	G. Floudas, I. Deligiannakis, A. Douvalis, C. Kosmidis, S. Cohen, A. Nindos, S. Patsourakos
M113	Statistical Physics	10	5	I. Deligiannakis
Total ECTS of 1st Semester: 30				

2nd SEMESTER

Code	Courses	ECTS	Weekly hours	Lecturer
M114	Classical Electrodynamics (Core)	9	5	I. Florakis
	Elective Course A	7	4	
	Elective Course B	7	4	
	Elective Course C	7	4	
Total ECTS of 2nd Semester: 30				

Elective courses are selected from the list below by field:

Code	Elective Courses in Theoretical Physics	ECTS	Weekly hours	Lecturer
M121	Mathematical Methods in Physics	7	4	A. Dedes, G. Leontaris
M122	Gravity and Cosmology	7	4	P. Kanti
M123	Plasma Physics	7	4	V. Archontis
M124	Astrophysics	7	4	A. Nindos
M125	Computational Methods in Physics	7	4	Not available in the academic year 2023-2024
M126	Quantum Field Theory	7	4	K. Tamvakis
M127	High Energy Physics	7	4	A. Dedes
M128	Condensed Matter Physics	7	4	G. Evangelakis
M129	Atomic and Molecular Physics	7	4	C. Kosmidis, S. Cohen
M141	Nuclear Physics	7	4	N. Patronis
M142	Statistical Analysis of Experimental Data (C++)	7	4	P. Kokkas, C. Foudas

Code	Elective Courses in Experimental Physics	ECTS	Weekly hours	Lecturer
M121	Mathematical Methods in Physics	7	4	A. Dedes, G. Leontaris
M143	Materials Science	7	4	A. Markou

M144	Nanoscale Physics	7	4	I. Deligiannakis
M124	Astrophysics	7	4	A. Nindos
M145	Quantum Optics and Lasers	7	4	D. Sofikitis
M126	Quantum Field Theory	7	4	K. Tamvakis
M127	High Energy Physics	7	4	A. Dedes
M128	Condensed Matter Physics	7	4	G. Evangelakis
M129	Atomic and Molecular Physics	7	4	C. Kosmidis, S. Cohen
M141	Nuclear Physics	7	4	N. Patronis
M142	Statistical Analysis of Experimental Data (C++)	7	4	P. Kokkas, C. Foudas
M146	Biophysics	7	4	P. Papadopoulos
M147	Magnetism	7	4	A. Douvalis

3rd SEMESTER

Code	Core Courses	ECTS	Weekly hours	Lecturer
M130	Master Thesis	30		

2. Postgraduate Studies in Atmospheric Sciences and the Environment

The Master's Program in Atmospheric Sciences and the Environment was established in 1994. It was re-established in 2018 and modified in 2023 (Official Government Gazette 1702/B/2023).

The Program provides specialized knowledge in Atmospheric Sciences and the Environment to graduates of related disciplines. It prepares and trains scientists at postgraduate level in accordance with international standards, with the aim of acquiring the ability of independent scientific research.

Objects of the Program "Atmospheric Sciences and Environment" are:

(1) postgraduate education and the provision of specialized knowledge in Atmospheric Sciences and the Environment to graduates of Departments of related specialties, graduates of Hellenic Higher Education Institutes or holders of recognized foreign equivalent diplomas.

(2) the training and education of scientists at postgraduate level in accordance with international standards and their specialization in research subjects related to the title of Program, with the aim of acquiring the ability of independent and autonomous scientific research.

The purpose of the Program is the creation of graduates with high-level knowledge, who are aware of the latest developments in the subjects of Atmospheric Sciences and the Environment and possess the necessary knowledge to produce original research in the above subjects and to participate in solving problems and dealing with related issues. The graduates of Program are theoretically and practically trained according to international standards and able to successfully meet the demands of their future employment in fields related to Atmospheric Sciences and the Environment.

The MSc program awards a Postgraduate Diploma in Atmospheric Sciences and the Environment.

Graduates of the Schools of Sciences (Physics, Mathematics), Environmental Sciences, Engineering Sciences, Agroforestry and Military Schools of Greek and of recognized institutions from abroad may be admitted to the Program. Graduates of other Departments may be admitted upon decision from the Steering Committee of the Program.

The minimum duration of studies is 3 semesters, including the time required for the submission and defense of the thesis. The maximum permitted duration of studies is set to 6 semesters.

Teaching, essays/homework, exams and writing of the MSc thesis can done in Greek or/and English.

The selection of candidates follows from an examination procedure that takes place under the responsibility of the Program Steering Committee and includes:

1. Written exams in General Physics.
2. Written exams in English on the terminology related to the Atmospheric Sciences
3. Oral interview of the candidates by the members of the Steering Committee.

Graduates of Physics Departments having exceptional grades (as specified in the Call), as well as candidates holding an MSc in Physics or in a related field are admitted following a decision of the Steering Committee, on a priority basis, without taking the exams in General Physics and on the condition of passing the English exam and attending the oral interview.

Courses and Lecturers Catalogue

1st SEMESTER

Code	Core Courses	ECTS	Weekly hours	Lecturer
M211	Meteorology	7	4	C. Lolis
M212	Climatology	8	4	N. Hatzianastasiou
M213	Physics of the Atmospheric Environment	7	4	P. Kassomenos
Two (2) of the elective courses below:				
Code	**Elective Courses**	**ECTS**	**Weekly hours**	**Lecturer**
M214	Oceanography	4	3	N. Bakas
M215	Micrometeorology	4	3	N. Bakas
M216	Man and the Environment	4	3	M. Markou
M217	Environmental Chemistry	4	3	N. Michalopoulos
Total number of ECTS of 1st semester: 30				

2nd SEMESTER

Code	Core Courses	ECTS	Weekly hours	Lecturer
M221	Physics of the Atmosphere	8	4	N. Hatzianastasiou
M222	Dynamic Meteorology	8	4	A. Bartzokas
M228	Computational Data Processing Tools	6	4	N. Hatzianastasiou, C. Lolis, N. Bakas, A. Nindos, S. Patsourakos
Two (2) of the elective courses below:				
Code	**Elective Courses**	**ECTS**	**Weekly hours**	**Lecturer**
M224	Methods of Remote Sensing	4	3	S. Kolios
M225	Elements of Weather Analysis and Forecasting	4	3	C. Lolis
M226	Renewable Sources of Energy	4	3	K. Kavvadias
M227	Environmental Impact Studies	4	3	P. Kassomenos
Total number of ECTS of 2nd semester: 30				

3rd SEMESTER

Code	Core Courses	ECTS	Weekly hours	Lecturer
M230	Master Thesis	30		

If there is sufficient funding, the Program provisions a few-day internship of the postgraduate students at the Meteorological Station of the Ioannina Airport, at the National Meteorological Service, the General Directorate of Atmospheric Pollution and Noise Control, the Center for Renewable Energy Sources and the Meteorological Applications Center of Macedonia Airport of Thessaloniki.

3. Postgraduate Studies in Modern Electronic Technologies

The Master's Program in Modern Electronic Technologies (MSc-MET) has been operating in the Physics Department since 1996. It was re-established in 2018 and modified in 2023 (Official Government Gazette 1593/B/2023).

The object of the MSc-MET is to offer post-graduate education and specialization in modern electronic technologies to graduates from domestic Departments of similar specialties or to holders of recognized equivalent diplomas from abroad.

The purpose of MSc-MET is to train its postgraduate students so that they can contribute to the advancement of research and development processes and support technological production in branches of Modern Electronic Technologies. Interdisciplinarity is particularly promoted by dealing with electronics in cutting-edge fields (e.g. Biomedicine, Environment, Telecommunications) that require innovative electronic systems, thus supporting not only research but also production and employment.

The Program awards a MSc-equivalent Postgraduate Diploma in Modern Electronic Technologies.

Students admitted at MSc-MET are graduates of Physics, Informatics, Electronic Engineering, Electrical Engineering, Computer Technology Engineering, Computer Engineering, Computer and Informatics Electrical Engineering, Computer Telecommunications and Network Engineering and other related specialties, nationally and internationally recognized.

The minimum and maximum duration of the studies to award a Master's Degree in the Program is three (3) and six (6) semesters respectively.

Teaching, essays/homework, exams and the writing of the MSc thesis can be done in Greek or/and English.

The selection of candidates follows from an interview or/and an examination procedure (oral or/and written) in topics decided by the Steering Committee and announced at the pertinent Call. Candidates are additionally required to pass written

exams in English, on the terminology related to the MSc. Successful completion of relevant undergraduate courses is highly considered during the selection process.

Following recommendation of the Steering Committee and decision of the Department of Physics Assembly, candidates may be selected without taking examinations provided that: a) they are distinguished graduates from Departments specified in article 4 of the Official Government Gazette 1593/B/2023, b) they hold a master's degree from a national university or a recognized foreign master's degree in subjects related to the Program.

Courses and Lecturers Catalogue

1st SEMESTER

Code	Core Courses	ECTS	Weekly hours	Lecturer
M411	Physics of Electronic Devices	5	3	E. Evangelou, G. Baldoumas (EDIP)
M412	Digital Electronics	8	5	K. Foudas
M413	Microprocessors-Microcontrollers-Laboratories	8	6	I. Evangelou, C. Foudas, D. Bletsas (EDIP)
M414	Microelectronics-Design with VHDL-Laboratories	9	6	N. Manthos, I. Papadopoulos, J. Strologas
TOTAL		**30**	**20**	

2nd SEMESTER

Code	Core Courses	ECTS	Weekly hours	Lecturer
M421	Analog Electronics	5	3	G. Tsiatouchas
M422	Electronic Design-Laboratories	9	7	E. Evangelou, I. Papadopoulos, G. Baldoumas (EDIP), D. Bletsas (EDIP)
M423	Telecommunication Principles	8	5	V. Christofilakis, N. Mitrou

M424	Digital Signal Processing	8	5	V. Christofilakis
TOTAL		**30**	**20**	

3rd SEMESTER

Κωδικός	Υποχρεωτικά Μαθήματα	ECTS	Ώρες	Διδάσκοντες
M430	MSc Thesis	30		

E. DOCTORAL STUDIES

The Regulation for Doctoral Studies at the Department of Physics is published in Official Government Gazette 832/2018. This Regulation applies to all doctoral candidates of the Department, regardless of their date of entrance. The full text is available on the website: http://www.physics.uoi.gr/el/node/225

The main points for the process of elaboration of a Doctoral Thesis are listed below:

1. Doctoral Dissertation preparation process

1. **Call for expression of interest for carrying out a doctoral dissertation**
   The Department of Physics may announce doctoral positions twice a year and, in particular, before the start of the winter and spring academic semesters. The announcement specifies the possible research fields and the recommending faculty members. The announcement is posted on the Department and on the University websites.

2. **Doctoral Candidates**
   Eligible for applying are those who hold a Master's Degree in Physics or in a subject related to Physics, obtained from national Institutions or recognized as equivalent Institutions from abroad. The documents required for supporting the application for candidacy, as well as the details of the selection process are provided for in the provisions of article 38 of Law 4485/2017 (Government Gazette 114 section A') and are listed in detail on the website: http://www.physics.uoi.gr/el/node/225

3. **Selection of doctoral candidates**
   Candidates are selected on the basis of their performance in undergraduate and postgraduate studies, the interview (which may also take place via teleconference), the letters of recommendation they submit, as well as the scientific papers or other research work they have carried out.

4. The **supervisor** of the doctoral thesis recommends the **three-member Advisory Committee** which is responsible for the supervision and guidance of the candidate, and is appointed by the General Assembly of the Department**.**

5. The **Doctoral Studies Committee** after consultation with the supervisor or the three-Member Advisory Committee (should it have been appointed) may recommend that the PhD candidate successfully attends courses offered by the Department's Postgraduate Studies Programs. In this case, the PhD candidate must successfully complete the courses before the seven-Member Examination Committee is established.

6. The title of the doctoral dissertation may be **amended/finalized** upon recommendation by the three-Member Advisory Committee and approval by the General Assembly of the Department, before the doctoral dissertation is written and prior to appointing the seven-Member Examination Committee.

7. **Duration**

   The duration for obtaining the doctoral degree is at least three (3) full calendar years and no more than six (6) full calendar years from the date that the three-Member Advisory Committee has been appointed.

8. **Writing, defense and evaluation of the doctoral dissertation**

   After completing the writing of the doctoral dissertation:

   - The PhD candidate applies to the General Assembly of the Department for the public defense and evaluation of the dissertation.
   - Should the application be accepted by the three-Member Advisory Committee, the Committee prepares a recommendation letter requesting the appointment of a seven-Member Examination Committee by the General Assembly of the Department.

2. Obligations of the Doctoral Candidate

Each PhD candidate is required to:

1) To renew his registration at the beginning of each academic year.
2) To submit to the three-Member Advisory Committee a detailed written report on their progress, once a year.
3) To give an oral presentation of their progress in the form of a seminar, once a year.
4) To attend the seminars organized by the Department.
5) To assist in teaching, when ask to.

3. Doctoral Candidates & List of Doctoral Theses

The catalogue of the Department PhD Candidates is available on the website:
http://www.physics.uoi.gr/el/node/225

The catalogue of PhD Dissertations carried out at the Department is available on the website:
http://www.physics.uoi.gr/phdlist

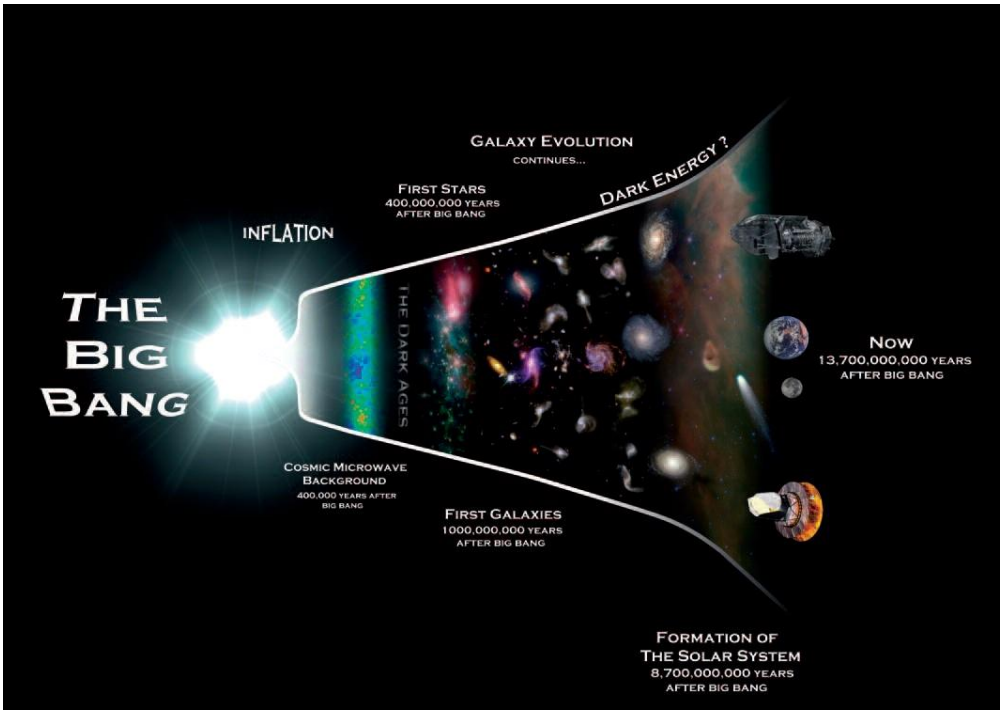
4. Postdoctoral Fellows

Name	Supervisor	Office	Tel.*	E-mail
Juxhin Zhuleku	V. Archontis	Φ2-405	8468	j.zhuleku@uoi.gr
Antoniou Ioannis	L. Perivolaropoulos	Φ2-302	8632	i.antoniou@uoi.gr
Giannaka Panagiota	X. Aslanoglou	Φ2-203	8489	pgiannaka@uoi.gr
Evangelias Achilleas	G. Throumoulopoulos	Φ2-325	8479	a.evangelias@uoi.gr
Moraitis Konstantinos	S. Patsourakos	Φ2-406	8478	k.moraitis@uoi.gr
Pipertzis Achilleas	G. Floudas	Φ3-208	8564	a.pipertzis@uoi.gr
Skara Fotini	L. Perivolaropoulos			f.skara@uoi.gr

* Telephone number prefix: +30 265100 -

F. CATALOGUE OF THE PERSONNEL

The catalogue of personnel of the Department of Physics is available on the website: http://www.physics.uoi.gr/el/node/1004



G. USEFUL INFORMATION

1. Useful Phone-numbers (265100-)

University Services	
Department of Physics Secretariat	7490, 7491, 7192
Department of Physics Reading room	8510
Central Gate	6533
Central Library	5958, 5912
Computer Center	7150, 7151, 7152
Network Management Center	7777, 7157
Department of Physics Concierge (building Φ2)	8519
Students Residences Manager Office	5466, 5467
Students Residences A΄ Concierge	5478
Students Residences B΄ Concierge	6436
Students Residences at Perivleptos Hill	2651042051, 2651043804, 2651042375
Health Service Office – Infirmary	5646, 5561, 6534
University Publishing (Printing Office - Bookstore)	6544
Division of International and Public Relations	7105-7, 7203
Career Services Office	8454-60
Vocational Training Center	9124, 9131, 9141
Office for Unemployment Programmes	7940
Student Care Office	5466, 5467, 5635
Counselling Center	6600
International Centre of Hellenic Culture and Professional Training "Stavros Niarchos" (DI.K.E.P.P.E.E.)	9135, 9150
DI.K.E.P.P.E.E. Guest House Management Office	9147
Science and Technology Park of Epirus	7650, 7448
University Sports Center	6440, 6441, 6442
Students Canteen	5383, 5385, 5386
«ΦΗΓΟΣ» Restaurant	5468, 5469
Restaurant and Canteen at Peristera of Dourouri Monastery	8646
School of Sciences Canteen	8623
Post office	5461, 5462, 5376
Association of Teaching Staff Members	7912
Association of Administrative Staff Members	7268
Society of Photography (FOSPI)	5476
Theatre Club (THE.S.P.I.)	5475
Speech and Art Hall	6449, 5918
Student Voluntary Blood Donation Group (FOEA)	5474, 5395

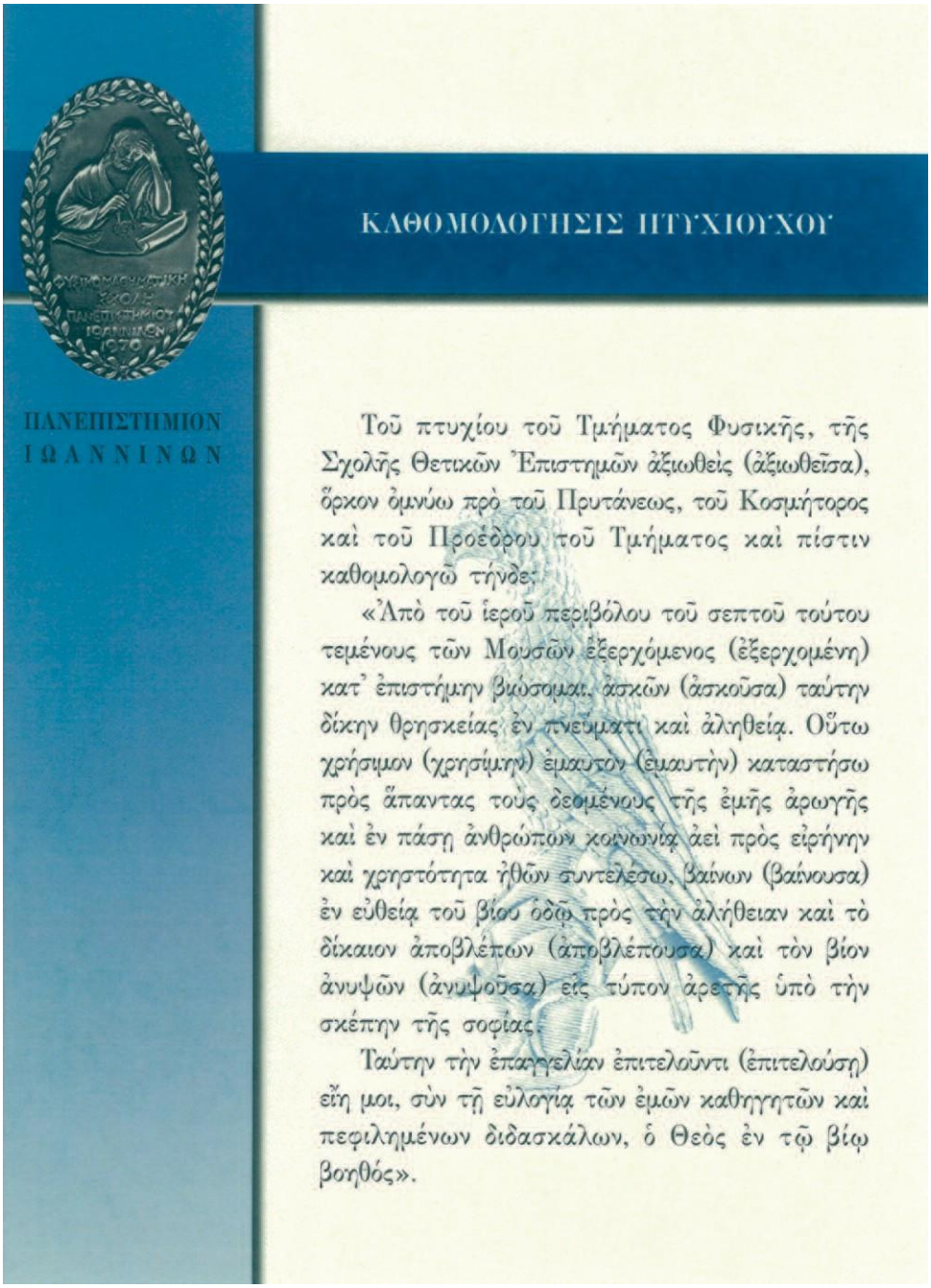
Hospitals	
General Hospital “G. Hatzikostas” (εφημερεύει τις ζυγές ημερομηνίες)	2651366111
University General Hospital (εφημερεύει τις μονές ημερομηνίες)	2651099111
National Emergency Center (E.K.A.B.)	166

2. Useful Internet Addresses

University of Ioannina	http://www.uoi.gr
Department of Physics	http://www.physics.uoi.gr
Department of Physics Secretariat	e-mail: gramphys@uoi.gr
Section I	http://www.physics.uoi.gr/el/node/42
Laboratory of Meteorology	http://www.physics.uoi.gr/seci/meteo1.html
Ioannina Weather Forecast	http://www.physics.uoi.gr/seci/weather.html http://www.riskmed.net
Laboratory of Astronomy	http://www.physics.uoi.gr/seci/astronomy1.html
Section II	http://theory.physics.uoi.gr http://www.physics.uoi.gr/el/node/43
Section III	http://www.physics.uoi.gr/el/node/44
Atomic and Molecular Physics Laboratory	http://atomol.physics.uoi.gr

Nuclear Physics Laboratory	http://npl.physics.uoi.gr
High Energy Physics Laboratory	https://alpha.physics.uoi.gr
Section IV	http://www.physics.uoi.gr/el/node/45
Electronics-Telecommunications Laboratory	http://www.telecomlab.gr
Online Course Registration	https://classweb.uoi.gr
Central Library – Information Center	http://www.lib.uoi.gr
University Publishing	http://epi.uoi.gr
Housing Service	http://enoikiazetai.uoi.gr
International Centre of Hellenic Culture and Professional Training "Stavros Niarchos" (DI.K.E.P.P.E.E.)	http://dikeppee.uoi.gr
ERASMUS Programme	http://www.uoi.gr/ekpaideysi/erasmusplus
Quality Certification Unit (MODIP)	https://modip.uoi.gr
Career Service	http://dasta.uoi.gr
Division of International and Public Relations	http://piro.uoi.gr
Asynchronous Online Teaching Platform	https://ecourse.uoi.gr
University Phone Book	http://www.uoi.gr/katalogos
Webmail Service	http://email.uoi.gr
Research Committee	https://www.rc.uoi.gr
Network Management Center	http://noc.uoi.gr, e-mail: helpdesk@noc.uoi.gr
Ioannina City Guide	http://ioannina.uoi.gr
Ministry of Education	http://www.minedu.gov.gr
Hellenic Physical Society	http://www.eef.gr
Physics Web	http://www.phys.org
Physics World	http://physicsworld.com

GRADUATE'S OATH (RELEGIOUS INAUGURATION)



ΠΑΝΕΠΙΣΤΗΜΙΟΝ
ΙΩΑΝΝΙΝΩΝ

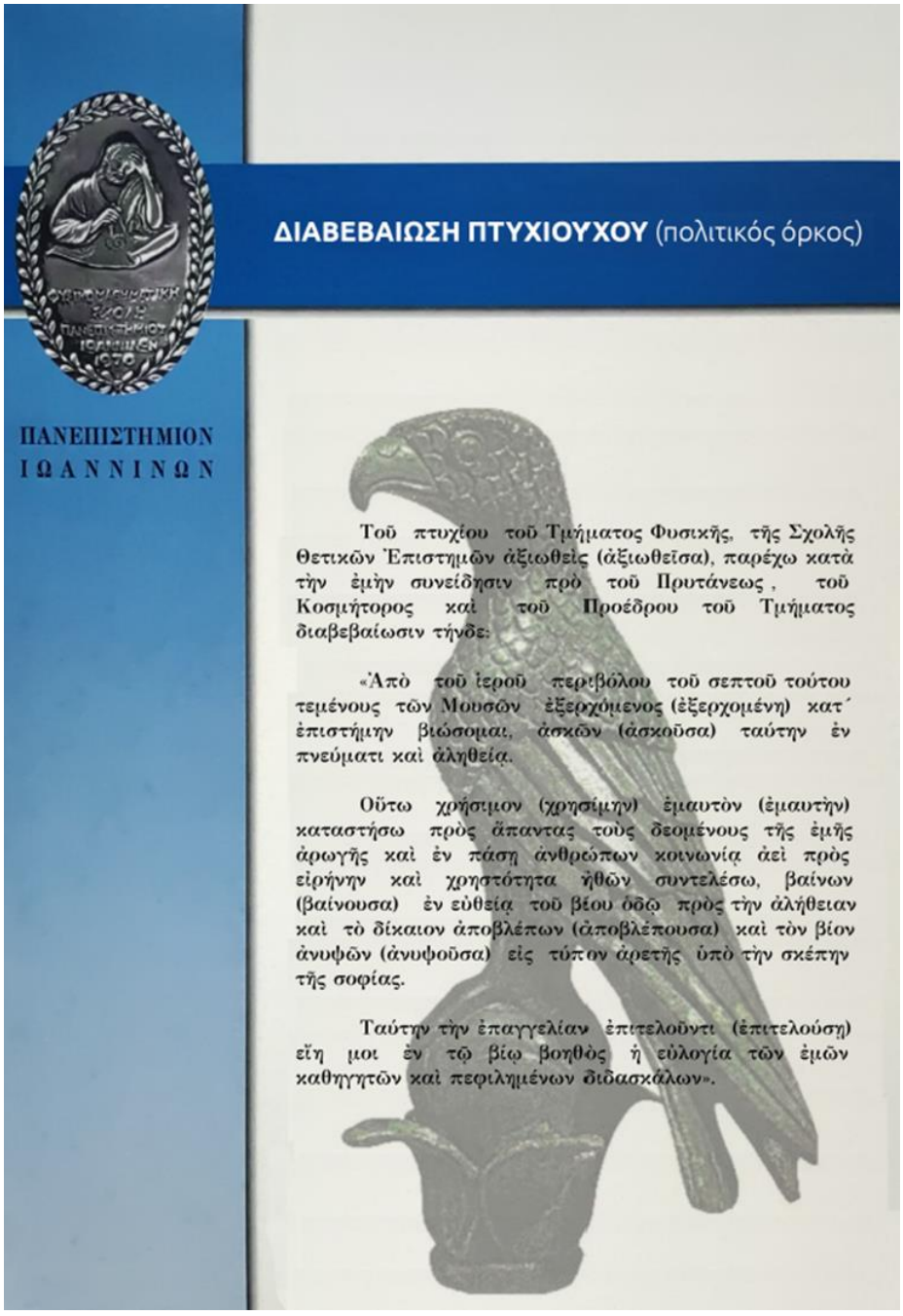
ΚΑΘΟΜΟΛΟΓΗΣΙΣ ΠΤΥΧΙΟΥΧΟΥ

Τοῦ πτυχίου τοῦ Τμήματος Φυσικῆς, τῆς Σχολῆς Θετικῶν Ἐπιστημῶν ἀξιωθεὶς (ἀξιωθεῖσα), ὅρκον ὀμνύω πρὸ τοῦ Πρυτάνεως, τοῦ Κοσμήτορος καὶ τοῦ Προέδρου τοῦ Τμήματος καὶ πίστιν καθομολογῶ τήνδε:

«Ἀπὸ τοῦ ἱεροῦ περιβόλου τοῦ σεπτοῦ τούτου τεμένους τῶν Μουσῶν ἐξερχόμενος (ἐξερχομένη) κατ' ἐπιστήμην βιώσομαι, ἀσκῶν (ἀσκοῦσα) ταύτην δίκην θρησκείας ἐν πνεύματι καὶ ἀληθείᾳ. Οὕτω χρήσιμον (χρησίμην) ἐμαυτὸν (ἐμαυτὴν) καταστήσω πρὸς ἅπαντας τοὺς δεομένους τῆς ἐμῆς ἀρωγῆς καὶ ἐν πάσῃ ἀνθρώπων κοινωνίᾳ ἀεὶ πρὸς εἰρήνην καὶ χρηστότητα ἠθῶν συντελέσω. Βαίνων (βαίνουσα) ἐν εὐθείᾳ τοῦ βίου ὁδῷ πρὸς τὴν ἀλήθειαν καὶ τὸ δίκαιον ἀποβλέπων (ἀποβλέπουσα) καὶ τὸν βίον ἀνυψῶν (ἀνυψοῦσα) εἰς τύπον ἀρετῆς ὑπὸ τὴν σκέπην τῆς σοφίας.

Ταύτην τὴν ἐπαγγελίαν ἐπιτελοῦντι (ἐπιτελούσῃ) εἴη μοι, σὺν τῇ εὐλογίᾳ τῶν ἐμῶν καθηγητῶν καὶ πεφιλημένων διδασκάλων, ὁ Θεὸς ἐν τῷ βίῳ βοηθός».

GRADUATE'S OATH (POLITICAL INAUGURATION)



ΠΑΝΕΠΙΣΤΗΜΙΟΝ
ΙΩΑΝΝΙΝΩΝ

ΔΙΑΒΕΒΑΙΩΣΗ ΠΤΥΧΙΟΥΧΟΥ (πολιτικός όρκος)

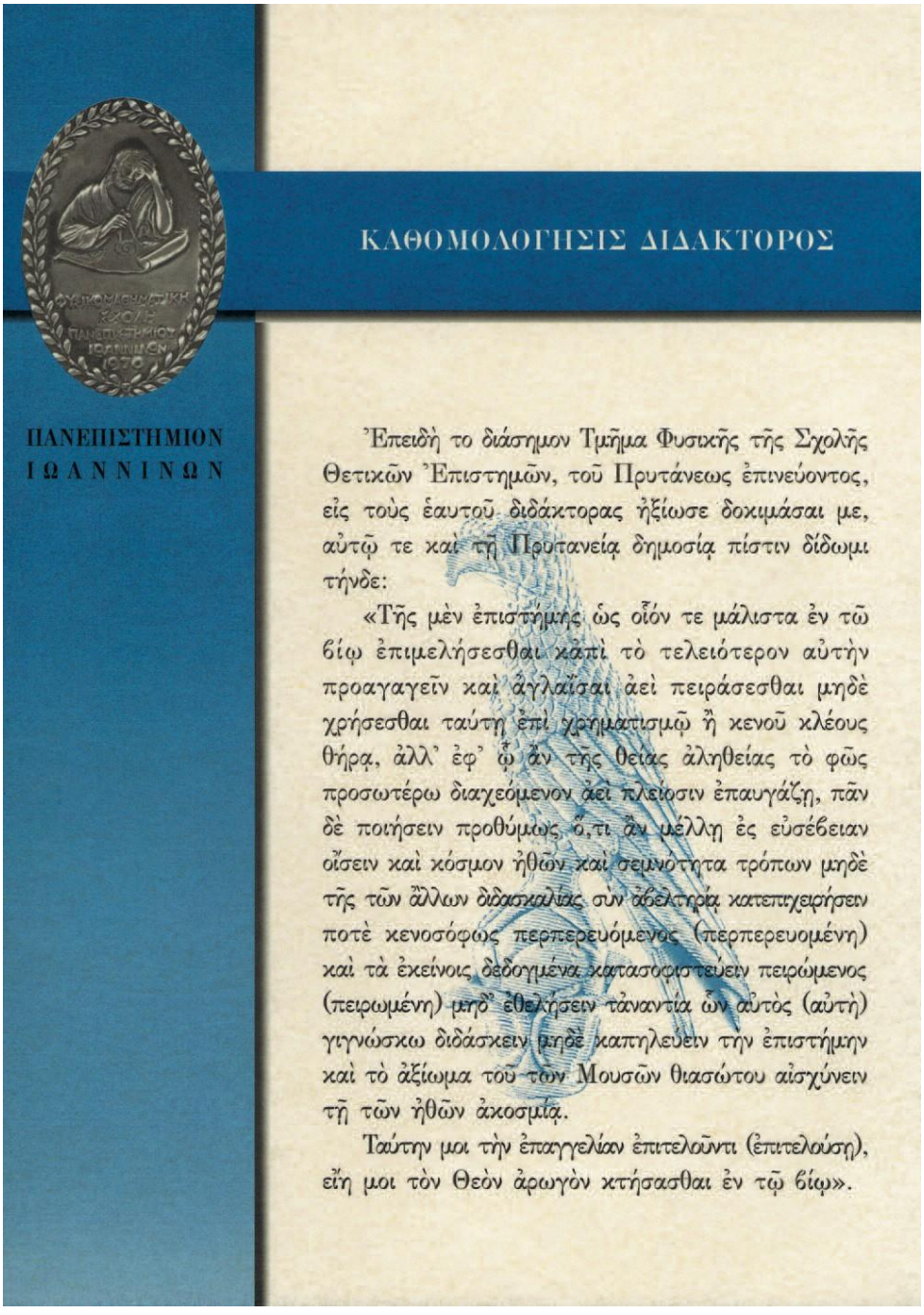
Τοῦ πτυχίου τοῦ Τμήματος Φυσικῆς, τῆς Σχολῆς Θετικῶν Ἐπιστημῶν ἀξιωθεὶς (ἀξιωθεῖσα), παρέχω κατὰ τὴν ἐμὴν συνείδησιν πρὸ τοῦ Πρυτάνεως, τοῦ Κοσμήτορος καὶ τοῦ Προέδρου τοῦ Τμήματος διαβεβαίωσιν τήνδε:

«Ἀπὸ τοῦ ἱεροῦ περιβόλου τοῦ σεπτοῦ τούτου τεμένους τῶν Μουσῶν ἐξερχόμενος (ἐξερχομένη) κατ΄ ἐπιστήμην βιώσομαι, ἀσκῶν (ἀσκοῦσα) ταύτην ἐν πνεύματι καὶ ἀληθείᾳ.

Οὕτω χρήσιμον (χρησίμην) ἐμαυτὸν (ἐμαυτὴν) καταστήσω πρὸς ἅπαντας τοὺς δεομένους τῆς ἐμῆς ἀρωγῆς καὶ ἐν πάσῃ ἀνθρώπων κοινωνίᾳ ἀεὶ πρὸς εἰρήνην καὶ χρηστότητα ἠθῶν συντελέσω, βαίνων (βαίνουσα) ἐν εὐθείᾳ τοῦ βέου ὁδῷ πρὸς τὴν ἀλήθειαν καὶ τὸ δίκαιον ἀποβλέπων (ἀποβλέπουσα) καὶ τὸν βίον ἀνυφῶν (ἀνυφοῦσα) εἰς τύπον ἀρετῆς ὑπὸ τὴν σκέπην τῆς σοφίας.

Ταύτην τὴν ἐπαγγελίαν ἐπιτελοῦντι (ἐπιτελούσῃ) εἴη μοι ἐν τῷ βίῳ βοηθὸς ἡ εὐλογία τῶν ἐμῶν καθηγητῶν καὶ πεφιλημένων διδασκάλων».

DOCTOR OF PHILOSOPHY (PhD) OATH (RELEGIOUS INAUGURATION)



ΠΑΝΕΠΙΣΤΗΜΙΟΝ
ΙΩΑΝΝΙΝΩΝ

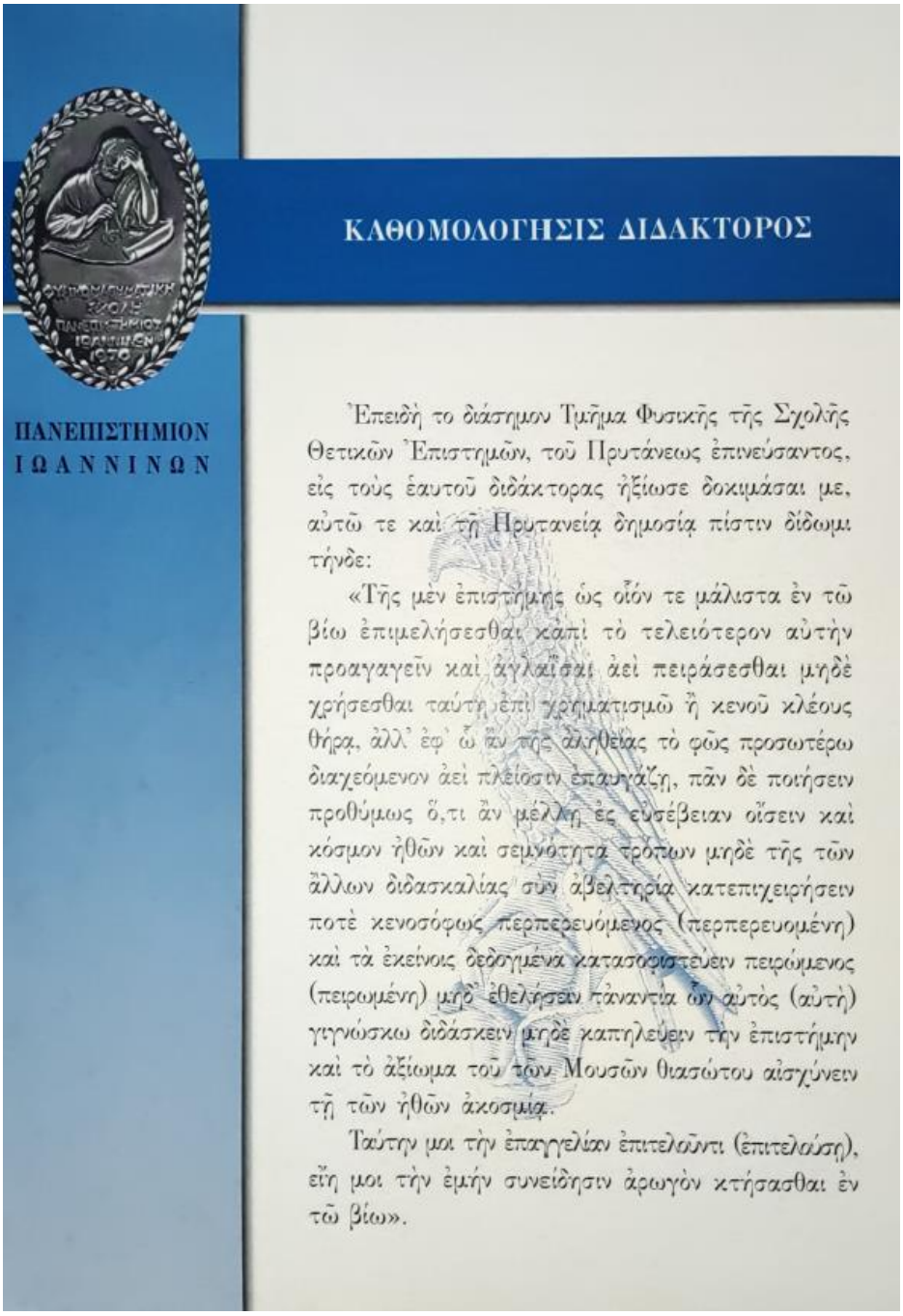
ΚΑΘΟΜΟΛΟΓΗΣΙΣ ΔΙΔΑΚΤΟΡΟΣ

Ἐπειδὴ το διάσημον Τμῆμα Φυσικῆς τῆς Σχολῆς Θετικῶν Ἐπιστημῶν, τοῦ Πρυτάνεως ἐπινεύοντος, εἰς τοὺς ἑαυτοῦ διδάκτορας ἠξίωσε δοκιμάσαι με, αὐτῷ τε καὶ τῇ Πρυτανείᾳ δημοσίᾳ πίστιν δίδωμι τήνδε:

«Τῆς μὲν ἐπιστήμης ὡς οἷόν τε μάλιστα ἐν τῷ βίῳ ἐπιμελήσεσθαι καὶ ἐπὶ τὸ τελειότερον αὐτὴν προαγαγεῖν καὶ ἀγλαΐσαι ἀεὶ πειράσεσθαι μηδὲ χρήσεσθαι ταύτῃ ἐπὶ χρηματισμῷ ἢ κενοῦ κλέους θήρᾳ, ἀλλ' ἐφ' ᾧ ἂν τῆς θείας ἀληθείας τὸ φῶς προσωτέρω διαχεόμενον ἀεὶ πλείοσιν ἐπαυγάζῃ, πᾶν δὲ ποιήσειν προθύμως ὅ,τι ἂν μέλλῃ ἐς εὐσέβειαν οἴσειν καὶ κόσμον ἠθῶν καὶ σεμνότητα τρόπων μηδὲ τῆς τῶν ἄλλων διδασκαλίας σὺν ἀφελτρίᾳ κατεπιχειρήσειν ποτὲ κενοσόφως περπερευόμενος (περπερευομένη) καὶ τὰ ἐκείνοις δεδογμένα κατασοφιστεύειν πειρώμενος (πειρωμένη) μηδ' ἐθελήσειν τἀναντία ὧν αὐτὸς (αὐτὴ) γιγνώσκω διδάσκειν μηδὲ καπηλεύειν τὴν ἐπιστήμην καὶ τὸ ἀξίωμα τοῦ τῶν Μουσῶν θιασώτου αἰσχύνειν τῇ τῶν ἠθῶν ἀκοσμίᾳ.

Ταύτην μοι τὴν ἐπαγγελίαν ἐπιτελοῦντι (ἐπιτελούσῃ), εἴη μοι τὸν Θεὸν ἀρωγὸν κτήσασθαι ἐν τῷ βίῳ».

DOCTOR OF PHILOSOPHY (PhD) OATH (POLITICAL INAUGURATION)



ΠΑΝΕΠΙΣΤΗΜΙΟΝ
ΙΩΑΝΝΙΝΩΝ

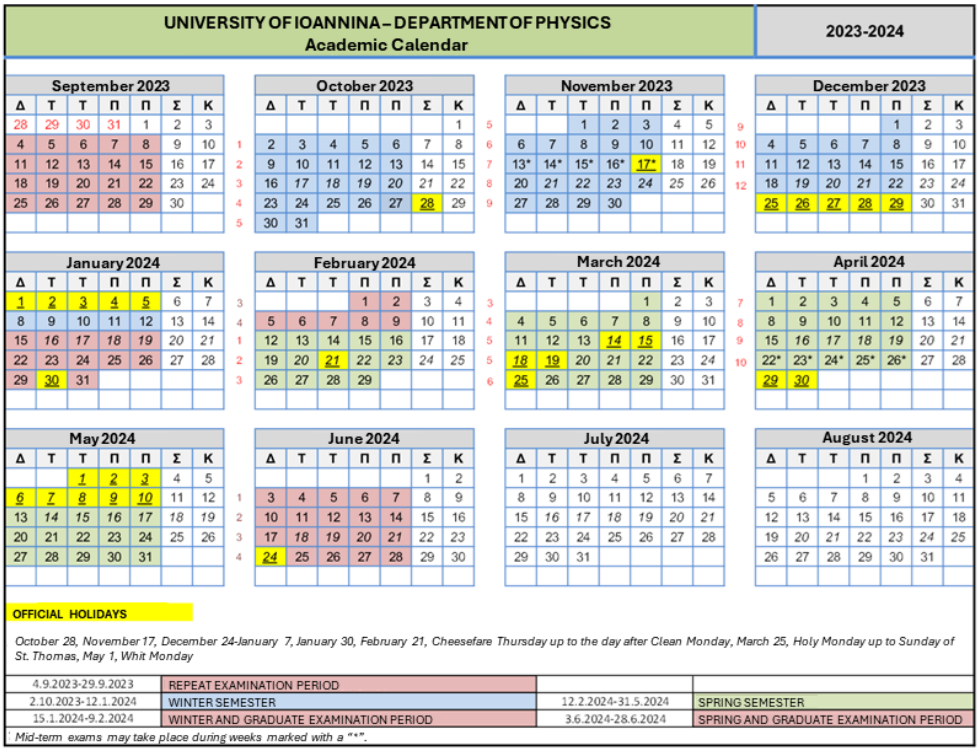
ΚΑΘΟΜΟΛΟΓΗΣΙΣ ΔΙΔΑΚΤΟΡΟΣ

Ἐπειδὴ το διάσημον Τμῆμα Φυσικῆς τῆς Σχολῆς Θετικῶν Ἐπιστημῶν, τοῦ Πρυτάνεως ἐπινεύσαντος, εἰς τοὺς ἑαυτοῦ διδάκτορας ἠξίωσε δοκιμάσαι με, αὐτῶ τε καὶ τῇ Πρυτανείᾳ δημοσίᾳ πίστιν δίδωμι τήνδε:

«Τῆς μὲν ἐπιστήμης ὡς οἷόν τε μάλιστα ἐν τῶ βίω ἐπιμελήσεσθαι καὶ τὸ τελειότερον αὐτὴν προαγαγεῖν καὶ ἀγλαΐσαι ἀεὶ πειράσεσθαι μηδὲ χρήσεσθαι ταύτῃ ἐπὶ χρηματισμῶ ἢ κενοῦ κλέους θήρᾳ, ἀλλ᾽ ἐφ᾽ ὦ ἂν τῆς ἀληθείας τὸ φῶς προσωτέρω διαχεόμενον ἀεὶ πλείστην ἐπαυγάζῃ, πᾶν δὲ ποιήσειν προθύμως ὅ,τι ἂν μέλλῃ ἐς εὐσέβειαν οἴσειν καὶ κόσμον ἠθῶν καὶ σεμνότητα τρόπων μηδὲ τῆς τῶν ἄλλων διδασκαλίας σὺν ἀβελτηρίᾳ κατεπιχειρήσειν ποτὲ κενοσόφως περπερευόμενος (περπερευομένη) καὶ τὰ ἐκείνοις δεδογμένα κατασοφιστεύειν πειρώμενος (πειρωμένη) μηδ᾽ ἐθελήσειν πάναντία ὧν αὐτὸς (αὐτὴ) γιγνώσκω διδάσκειν μηδὲ καπηλεύειν τὴν ἐπιστήμην καὶ τὸ ἀξίωμα τοῦ τῶν Μουσῶν θιασώτου αἰσχύνειν τῇ τῶν ἠθῶν ἀκοσμίᾳ.

Ταύτην μοι τὴν ἐπαγγελίαν ἐπιτελοῦντι (ἐπιτελούσῃ), εἴη μοι τὴν ἐμὴν συνείδησιν ἀρωγὸν κτήσασθαι ἐν τῶ βίω».

PHYSICS DEPARTMENT'S ACADEMIC CALENDAR 2023-2024



UNIVERSITY OF IOANNINA – DEPARTMENT OF PHYSICS
Academic Calendar

2023-2024

September 2023

	Δ	Τ	Τ	Π	Π	Σ	Κ
	28	29	30	31	1	2	3
1	4	5	6	7	8	9	10
2	11	12	13	14	15	16	17
3	18	19	20	21	22	23	24
4	25	26	27	28	29	30	

October 2023

	Δ	Τ	Τ	Π	Π	Σ	Κ
							1
1	2	3	4	5	6	7	8
2	9	10	11	12	13	14	15
3	16	*17*	*18*	*19*	*20*	*21*	*22*
4	23	24	25	26	27	28	29
5	30	31					

November 2023

	Δ	Τ	Τ	Π	Π	Σ	Κ
5			1	2	3	4	5
6	6	7	8	9	10	11	12
7	13*	14*	15*	16*	17*	18	19
8	20	*21*	*22*	*23*	*24*	*25*	*26*
9	27	28	29	30			

December 2023

	Δ	Τ	Τ	Π	Π	Σ	Κ
9					1	2	3
10	4	5	6	7	8	9	10
11	11	12	13	14	15	16	17
12	18	*19*	*20*	*21*	*22*	*23*	*24*
	25	26	27	28	29	30	31

January 2024

	Δ	Τ	Τ	Π	Π	Σ	Κ
	1	2	3	4	5	6	7
13	8	9	10	11	12	13	14
1	15	*16*	*17*	*18*	*19*	*20*	*21*
2	22	23	24	25	26	27	28
3	29	30	31				

February 2024

	Δ	Τ	Τ	Π	Π	Σ	Κ
3				1	2	3	4
4	5	6	7	8	9	10	11
1	12	13	14	15	16	17	18
2	19	*20*	*21*	*22*	*23*	*24*	*25*
3	26	27	28	29			

March 2024

	Δ	Τ	Τ	Π	Π	Σ	Κ
3					1	2	3
4	4	5	6	7	8	9	10
5	11	12	13	*14*	*15*	16	17
5	*18*	*19*	*20*	*21*	*22*	23	*24*
6	*25*	26	27	28	29	30	31

April 2024

	Δ	Τ	Τ	Π	Π	Σ	Κ
7	1	2	3	4	5	6	7
8	8	9	10	11	12	13	14
9	15	*16*	*17*	*18*	*19*	*20*	*21*
10	22*	23*	24*	25*	26*	27	28
	29	*30*					

May 2024

	Δ	Τ	Τ	Π	Π	Σ	Κ
			1	*2*	*3*	4	5
	6	*7*	*8*	*9*	*10*	11	12
11	13	*14*	*15*	*16*	*17*	*18*	*19*
12	20	21	22	23	24	25	26
13	27	28	29	30	31		

June 2024

	Δ	Τ	Τ	Π	Π	Σ	Κ
						1	2
1	3	4	5	6	7	8	9
2	10	11	12	13	14	15	16
3	17	*18*	*19*	*20*	*21*	22	*23*
4	*24*	25	26	27	28	29	30

July 2024

	Δ	Τ	Τ	Π	Π	Σ	Κ
	1	2	3	4	5	6	7
	8	9	10	11	12	13	14
	15	*16*	*17*	*18*	*19*	*20*	*21*
	22	23	24	25	26	27	28
	29	30	31				

August 2024

	Δ	Τ	Τ	Π	Π	Σ	Κ
				1	2	3	4
	5	6	7	8	9	10	11
	12	13	14	15	16	17	18
	19	*20*	*21*	*22*	*23*	*24*	*25*
	26	27	28	29	30	31	

OFFICIAL HOLIDAYS

October 28, November 17, December 24-January 7, January 30, February 21, Cheesefare Thursday up to the day after Clean Monday, March 25, Holy Monday up to Sunday of St. Thomas, May 1, Whit Monday

4.9.2023-29.9.2023	REPEAT EXAMINATION PERIOD		
2.10.2023-12.1.2024	WINTER SEMESTER	12.2.2024-31.5.2024	SPRING SEMESTER
15.1.2024-9.2.2024	WINTER AND GRADUATE EXAMINATION PERIOD	3.6.2024-28.6.2024	SPRING AND GRADUATE EXAMINATION PERIOD

Mid-term exams may take place during weeks marked with a "".*

The content of this Study Guide was edited by the members of the Study Guide, Website and Promotion Committee of the Department.

The Study Guide is also available
on the website of the Department of Physics:

http://www.physics.uoi.gr

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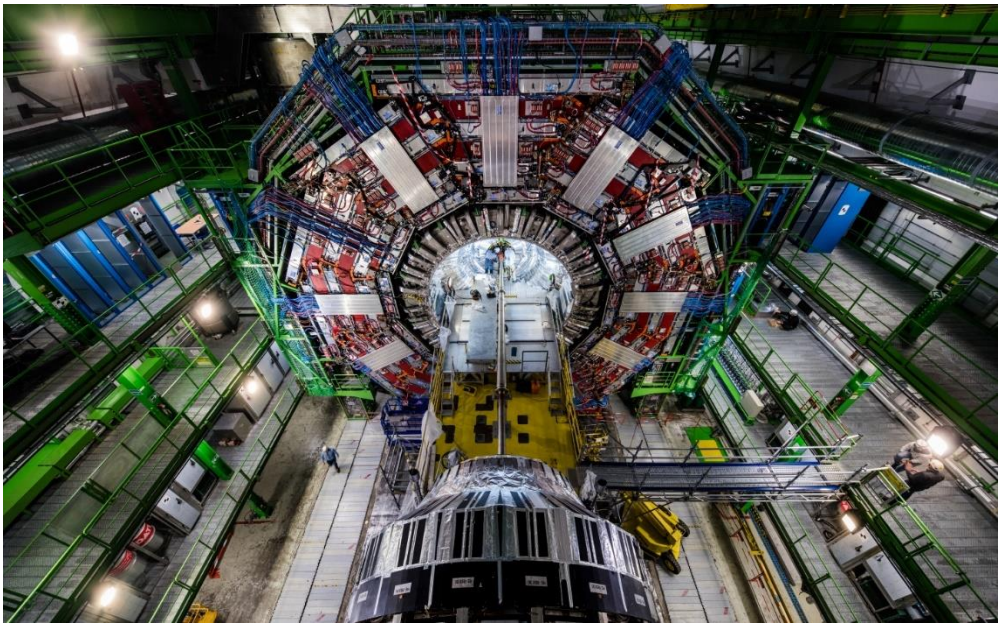

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Τυπογραφείο
ΙΩΑΝΝΙΝΩΝ