



UNIVERSITY OF CRETE

Department of Physics

School of Sciences and Engineering

Study Guide





Organization of the Department

Establishment of the Department

The Department of Physics was established in 1978 and is the youngest among the all physics departments in Greece. It is internationally renowned for its top-notch research in all areas of modern physics, as well as for the high-quality education and professional development opportunities offered to its students.

Administration of the Department

Chairman: Prof. Xenofon Zotos

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Deputy Chairman: Prof. George Tsironis

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General Description of the Department

The Department is organized in five sections defining the main research directions.

Τομέας Αστροφυσικής και Διαστημικής Φυσικής

1. Section of Astrophysics and Space Physics

Theoretical astrophysics, infrared and x-ray observational astrophysics, star formation, high-energy astrophysics, planetary atmospheres, ionospheric physics.

2. Section of Atomic, Molecular, and Optical Physics

Interaction of atoms and molecules with radiation, photonics, ultrafast laser science, attosecond science, atomic and ion collisions, fundamental physics tests with atoms, atomic and molecular spectroscopy, precision quantum measurements, biophysics.

3. Section of Applied Physics

Novel materials and devices and technological applications, micro- and nanoelectronics, semiconductor devices, optoelectronics, laser characterization of materials.

4. Section of Theoretical High Energy Physics

Fundamental interactions of elementary particles, quantum field theory, string theory, cosmology

5. Section of Condensed Matter Physics

Quantum solids and liquids, ultrafast processes in condensed matter, complex matter and nonlinear physics, superconductivity.

Faculty

Section of Astrophysics and Space Physics

Name	Telephone	email	Research Field
	+30-2810-39		
Ilias Vardavas Associate Professor	4214	vardavas@physics.uoc.gr	Stellar and Planetary Atmospheres
Andreas Zezas Assistant Professor	4212	azezas@physics.uoc.gr	Observational Astrophysics
Nikos Kylafis Professor	4215	kylafis@physics.uoc.gr	Theoretical Astrophysics
Iossif Papadakis Associate Professor	4213	jhep@physics.uoc.gr	Observational Astrophysics

Vasiliki Pavlidou Assistant Professor	4211	pavlidou@physics.uoc.gr	Theoretical Astrophysics
Kostas Tassis Assistant Professor	4219	tassis@physics.uoc.gr	Theoretical Astrophysics
Christos Haldoupis Professor	4220	chald@physics.uoc.gr	Space and Ionospheric Physics
Vassilis Charmandaris Associate Professor	4216	vassilis@physics.uoc.gr	Observational Astrophysics

Section of Atomic, Molecular and Optical Physics

Name	Telephone	email	Research Field
Iannis Kominis Assistant Professor	4223	ikomnis@physics.uoc.gr	Atomic Molecular and Optical Physics
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Theo Zouros Professor	4117	tzouros@physics.uoc.gr	Experimental Atomic Physics
Costas Fotakis Professor	1316	fotakis@iesl.forth.gr	Laser Physics
Dimitris Charalambidis Professor	1464	chara@iesl.forth.gr	Experimental Atomic and Molecular Physics

Section of Applied Physics			
Name	Telephone	email	Research Field
Alexandros Georgakilas Professor	4104	alexandr@physics.uoc.gr	Experimental Physics of Compound Semiconductors
Eleftherios Iliopoulos Assistant Professor	4113	iliopoul@physics.uoc.gr	Experimental Physics of Compound Semiconductors and Semiconducting Devices
George Kiriakidis Associate Professor	1271	kiriakid@iesl.forth.gr	Experimental Materials Physics
Zaharias Hatzopoulos Associate Professor	4109	chatzop@physics.uoc.gr	Physics of Semiconducting Devices

Section of Nuclear and Elementary Particle Physics

Name	Telephone	email	Research Field
Grigorios Athanasiu Assistant Professor	4207	athanasi@physics.uoc.gr	Theoretical Elementary Particle Physics
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Nikos Papanicolaou Professor	4202	papanico@physics.uoc.gr	Theoretical Physics, Mathematical Physics
Theodore Tomaras Professor	4206	tomaras@physics.uoc.gr	Theoretical Elementary Particle Physics
Nicholas Tsamis Associate Professor	4204	tsamis@physics.uoc.gr	Theoretical High Energy Physics and Cosmology

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Section of Condensed Matter Physics

Name	Telephone	email	Research Field
Xenofon Zotos Professor	4226	zotos@physics.uoc.gr	Theoretical Condensed Matter Physics
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Ilias Perakis Professor	4259	ilias@physics.uoc.gr	Theoretical Condensed Matter Physics
Panagiotis Tzanetakos Professor	4116	tzaneta@physics.uoc.gr	Experimental Condensed Matter Physics
George Tsironis Professor	4220	gts@physics.uoc.gr	Theoretical Condensed Matter Physics
Gregory Psaltakis Associate Professor	4217	psaltaki@physics.uoc.gr	Theoretical Condensed Matter Physics

Emeritus Faculty

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English Instruction

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The Department of Physics participates to the life-long learning program of ERASMUS (<http://www.uoc.gr/erasmus>). All students are encouraged to spend time and follow courses in the various collaborating universities in Europe and use the ECTS and grades they received there towards their BSc degree. The coordinator of the program for the Department is Prof. A. Zezas. Collaborating institutions have included the following:

Participation in the ERASMUM Program

Inonu University (Turkey)	Undergrad courses	2008
Milano-Bicocca (Italy)	Project Masters	2008
Pedagogical University Crakow (Poland)	Undergrad	2009
TU Munich (Germany)	Undergrad	2010
Wroclaw University of Technology (Poland)	Undergrad	2012
Universidad de Cordoba (Spain)	Undergrad	2012
TU Berlin (Germany)	Undergrad	2012
Humboldt University Berlin (Germany)	Undergrad	2013
TU Berlin (Germany)	Undergrad	2013

Procedures for Admission

Standard procedures according to the Ministry of Education and Religious Affairs.

Admission to the Department takes place with either one of the procedures established by the Ministry of Education and Religious Affairs, mainly through the nationwide exams, but also through special provisions established by the Ministry.

Enrollment by examination or by degree grade

Students may also be admitted to the Department if they already have another Bachelors degree. The total number that can be admitted may not be more than 10% of the regular admission. Successful performance in a written examination, which is administered by the Department of Physics, is necessary. More information is available by the Secretariat of the Department.

Specific arrangements for recognition of prior learning

The recognition of courses taught in other institutions for the students enrolled after obtaining another degree or transferring from another program through examinations takes place after the relevant application to the Undergraduate Studies Committee. The application should contain the list of courses to be recognized and their detailed curriculum, which has to be approved by the faculty of our department.

General Description of Learning Objectives



Profile of the Program

The Department of Physics, after nearly thirty years of academic presence, has been established as the best of all similar departments in Greece. It is very active in research, participating in the international developments both in fundamental modern physics as well as in related applied fields with and technological applications. The Department also follows the new trends in education and the labor market, and it adapts the curriculum so that its graduates may respond successfully to the challenges they will face upon completion of their degrees.

Education and Research Objectives

The flexible undergraduate curriculum offers a wide range of choices to the students. This helps them shape their future career development according to the interests and abilities of each in-

dividual. In addition to traditional career tracks like research or teaching at the secondary education, students have the opportunity to follow a program that will lead them, possibly after some graduate studies, to modern and rapidly evolving technology areas, like micro-/nano-electronics, photonics, lasers, material science, medical technologies, astrophysics and space physics, environmental studies and renewable energy, telecommunications, computational sciences and simulations of physical systems.

Occupational Profile of Graduates

The structure of the undergraduate curriculum of the Department also offers the students the opportunity to develop a wide range of skills and abilities such as using advanced mathematical tools, identifying key factors that determine the various natural phenomena, quantitatively formulating the relationship between cause and effect, querying and using the literature, using of computers and computer networks, developing working knowledge of at least one foreign language (mainly English).

The successful career track of the Department's graduates is evident from the data they themselves provide in the Department's Alumni webpage: <http://alumni.physics.uoc.gr>.



Semester

1st	2nd	3rd	4th
Physics I (Φ101)	Physics II (Φ102)	Modern Phys. I (Φ201)	Modern Phys. II (Φ202)
Mathematics I (Φ111)	Mathematics II (Φ112)	Diff. Eqs. I (Φ211)	Diff. Eqs II (Φ212)
Math Physics I (Φ113)	Physics Lab I (Φ108)	Physics Lab II (Φ207)	Classical Mech. I (Φ204)
English I (Φ011)	English II (Φ012)	Elective Course	Physics Lab III (Φ208)
Intro. Comp. (Φ150)	Comp. Progr. (Φ151)	Elective Course	Elective Course

Semester

5th	6th	7th	8th
Quantum I (Φ303)	Electromagnetism I (Φ301)	Quarks (Φ403)	Elective Course
Thermo-Stat (Φ405)	Elective Course	Elective Course	Elective Course
Advanced Lab (Φ307)	Elective Course	Elective Course	Elective Course
Elective Course	Elective Course	Elective Course	Elective Course

Even though the above curriculum is not compulsory and each student may organize the courses he/she wishes to follow, the Department of Physics considers that it is not wise to deviate substantially from it. The material covered in each course offered in advanced semesters assumes a solid knowledge of the material covered in all previous courses.

With the exception of the four compulsory Physics Labs there are no strict prerequisites for any course. However, if a student who has not passed basic courses of the first years wishes to register to an advanced course it is highly recommended to discuss this with the instructor of the course of the Physics faculty who acts as the undergraduate advisor.



6. The Main Rules of the Physics Curriculum

The following five rules determine the way a physics undergraduate student may select his/her courses in order to complete the curriculum and eventually obtain his/her BSc in Physics.

1. The maximum number of courses to which a student may register per semester is eight (8)
2. At a given semester a student must register to a maximum of eight (8) courses in the following order:
 - a. All offered courses of Category A of past semesters that the student has not "passed" in the order they appear in Table A.
 - b. All offered courses of Category A, which belong to the current semester the student is registered, in the order they appear in Table A.
 - c. Any course of Category B or C.
3. It is considered that a student has successfully completed (i.e. "passed") a course only if
 - a) the course was among the 8 possible courses



the student had registered b) the student have obtained a passing grade, that is five (5) out ten (10), during the finals of the same semester or at the period of the make up examinations (typically in September) of the same academic year. The minimum grade for a course is zero (0), the maximum is ten (10), and the minimum possible increment is half (0.5).

4. If a student has not “passed” a course he/she was registered for during the Winter of Spring semester, the student may take the make up examination (typically in September) of the same academic year. If the student fails again, he/she has to include the course in his/her registration in a following semester in order to be able to be examined on the course.

5. If a student has passed a course during the examination period of the Winter or Spring semester, he/she may opt to be examined again during the make up examination period of the same academic year in order to improve his/her grade. To do so, the student must request this in writing from the Undergraduate Secretariat at least 15 days in advance of the make up examination period. If the new grade is lower from the one she/he already had, the older, higher, grade remain in the student record.

The final Grade Point Average (GPA) is calculated as the average of all grades in courses weighted by the ECTS of each course. The GPA is given with an accuracy of two decimals. If a student has accumulated more than 240 ECTS, the extra courses of Category B and C with the lowest grade are removed from the GPA calculation, ensuring that the final is load is more than 240 ECTS.

According the Greek legislation (law 3549/2007) the maximum duration of undergraduate studies is eight (8) years or sixteen (16) semesters, for students who registered for the first time during the academic year 2007-08. In exceptional cases this may be extended for two (2) additional semesters after a decision of the General Assembly of the University of Crete, following a recommendation of the Department of Physics.



7. Obtaining a Bachelors of Science (BSc) in Physics

The requirements to obtain a Bachelors of Science (BSc) in Physics are:

- The student must be registered for at least eight semesters.
- The student must have successfully attended (i.e. passed) courses having a total weight of at least 240 ECTS. The 144 ECTS must originate from the 22 compulsory courses of the Department (Category A) and at least 40 ECTS must be from courses of Category B. The remaining ECTS may be from courses of Category C.

The final grade is calculated with an accuracy of two decimal digits, as the average of all course grades weighted by their corresponding ECTS. If a student has accumulated more than 240 ECTS, he/she may elect to remove from his/her transcripts some of the additional courses of Category B or C.



8. Offered courses

Table A

Courses of Category A – «Compulsory Courses»

AA	Code	Course Title	ECTS
1	Φ-101	General Physics I	7
2	Φ-111	General Mathematics I	7
3	Φ-113	Mathematics for Physics I	7
4	Φ-150	Introduction to Computers	4
5	Φ-011	English I	4
6	Φ-102	General Physics II	7
7	Φ-112	General Mathematics II	7
8	Φ-108	Physics Lab I: mechanics and Thermodynamics	7
9	Φ-151	Introduction to Programming (FORTRAN or C)	6
10	Φ-012	English II	4
11	Φ-201	Introduction to Modern Physics I	7
12	Φ-211	Differential Equations I: Ordinary Differential Equations	7
13	Φ-207	Physics Lab II: Electricity	7
14	Φ-202	Introduction to Modern Physics II	7
15	Φ-212	Differential Equations II: Partial Differential Equations	7
16	Φ-204	Classical Mechanics I	7
17	Φ-208	Physics Lab III: Optics	7
18	Φ-303	Quantum Mechanics I	7
19	Φ-405	Thermodynamics and Statistics	7
20	Φ-307	Advanced Physics Lab	7
21	Φ-301	Electromagnetism I	7
22	Φ-403	From the Quarks to the Universe	7
Total			144

Notes on Table A:

Each undergraduate student of the Department of Physics must successfully complete (i.e. “pass”) all courses of Table A. If a student fails a course, he/she must sign up again for the course the following semester it is offered. All courses of Category A that a student have not passed during the semester indicated by the suggested curriculum are automatically included among the maximum of 8 courses a student may sign up each semester following their corresponding index [A/A], as long as they are offered during that semester. Courses with lower index number appear before those of higher index in the course registration form.

Table B

– Courses of Category B – «General Physics Directions»

AA	Code	Course Title	ECTS
1	Φ-311	Mathematics for Physics II	6
2	Φ-152	Numerical Analysis	6
3	Φ-406	Mechanics of Continuous Media	6
4	Φ-271	Introduction to Circuit Theory	6
5	Φ-374	Elements of Electronics	7
6	Φ-461	Laboratory of Lasers and Modern Optics	7
7	Φ-302	Electromagnetism II (Waves)	6
8	Φ-304	Quantum Mechanics II (Structure of Matter)	6
9	Φ-230	Astrophysics I	6
10	Φ-331	Astrophysics II	6
11	Φ-333	Atmospheric Environment	6
12	Φ-361	Introduction to Optoelectronics	6
13	Φ-467	Atomic, Molecular and Optical Physics	6
14	Φ-273	Introduction to Semiconducting Devices	6
15	Φ-441	Introduction to Condensed Matter Physics	6
16	Φ-351	Computational Physics I	6
17	Φ-442	Condensed Matter Physics	6
18	Φ-324	Gravity and Cosmology	6
19	Φ-422	Elementary Particles and Forces	6
20	Φ-429	Special Topics in High Energy Physics	6
-		Graduate courses offered in the Masters programs of "Advanced Physics" and "Photonics and Nanoelectronics" of the Department of Physics 5 or 6	

Notes on Table B:

Each undergraduate student of the Department of Physics must successfully complete (i.e. "pass") courses from the Category B which correspond to a total of at least 40 ECTS. Table B, includes all graduate courses of 5 or 6 ECTS offered by the Department of Physics in the Masters programs of «Advanced Physics» and «Photonics and Nanoelectronics».

Table C

– Courses of Category C – «Special Topics in Physics»

AA	Code	Course Title	ECTS
1	Φ-491	Diploma Thesis	12
	Φ-103	Topics in Modern Physics I	3
	Φ-107	Physics Concept Grinders I	6
	Φ-232	Observational Astrophysics	6
	Φ-277	Electronic Microscopy	6
	Φ-334	Introduction to Atmospheric Physics	6
	Φ-407	Physics of the Interior of the Earth	6
	Φ-428	Introduction to Neural Networks	6
	Φ-457	Financial Mathematics I	6
	Φ-466	Techniques of Laser Spectroscopy	6
	Φ-473	Semiconductor Physics Laboratory	7
	Φ-547	Applied Geophysics	6

	Φ-015	Modern Physics with English I	5
	...	Teaching Assistant – Physics Lab I, II, III	3

	...	Teaching Assistant in Computing I, II	3

	...	English III & IV	4

Notes on Table C:

The table above includes only a few representative courses of Category C since courses in this category are only offered when there is interest from the students and availability of instructors. This Category also includes select courses offered by other Departments of the University of Crete. The complete list of available courses in this Category is announced before the beginning of each semester. An undergraduate student who has completed the requirements of courses in Categories A and B, has to successfully complete (i.e. "pass") as many courses in Category C necessary, in order to obtain the minimum of 240 ECTS, towards the BSc in Physics.

Recognition of ECTS units through the ERASMUS program

The ERASMUS program offers our students the opportunity to A) study in a foreign institution having a bilateral agreement with the University of Crete for student exchange, and B) perform practical training in industry or other institutions. Each exchange takes place in one of the 30 European countries for a period of 3-12 months being fully recognized. In such a case students must enroll in courses corresponding to our curriculum for 30 ECTS units per semester.

Examination regulations, assessment and grading

The academic year commences in September and includes the winter semester (13 weeks), the winter exam period (3 weeks in January), the spring semester (13 weeks), the spring exam period (3 weeks in June), the summer recess, and the supplementary exam period in September. During the September exam period students can opt to be re-examined in a course they enrolled at in the same year, towards obtaining a higher grade. For a different-year course they have to erase the existing grade and the obtained grade in the September re-examination will be the new grade.

Graduation Requirements

Requirements	ECTS
Successful completion of 22 compulsory classes/laboratories	144
Minimum 40 ECTS from category-B courses and at most 56 ECTS from category-C courses	96
Total	240

Funding Opportunities

All undergraduate students are eligible for academic merit-based scholarships from the State Scholarship Foundation, based on their performance in the national entrance exams. In addition, the following scholarships of private funds are available:

Scholarship of X. & A. Karydis Fund (for one undergraduate student)

Scholarship «Emanuel Saklampanis» (for graduate studies in educations)

Scholarship of Maria Manasaki Fund (for one or two graduate students)

Contact Details

Official website of the Department:

<http://www.physics.uoc.gr>

Graduate Program website

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