COURSES IN FOREIGN LANGUAGES for ERASMUS INCOMING STUDENTS

2021/2022 academic year

Faculty of Physics

Faculty coordinator: Prof. Miroslav Abrashev, mvabr@phys.uni-sofia.bg

BS Programme: Astrophysics, Meteorology and Geophysics, PHA040112

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH E154	**Physics of the atmosphere 1**	**English**	**BS**	**Winter**	**4.5**	**30**	**15**	**15**	**Assoc. Prof. Guergana Guerova**	**guerova@phys.uni-sofia.bg**

Short description of the course (in the language of instruction):

"In the recent years, weather and climate have become front page news from such environmental issues as greenhouse warming and ozone depletion in the stratosphere to the global weather influences of El Nino. The dynamic nature of the atmosphere demands our attention and understanding more than ever before."

"Weather influences our daily lives in so many ways. From drought and famine to devastating floods, some of the greatest challenges we face come in the form of natural disasters created by weather. Yet dealing with weather and climate is an inevitable part of our lives. The atmosphere will always provide challenges for us but, as research and technology advance, our ability to understand our atmosphere improves as well."(Meteorology Today, C. Donald Ahrens, 2008, Thomson Brooks/Cole 9th Edition.)

Requirements for enrollment: NO

If any, please describe the specific requirements:

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH E169	**Synoptic Meteorology**	**English**	**BS**	**Winter**	**4**	**60**			**Assoc. Prof. Guergana Guerova**	**guerova@phys.uni-sofia.bg**

Short description of the course (in the language of instruction): Synoptic meteorology is the study of the weather on the continental scale. This course examines important phenomena such as air masses, atmospheric fronts, cyclones and anticyclones, jet streams that govern the weather over thousands of square kilometers. This description is in close relation with the governing equations of the mid-latitude atmospheric dynamics. Students will become familiar with the weather maps and gain skills in analyzing the state of the atmosphere and the development of weather systems.

Requirements for enrollment: YES
If any, please describe the specific requirements: Basic knowledge in Meteorology

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH E171	**Physics of Climate**	**English**	**BS**	**Summer**	**5**	**45**	**15**		**Assoc. Prof. Elisaveta Peneva**	**elfa@phys.uni-sofia.bg**

Short description of the course (in the language of instruction):

The course consists of 45 hours of lectures and 15 hours of exercises. The objective is to complement the knowledge of the students in Meteorology with the necessary knowledge in climatology. The material can be divided into 3 parts: Physical basics of climatology; Present-day climate; Dynamics of the climate – oscillations and change.

The first part of the course presents the general concepts in climate science, processes and interrelations between the components of the climate system. The necessary knowledge of climate data processing is acquired.

The second part of the course covers many aspects of the classical climatology. It also aims to give to the students the necessary knowledge about the current state of the Earth's climate as a whole, as well as knowledge of regionalization and classification of climates.

The third part of the course deals with climate variations, distinguishing between oscillations and change. The issues of global warming and climate change are discussed the last century. Recent scientific information, including appropriate graphic material, is used to build the course.

The course also includes practical computer exercises, which include work with global and regional climatic data. The students learn methods

to present climate data (e.g. climographs, windrose) and to identify trends and correlations.

Requirements for enrollment: YES

If any, please describe the specific requirements: Knowledge in General Meteorology and Dynamic Meteorology; general knowledge in Mathematics and Physics; computer literacy.

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH E176	**Seismology**	**English**	**BS**	**summer**	**4**	**60**			**Assoc. Prof. Reneta Raykova**	**rraykova@phys.uni-sofia.bg**

Short description of the course (in the language of instruction):

This is a 3th/4th year undergraduate course providing general overview of modern seismology and internal structure of the Earth determined by seismic wave's propagation. Topics include earthquake sources, seismic waves and their usage in determination of the Earth structure, tsunami waves of seismic origin, magnitude and intensity scales, earthquake location, spatial and temporal distribution of earthquakes, plate tectonics and earthquakes, earthquake prediction, earthquake hazard assessment, seismometry. The course concentrates mainly on earthquake seismology but volcano seismology is also briefly considered.

Requirements for enrollment: NO

If any, please describe the specific requirements:

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH E177	**Seismological Practice**	**English**	**BS**	**Winter**	**4.5**			**45**	**Assisst. Prof. Gergana Georgieva**	**ggeorgieva@phys.uni-sofia.bg**

Short description of the course (in the language of instruction):

The practicum in seismology is intended to supplement the knowledge obtained during the theoretical course in seismology. Within the practicum students will work with the main sources of seismic information - seismograms and seismic catalogs. Exercises for identifying of main seismic phases from local, regional and distant earthquakes, assessment of earthquake parameters (epicenter location, magnitude, focal mechanism), determine the statistical properties of seismic data from local and global earthquake catalogs are included in the course. The majority of the practical exercises in this course are taken from "The new leadership of seismic observations" (New Manual of Seismological

Observatory Practice), issued by the International Association of Seismology and Physics of the subsurface (IASPEI) in order to create international standards collection, processing, interpretation and documentation of seismic information. These exercises are developed by leading German seismologists and used in the training of staff of national seismic services worldwide.

Requirements for enrollment: NO

If any, please describe the specific requirements:

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH A107	**Geophysical Practice**	**English**	**BS**	**Summer**	**5**			**60**	**Assisst. Prof. Gergana Georgieva**	**ggeorgieva@phys.uni-sofia.bg**

Short description of the course (in the language of instruction):

The teaching material in discipline Geophysics Practice is intended to complement the theoretical and practical training of students. The practice is carried out jointly National Institute of Geophysics, Geodesy and Geography (NIGGG) BAS (Section in seismology, geomagnetic observatory Laboratory Paleomagnetism).

It is envisaged that in laboratory Paleomagnetism of the Geophysical Institute of students to perform laboratory work on the evaluation of the magnetic properties of rocks and soils, with an emphasis on the application of modern methods used in solving environmental problems.

The Department of seismology at the Geophysical Institute of BAS the students will be acquainted with the existing national research infrastructure for registration of earthquakes and operational practice on duty seismologists, and will also perform practical exercises processing of seismic data collected by seismic stations on Bulgarian National seismic network. In geomagnetic observatory of the Geophysical Institute of BAS students will learn about the equipment and methods for absolute and relative measurement of the Earth's magnetic field.

Requirements for enrollment: NO

If any, please describe the specific requirements:

BS Programme: Communications and Physical Electronics, PHC080117

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH E505	**Antenna systems and technology**	**English**	**BS**	**summer**	**4**	**45**	**15**		**Assoc. Prof. Kissovski**	**kissov@phys. uni-sofia.bg**

Short description of the course (done in the language of instruction): The lecture course proposes opportunity to the students to introduce them to the applications of the Electromagnetic waves as a basis of the modern communication technologies. In the first part of the lectures are considered electro-dynamical structures (waveguides) for directing and guiding of the EM waves from radiofrequency to the optical range of the spectrum as well as the resonance structures on their basis. In the second part, the students will study the elementary electrical and magnetic radiators and on their base they are acquainted with the modern antennas for wide frequency range. Here are considered aperture antennas and smart antennas, too. In the lectures are presented the fundamental mechanisms of propagation of the EM waves in the Earth atmosphere, radio traces, influence of the obstacles and some problems of the electromagnetic compatibility.

Requirements for enrollment: NO
If any, please describe the specific requirements:

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH E734	**Computer Design of Electronic Circuits**	**English**	**BS**	**Summer**	**6**	**30**		**45**	**Stanimir Kolev**	**skolev@phys. uni-sofia.bg**

Short description of the course (in the language of instruction):
The aim of this course is to introduce to the students the principles and the essence of the electronic design systems in the modern engineering. At the end of the course the students will be able to use and take advantage of the contemporary electronic design systems consistent with the present industrial standards for the whole process of circuit design – starting with the layout of the basic concept of the engineering project, going through the creation and simulation of the schematics and finally, designing the printed circuit board (PCB) topology and presenting the final product. The lecture course presents the basis of circuit simulation and the numerical methods used for that purpose and it gives the main standards and best practices for the PCB design. The course has an extended program of practical exercises including circuit design and layout, simulation of analogue and digital circuits and creation of the final PCB projects. The practical exercises are based on the Cadence Orcad software package.

Requirements for enrollment: YES

If any, please describe the specific requirements: The course requires basic knowledge in electronics, electronic components and schematics.

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH E806	**Gas discharges and their technological applications**	**English**	**BS**	**summer**	**5**	**30**	**15**	**15**	**Assoc. Prof. Kissovski**	**kissov@phys.uni-sofia.bg**

Short description of the course (done in the language of instruction): The course introduces the students to the physical processes in dc discharges, RF capacitive and inductive discharges, microwave discharges and their applications in the technologies (flat plasma screens, electrode-less light lamps, ICP emission analysis, plasma deposition and etching in the microelectronics, etc).

The course comprises the theory of elementary processes in gas-discharges, processes of diffusion of the particles and energy transfer, and also the specific properties of the different types of discharges, which allow their application for technological purposes in the industry. The practical exercises are on the main types of the gas-discharges and on the calculation of their parameters. The obtained knowledge from the students will assist their future work in the fields of manufacturing processes in the electronics, microelectronics and optoelectronics, of ecology (detoxification of the noxious gases and materials) and ecological products.

Requirements for enrollment: NO

If any, please describe the specific requirements:

BS Programme: Engineering Physics, PHE020112

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH E798	**Classical Mechanics**	**English**	**BS**	**Summer or winter**	**6**	**45**	**30**	**105**	**Assoc. Prof. Svetoslav Ivanov**	**sivanov@phys.uni-sofia.bg**

Short description of the course (in the language of instruction): Based on first-year knowledge in University mathematics, this lecture course teaches basic notions, quantities, laws and experimental facts from the classical mechanics of ideal and real bodies. The course serves as the basis for building further and more profound education in physics, both fundamental and applied. The course is strongly problem-driven as theoretical knowledge is revealed by solving numerous practical problems.
Requirements for enrollment: YES **If any, please describe the specific requirements:** Calculus, linear algebra

BS Programme: Nuclear and Particle Physics, PHH120117

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH A008	**Object-Oriented Programming**	**English**	**BS**	**summer**	**5**	**45**		**30**	**Assoc. Prof. Borislav Pavlov, PhD**	**Borislav.Pavlov@cern.ch**
Short description of the course: In the last decade the Object-Oriented Programming paradigm and C++ programming language dominated in the scientific software in the field of Particle and Nuclear Physics and especially for analyzing data from LHC accelerator at CERN. C++ is widely used programming language also for wide range of applications in numerous other fields. In this course, the students learn a language that has many practical uses in the real world. The fundamental concepts of the object oriented paradigm are introduced and object oriented programming is stressed in place of traditional structured programming. The course is practically oriented and lectures are well covered with practical exercises.										
Requirements for enrollment: NO **If any, please describe the specific requirements:**										
Course code	**Course title (in English)**	**Language of instruction**	**Course offered to BA/BS, MA/MS, PhD**	**Semester (winter/ summer)**	**ECTS**	**Workload (hours)**			**Lecturer/s's name**	**Lecturer/s's E-mail**
						Lectures	**Exercises/ Seminars**	**Practical work**		
PH A012	**Ordinary Differential Equations**	**English**	**BS**	**winter**	**5**	**30**	**30**		**Assoc. Prof. Galin Gyulchev**	**gyulchev@phys.uni-sofia.bg**

Short description of the course (in the language of instruction):

This is an initial course of ordinary differential equations. It includes introduction to basic concepts in the theory of differential equations, then formulate the main task in the theory of ordinary differential equations and discusses various tasks. The main goal of this course is to provide a self-contained introduction to the basic concepts in modern theory of ODE. The idea is to make contact with physics and its applications like classical mechanics and statistical physics. The course also gives basic knowledge in control theory.

Requirements for enrollment: YES/NO

If any, please describe the specific requirements:

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH A013	**Electricity and Magnetism**	**English**	**BS**	**Winter or Summer**	**7.5**	**60**	**30**		**Assoc. Prof. Victor Atanasov Atanasov**	**vatanaso@phys.uni-sofia.bg**

Short description of the course (in the language of instruction):

The course in Electricity and Magnetism is the third part of the course in General Physics. It is designed for students in the third semester of their studies. The course is part of a longstanding tradition in the Department of Condensed Matter Physics.

The course consists of two main parts: i.) the general laws of electromagnetism and ii.) electrical and magnetic phenomena in matter. The first part contains three sections: 1) electrostatics; 2) stationary electric and magnetic fields and 3) alternating electromagnetic field. It is constructed on the principle of successive generalizations, allowing the students to get to Maxwell's equations in an elegant and obvious way. Special attention is paid to the basic phenomena that are coded in Maxwell's equations, such as the existence of, properties and physical characteristics of electromagnetic waves.

The second part concerns the electric and magnetic properties of matter in gas phase, plasma, electrolytes and metals. The model building in the case of dielectrics and plasma is based on classical physics, while for magnetism some quantum mechanical ideas (the quantization of magnetic moments) are explored. The plasma physics section is the only one in the general course dedicated to this most common state of matter.

Seminars deepen and illustrate with appropriate problems the lectures. Demonstrations of the discussed phenomena are also included in the syllabus.

Requirements for enrollment: YES/NO

If any, please describe the specific requirements:

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH A017	**Partial Differential Equations**	**English**	**BS**	**summer**	**4**	**30**	**30**		**Assoc. Prof. Galin Gyulchev**	**gyulchev@phys.uni-sofia.bg**

Short description of the course (in the language of instruction):

The basic facts, properties and techniques for solving partial differential equations are considered. The students will acquire basic knowledge and computational skills which they will use in other courses and in their work as physicists

Requirements for enrollment: YES/NO

If any, please describe the specific requirements:

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH A018	**Theoretical Mechanics**	**English**	**BS**	**summer**	**6.5**	**60**	**30**		**Assist. Prof. Dimo Arnaudov**	**dlarnaudov@phys.uni-sofia.bg**

Short description of the course (in the language of instruction):

Classical mechanics has a conceptual meaning for Physics. The basic ideas have been developed subsequently in different directions and different forms in quantum theories and give a special status among physical sciences. The lectures provide description of the main elements of Classical mechanics.

The course on Classical mechanics is intended for students at third year of bachelor program and is dealing with the contemporary theoretical description and generalizations build upon knowledge from high school and general physics courses in the University. The lectures begin as a warm up with a systematic presentation of Newtonian mechanics and the mathematical apparatus needed for it. In the second part a special emphasis is given to Lagrangian formulation of Classical mechanics as well as to the Hamiltonian dynamics. A particular attention is given to the variational principles, conservation laws, symmetries and invariants. The third part of the lectures contain Hamilton-Jacobi approach to Classical mechanics as well as dynamics of the solid bodies. At each level of presentation the experimental data and applicability of Classical mechanics is discussed.

Requirements for enrollment: YES/NO

If any, please describe the specific requirements:

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH A022	**Atomic Physics and Interaction of Radiation with Matter**	**English**	**BS**	**winter**	**6**	**45**	**30**		**Assoc. Prof. K. Gladnishki, PhD**	**kag@phys.uni-sofia.bg**

Short description of the course: This course for undergrads (bachelor students) presents the general concepts and principles of the physics of atoms, molecules, and the interaction of ionizing radiation with matter. Courses on classical mechanics, calculus, probability theory, and mathematical statistics – undergrad level should be taken in advance. General topics Mass, size, structure of atoms; Constituents of the matter; Photon, electron, and matter waves; Bohr's model of the hydrogen atom; The mathematical framework of quantum mechanics; fine structure and hyperfine structure of atomic spectra – the spin of electrons, protons, neutrons;; Atoms in a magnetic field; Many-electron atoms – vector model; Fermi model; Structure of the periodic table, x-ray spectra; molecular bonds; stopping power of heavy and light charged particles.

Requirements for enrollment: YES/NO
If any, please describe the specific requirements:

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH A023	**Laboratory exercises in atomic physics and interaction of ionizing radiation with matter.**	**English**	**BS**	**winter**	**4,5**			**45**	**Prof. Dr.habil. G. Rainovski** **Assoc. prof. K. Gladnishki, PhD**	**rig@phys.uni-sofia.bg** **kag@phys.uni-sofia.bg**

Short description of the course: Laboratory exercises in atomic physics and interaction of ionizing radiation with the matter is one semestrial course (V semester). In it, students get acquainted with some of the fundamental experiments in quantum physics; get some knowledge about the determination of basic experimental quantities; acquire important practical skills in working with detectors of ionizing radiations and their characteristics.

Requirements for enrollment: NO

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH A024	**Electrodynamics**	**English**	**BS**	**winter**	**6.5**	**60**	**30**		**Assoc. Prof. Andon Rangelov**	**rangelov@phys.uni-sofia.bg**

Short description of the course (in the language of instruction): The course is devoted to the Classical Electrodynamics and the Special Relativity. The course introduces the basics ideas and equations of the electrodynamics and the theory of special relativity. The students will be acquainted with the basic results and they will be able to solve standard problems. They will have the background to further expand their knowledge and skills in this area.

Requirements for enrollment: NO

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH A025	**Quantum Mechanics**	**English**	**BA**	**winter**	**6.5**	**60**	**30**		**Prof. Nikolay Vitanov**	**vitanov@phys.uni-sofia.bg**

Short description of the course (in the language of instruction):

The course in Quantum Mechanics is the third of four courses that make up the core of education in theoretical physics. This course introduces students to the basic principles of quantum mechanics and the basic methods and applications. This course provides the students with the necessary knowledge to solve quantum mechanical tasks and skills for qualitative and quantitative evaluation of physical phenomena in the microworld. The content of the course covers the necessary information for a future specialization in the field of theoretical physics and astrophysics, high-energy physics, atomic, molecular and optical physics and condensed matter physics.

Requirements for enrollment: NO

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercise Seminars	Practical work		

PH E001	**Nuclear electronics**	**English**	**BS**	**summer**	**6**	**45**		**45**	**Assoc. Prof. Ilko Rusinov, PhD**	**irusinov@phys.uni-sofia.bg**

Short description of the course:

The subject of the course is the field of electronics applied to acquisition and processing of electrical signals generated by various types of radiation detectors. Basic principles and building blocks used for amplification, shaping, transmission, and analog-to-digital conversion of signals are studied. The students get acquainted with the techniques for amplitude and timing data acquisition. Among the included topics are: preliminary amplification of pulses by voltage and charge sensitive amplifiers, various means of pulse shaping, integrators, appropriate analog-to-digital conversion schemes, time-to-amplitude conversion, single- and multi-channel analyzers, simulation of some electrical circuits with basic application, etc. In the laboratory the students assemble and investigate some relevant electronic circuits using analog, digital and mixed-signal integrated circuits and discreet components. Some pre-assembled modules are also used.

Requirements for enrollment: YES/NO

If any, please describe the specific requirements:

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH E002	**Nuclear Physics**	**English**	**BS**	**summer**	**5**	**45**	**30**		**Prof. Dr. habil. G. Rainovski**	**rig@phys.uni-sofia.bg**

Short description of the course:

The course aims to give a simple and up-to-data introduction to the physics of atomic nucleus. The major sub-topics in Nuclear physics, namely Nuclear structure, Nuclear decays and radioactivity, Nuclear reactions and Applications, comprise the main parts of the course. Within these main parts a broad selection of nuclear phenomena and characteristics are introduced and discussed as a special emphasis is made on the experimental roots of nuclear science. The course begins with the bulk properties of atomic nucleus and gradually moves towards more complex picture of the nucleus as a quantum mechanical many-body system which dynamics is primarily determined by the strong nuclear interaction but it is also affected by the Coulomb and the weak nuclear interaction. The properties of nuclear decays and reactions are also introduced and discussed not only as tools to study the atomic nucleus but also as phenomena which form the basis of the nuclear technology.

Requirements for enrollment: YES/NO

If any, please describe the specific requirements:

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH E003	**Laboratory Exercises in nuclear physics**	**English**	**BS**	**summer**	**4,5**			**45**	**Prof. Dr. habil. G. Rainovski** **Assoc. Prof. K. Gladnishki PhD**	**rig@phys.uni-sofia.bg** **kag@phys.uni-sofia.bg**
Short description of the course: Laboratory Exercises in nuclear and particle physics is one semestrial course (VI semester). There students are introduced to some basic methods for determining the characteristics of radioactive decay: alpha, beta and gamma, half-life and decay constant, with the experimental methods in nuclear physics. In the exercises, students get acquainted with dosimeter's quantity and acquire skills in using radiometers and dosimeters.										
Requirements for enrollment: YES **If any, please describe the specific requirements:** Courses as "Atomic Physics and Interaction of Radiation with Matter" and "Nuclear Physics" undergrad level should be taken in advance.										
Course code	**Course title (in English)**	**Language of instruction**	**Course offered to BA/BS, MA/MS, PhD**	**Semester (winter/ summer)**	**ECTS**	**Workload (hours)**			**Lecturer/s's name**	**Lecturer/s's E-mail**
						Lectures	**Exercises/ Seminars**	**Practical work**		
PH E007	**Particle Physics**	**English**	**BS**	**winter semester**	**5**	**45**	**30**		**Assoc. Prof. Mariyan Bogomilov**	**marian@phys. uni-sofia.bg**
Short description of the course: The course is intended for bachelor students in all programs at the Faculty of Physics. The course main topics of study are fundamental micro-objects (leptons, quarks, gluons, etc.) which, following given rules and laws of interaction, build nucleons, nuclei, atoms - microsystems better known by the students. The goal of the course is to familiarize the students with contemporary concepts about fundamental constituents of matter and their interactions. Basics of kinematics of elementary particles are presented. The symmetries of										

elementary particles (continuous and discrete, spatial and internal, global and local) and following conservation laws are discussed. The interactions are described with local (gauge) symmetry group formalism. Special attention is given to the experimental methods for study of elementary particles properties and their interactions, including present-day acceleration complexes and multi-detector systems for particle registration and identification. The emphasis is on the specifics of high-energy particles (~GeV), short lifetimes (~ns) and large background of particles. Basics of quark model and introduction to quantum chromodynamics, describing strong interaction, are shown. The experimental proofs for the existence of quarks and gluons are discussed. The weak interaction and Glashow-Weinberg-Salam model, describing electromagnetic and weak interactions, are presented. The neutrino mass problem and neutrino oscillations are discussed. The attempts for building theories, which unify electromagnetic, weak and strong interaction are presented. The main problems and trends of particle physics development are outlined.

Substantial part of the course are the seminars, which are devoted to solving problems. The problems are chosen in such a way that they complement, develop and clarify lecture material. Successful problem solving does not need full use of mathematical methods in physics but rather depends on the level of understanding of physical ideas and orientation in the particular problem.

Out-of-class credits are foreseen for independent work with literature sources, for solving problems as homework and for exam preparation.

Requirements for enrollment: YES/NO

If any, please describe the specific requirements: A necessary prerequisite for choosing this course is formerly acquired basic knowledge of Quantum Mechanics, Atomic and Nuclear Physics.

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH E010	**Experimental Nuclear Physics**	**English**	**BS**	**summer**	**7,5**	**45**		**60**	**Prof. V. Rusanov** **Prof. G. Rainovski** **Assoc. Prof. K. Gladnishki**	**rusanov@phys.uni-sofia.bg** **rig@phys.uni-sofia.bg** **kag@phys.uni-sofia.bg**

Short description of the course:

The aim of the course is to introduce the main contemporary methods of nuclear spectroscopy, the experimental set-ups, and the techniques for data manipulations used in nuclear physics experiments at low energies.

The course focuses on the interaction of the nuclear radiation with matter, the detectors for nuclear radiation and the related with them apparatus. The course includes the methods of γ-ray spectroscopy, α spectroscopy, β spectroscopy, nuclear lifetime measurements, and methods for construction of complex decay schemes.

Requirements for enrollment: NO

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH E012	**Programming in Unix environment**	**English**	**BS**	**winter**	**4,5**	**30**		**30**	**Assoc. V. Kouzhuharov PhD**	**venelin@phys.uni-sofia.bg**

Short description of the course: The goal of the course is to provide basic knowledge of the UNIX-based working environments. A short description of the history of the operating systems is provided and the initial focus is on the text based user interface. It is used both as a command interpreter and as a scripting environment. During the course the students will understand the guiding principles of the file system, security and networking. The basic principles of programming are revealed. During the second half of the course the main focus is the C programming language with the attempt to get a working knowledge of the GCC compiler (including the preprocessor, the compiler, and the linker) and the basic algorithmic structures used within C.

Requirements for enrollment: NO
If any, please describe the specific requirements:

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH E036	**Introduction to Quantum Field Theory**	**English**	**BA**	**summer**	**6**	**45**	**30**		**Assist. Prof. Cvetan Vecov**	**vetsov@phys.uni-sofia.bg**

Short description of the course (in the language of instruction): Introduction in Quantum Field Theory is given starting with the foundations and going up to calculation of real processes. This course is a natural continuation of the course on Quantum Mechanics.

Requirements for enrollment: YES/NO
If any, please describe the specific requirements:

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		

PH E039	**Nuclear symmetries**	**English**	**BS**	**summer**	**5**	**45**		**30**	**Assoc. Prof. K. Gladnishki, PhD**	**kag@phys.uni-sofia.bg**

Short description of the course:

The course is designed for students from all undergraduate programs in the physics department. The course presents a systematic introduction to various types of nuclear symmetries. The object of the course is theoretical descriptions of effects related to nuclear symmetries and also the main experimental methods and results obtained regarding the structure of atomic nuclei. The program is built on students' knowledge derived from basic undergraduate courses covered in the program as "Introduction to Nuclear and particle physics", "Experimental Nuclear Physics" and "Theoretical Nuclear Physics" and appears as a link to courses in "Nuclear Structure" and "Nuclear models". The program of the course is set to presentation of contemporary problems of nuclear structure physics. Deals with issues related to the modern understanding of the nuclear interaction, nuclear structure, and nuclear models describing the fundamental nuclear symmetries and quantum theory of many body quantum systems. The course aims to build understanding of the parameters used in nuclear physics, and practical skills to solve problems in nuclear physics. The planned practicum, aims not only to demonstrate modern experimental and theoretical techniques in the analysis of real experimental data, but also to create practical skills in students to work with spectra, intensities and etc. In essence, the course provides a smooth transition between basic courses in the bachelor program and master program "Physics of atomic nuclei and elementary particles" while it is built on core courses such as quantum mechanics, atomic and nuclear physics studied by all specialties making it suitable for students graduates from all disciplines.

Requirements for enrollment: YES/NO

If any, please describe the specific requirements:

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH E572	**Introduction to the theory of elementary particles**	**English**	**BS**	**summer**	**4,5**	**45**			**Prof. Dr. Leandar Litov**	**litov@phys.uni-sofia.bg**

Short description of the course:

The course is a natural extension and follow-up of the introductory course "Elementary Particle Physics". It gives a detailed description of the basic interactions in the nature in the framework of Quantum field theory. The different types of the interaction symmetries are considered. The local (gauge) symmetries are explored in order to build field models of the fundamental interactions. The basics, predictions and open problems of the Quantum Chromodynamics - the theory of the strong interactions of the quarks are presented. A significant part of the material is devoted of the treatment of the electromagnetic and weak interactions in the framework of Glashow- Weinberg – Salam model. The results of the precise tests of its predictions are discussed. The main open questions and unsolved problems together with future perspectives of the particle physics are considered.

Requirements for enrollment: NO										
Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH E581	**Nuclear structure**	**English**	**BS**	**winter**	**5**	**45**		**15**	**Prof. Dr. habil. Georgi Rainovski**	**rig@phys.uni-sofia.bg**
Short description of the course: The course presents the main accelerator-based experimental techniques used nowadays to study the structure of atomic nuclei. The main aim of the course is to demonstrate how the obtained experimental data is used for designing and refining the theoretical models of atomic nucleus. i.e. to make the relation between the experimental methods and results and the theoretical approaches in the contemporary nuclear physics										
Requirements for enrollment: YES/NO **If any, please describe the specific requirements:**										

BS Programme: Medical Physics, PHM050112

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH E051	**Modeling of Interactions of Biological Molecules**	**English**	**BS**	**summer**	**5**	**30**		**30**	**Prof. Dr. Leandar Litov**	**litov@phys.uni-sofia.bg**
Short description of the course: This course is an introduction to the modern methods of *in-silico* modeling of the interaction of biological molecules and computer aided drug design. The course aims at introducing students to the methods of molecular dynamics and quantum mechanical description of the interaction between active sites of biological molecules. The labs include working with software for visualization of 3D structures of proteins and results of molecular dynamics simulations, working with PDB (Protein Data Bank) for protein structures, knowledge of software packages to simulate the interatomic and intermolecular interactions.										

Requirements for enrollment: YES/NO **If any, please describe the specific requirements:**										
Course code	**Course title (in English)**	**Language of instruction**	**Course offered to BA/BS, MA/MS, PhD**	**Semester (winter/ summer)**	**ECTS**	**Workload (hours)**			**Lecturer/s's name**	**Lecturer/s's E-mail**
						Lectures	**Exercises/ Seminars**	**Practical work**		
PH E386	**Accelerators and ionizing particle detectors in medicine**	**English**	**BS**	**summer**	**6**	**45**	**30**		**Prof. Dr. L. Litov**	**litov@phys.uni-sofia.bg**
Short description of the course: The course is an introduction to the technique of diagnosis and treatment, inspired by the development of experimental apparatus in nuclear physics and high energy physics. The aim of the course is to introduce students to modern accelerator equipment and ionising radiation detectors in medicine. The principles of accelerator operation are discussed. The main types of accelerators and their applications in medicine for radiation therapy and production of radioactive isotopes are reviewed. Mechanisms of interaction of charged and neutral particles with the matter are discussed. The different types of detectors used to register such particles have been examined in detail. Scintillation detectors and modern light detectors are being considered. A special place is devoted to modern trends in the development of detectors for medical physics. The methods of computer simulation of their work are also discussed briefly. Some basic applications of ionising radiation detectors used in imaging diagnostics are presented.										
Requirements for enrollment: YES/NO **If any, please describe the specific requirements:**										

BS Programme: Medical Physics, PHM050115

Course code	**Course title (in English)**	**Language of instruction**	**Course offered to BA/BS, MA/MS, PhD**	**Semester (winter/ summer)**	**ECTS**	**Workload (hours)**			**Lecturer/s's name**	**Lecturer/s's E-mail**
						Lectures	**Exercises/ Seminars**	**Practical work**		
PH E370	**Medical Biophysics**	**English**	**BS**	**winter**	**6**	**45**	**15**	**30**	**Head Assist. Prof. Elitsa Pavlova**	**elli_pavlova@abv.bg**

Short description of the course:

The course in Medical Biophysics is taught to students with interests in Medical Physics. It is a basic, general biological discipline, which is focused on studying the physical and physic-chemical processes, as grounds of the theoretical and practical clinical medicine. The major aim of the biophysical research is the detailed revelation of the mechanisms of the biological processes. The Biophysics discipline embraces the knowledge on the mechanisms of the physiological phenomena on the level of membranes, cells and the whole organism. The achieved fundamental knowledge is very important about the future professionals, in the aspects of research and development of biomedical technologies, needed for diagnostics and therapy. The presented matter demands basic preparation in Physics, Chemistry and Human Biology which is earlier achieved by the students in the following courses: Basics in Biology, Molecular Physics, Chemistry, Basics in Human Anatomy and Physiology, Basics in Biochemistry, Basics in Medical Physics. Each topic starts with a resume of the general and important biophysical principles and interrelations and is followed by a discussion on the processes of the major biological structures – biological membranes, cells, tissues, organs and systems. A part of the lectures, seminars and practical classes are devoted to the most commonly used and specifically applied methods for measurement and research of the physical parameters in biological systems and objects in correlation to clinical practice.

Requirements for enrollment: YES/NO

If any, please describe the specific requirements:

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH E540	**Luminescent Methods for Analysis in the Medical and Biological Research**	**English**	**BS**	**summer**	**5**	**30**		**30**	**Head Assist. Prof. Elitsa Pavlova**	**elli_pavlova@abv.bg**

Short description of the course:

This optional, one-semester course is focused on the basic terms of luminescence. Most topics are devoted to the physical methods applied in biotechnology and medical practice. The promoted knowledge is upgrading the basics in the general courses of the bachelor grade education. It is made a review of the contemporary luminescent methods for research applied to humans and other living systems. All these express, extremely sensitive and precise modern investigation techniques are presented theoretically and some of them are tried by the students in the practical classes. The lectures are discussing the fields and practical applications of these methods in the medical and biological practical research and measurements, also including ecology and environmental protection. The practical classes are devoted to some most popular chosen methods and techniques and the specific details in the measurement procedures. This course could be very helpful to all bachelor-grade students who have chosen the following specialties – Medical Physics, Physics, Engineering Physics, Physics and Mathematics, but can also be very interesting and useful to the master-grade students from these specialties, as well as advanced students coming from the Faculty of Chemistry and the Faculty of Biology at Sofia University.

Requirements for enrollment: YES/NO If any, please describe the specific requirements:										
Course code	**Course title (in English)**	**Language of instruction**	**Course offered to BA/BS, MA/MS, PhD**	**Semester (winter/ summer)**	**ECTS**	**Workload (hours)**			**Lecturer/s's name**	**Lecturer/s's E-mail**
						Lectures	**Exercises/ Seminars**	**Practical work**		
PH E652	**Introduction to Biophysics**	**English**	**BS**	**Summer**	**2**	**30**			**Head Assist. Prof. Elitsa Pavlova**	**elli_pavlova@abv.bg**
Short description of the course: This optional course is designed for students from all the specialties of the Faculty of Physics, focused on those who specialize in "Medical Physics". This is a basic, general biological discipline that is introducing the study of the physical and physicochemical processes which are the foundation of the theoretical and practical clinical medicine. The major objective of the biophysical research is to clarify the detailed mechanisms of the biological processes. The bachelor students will achieve common fundamental knowledge, helpful to the future professionals in building mutual interrelations and feedbacks when studying the mandatory biological, chemical and physical disciplines in the course of their university education. A part of the lectures is dedicated to the most commonly used and/or specialized methods to measure and study the physical parameters in the living systems.										
Requirements for enrollment: YES/NO **If any, please describe the specific requirements:**										

BS Programme: Nuclear Engineering, PHN030112

Course code	**Course title (in English)**	**Language of instruction**	**Course offered to BA/BS, MA/MS, PhD**	**Semester (winter/ summer)**	**ECTS**	**Workload (hours)**			**Lecturer/s's name**	**Lecturer/s's E-mail**
						Lectures	**Exercises/ Seminars**	**Practical work**		
PH E331	**Nuclear Astrophysics**	**English**	**BS**	**winter/ summer**	**4.5**	**45**	**15**		**Assoc. Prof. Stefan Lalkovski**	**stl@phys.uni-sofia.bg**
Short description of the course (in the language of instruction): The course covers a range of topics from basic astrophysics and nuclear physics concepts, through reaction rates, burning cycles and advanced burning stages. Experimental methods for measurements of nuclear characteristics, which are of key importance for the nuclear astrophysics, are discussed, as well as techniqies used in the contemporary										

telescopes for X- and gamma-ray astronomy.
Requirements for enrollment: YES/NO **If any, please describe the specific requirements:**

BS Programme: Physics, PHP010112

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH A190	**Complex Analysis**	**English**	**BS**	**summer**	**5**	**30**	**30**		**Assoc. Prof. Naoum Karchev**	**naoum@phys.uni-sofia.bg**
Short description of the course (in the language of instruction):										
Requirements for enrollment: YES/NO **If any, please describe the specific requirements:**										

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH E800	**Biophysics of Photosynthesis**	**English**	**BS**	**winter**	**4.5**	**30**		**30**	**Assoc. Prof. Katerina V. Stoitchkova**	**katys@phys.uni-sofia.bg**

Short description of the course (in the language of instruction):

The purpose of the course is to introduce the students closer to the process of photosynthesis realized by many organisms: higher plants, most algae and many species of bacteria. The emphasis is on the ability of these organisms to build up by light many other chemicals except for the molecular oxygen that can serve man as pharmaceuticals, food supplements, clean fuels and others. The course includes description of the light dependent and light independent steps of the process photosynthesis, the influence of the environmental factor, the mechanisms of adaptation and protection and the synthesis of different products. An overview of the economic profitableness of some products will also be given. The course is based on the knowledge of general and theoretical physics and general biophysics and on interdisciplinary approach. The laboratory classes aim at indirect visualization of some of the mechanisms of the process photosynthesis and involving the students in some spectroscopic methods of the experimental research in the field.

Requirements for enrollment: YES

If any, please describe the specific requirements: Knowledge of general and theoretical physics and general biophysics

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH E801	**Computer practice in communication systems**	**English**	**BS**	**Winter or Summer**	**4,5**			**45**	**Asst. Prof. Nikolay Zografov PhD**	**zoggy@phys.uni-sofia.bg**

Short description of the course (in the language of instruction):

The presented course is dedicated for students in physics and is designed to develop specific skills and abilities necessary for further professional career in working with local and global computer networks. The exercise structure follows 7-layers OSI model in parallel with TCP/IP. Special attention is given to acquiring practical experience for maintenance, configuration and administration of network devices and services in local computer networks.

Here the students will understand in practice the fundamental concepts and principles of telecommunications; computer networks; OSI and TCP/IP models; design and build of local networks; network devices; configuration and administration of end-user computer systems; network routing; maintain network services; analyze and estimation of optimal conditions; discover reasons for limited connectivity and finding effective solutions for.

The final grade is formed after multimedia presentation and defense of course project.

Requirements for enrollment: NO

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH E802	**Practical Chemistry**	**English**	**BS**	**Winter or Summer**	**3,5**		**15**	**30**	**Asst. prof. Nikolay Zografov PhD**	**zoggy@phys.uni-sofia.bg**

Short description of the course (in the language of instruction):

The presented course is dedicated for students in physics. The seminars and tutorials are designed to confirm and extend students' knowledge obtained in bachelor degree training on key areas of applied chemistry and physical chemistry as purification methods, chemical synthesis, qualitative, quantitative and phase analysis.

Laboratory practical exercises allows students to put into practice their knowledge, to learn the rules and techniques of chemical experiments

and acquire skills for independent laboratory and research work in various fields of application.
The course is designed for students in physics and is adapted to their needs in this area. During seminars and practical classes are conducted discussions aimed to clarify specific issues concerning the future work of young professionals and the need to acquire practical knowledge and skills to work in research laboratories.
The final grade is formed after multimedia presentation and defense of course project.

Requirements for enrollment: NO

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH E814	**Introduction to experiment control system LabVIEW**	**English**	**all**	**winter**	**3**	**45**			**Head. Assist. Prof. Nikolay Dimitrov**	**nrd@phys.uni-sofia.bg**

Short description of the course (in the language of instruction): The aim of the course is to introduce the students to the Laboratory Virtual Instrument Engineering Workbench (LabVIEW). Within this framework, they acquire basic knowledge of its capabilities in creating a variety of software products. LabVIEW projects allow integration of different types of tasks into one program. The processing and interpretation of experimental data can be combined with physical simulations or the management and synchronization of various laboratory hardware devices. This allows the creation of a user-friendly interface for complete control on specific tasks and makes LabVIEW an extremely popular product in the research community. It is also commonly used in creating test and automation software for the industry of all sizes, including automotive and aviation.
Training takes place in a specially equipped classroom, in the form of computer aided lectures, three hours a week (total 45 hours).

Requirements for enrollment: NO

BS Programme: Physics and Informatics, PHX070117

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH A318	**Quantum Physics**	**English**	**BS**	**summer**	**8**	**60**	**30**		**Prof. Dr. Leandar Litov**	**litov@phys.uni-sofia.bg**

Short description of the course:

This is a completing course of the general physics education for the students in physics. It introduces the physics of microworld. The course is foreseen for BSc students in "Physics and Informatics" and in "Communication and physical electronics". The course covers four main topics: quantum physics, atomic physics, nuclear physics and particle physics. It starts with basics of the quantum mechanics and its mathematical apparatus. The structure of the atoms is discussed and the modern interpretation of the chemical properties of the elements is given. The interaction of the ionizing radiation with the matter is described. The structure of the atomic nucleus is discussed. The today's understanding of the elementary constituents of the matter is explained together with their properties and interactions. The aim of the course is to give a conceptual description of the quantum world as well as to show the contemporary understanding of the structure of the matter.

Requirements for enrollment: NO

MS Programme: Geophysics, PHA222117

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH M339	**Earth's Thermal field**	**English**	**MS**	**winter**	**5**	**30**	**30**		**Assist. Prof. Gergana Georgieva**	**ggeorgieva@phys.uni-sofia.bg**

Short description of the course (in the language of instruction):

The aim of the course is to acquaint students with the basic physical processes of formation and evolution of the Earth's thermal field. The hypotheses for the origin of the Earth's thermal field are part of the course, as well as the processes in the Earth's crust and Earth's interior. The acquired knowledge can be used in solving problems of applied geothermy. This is especially relevant in connection with the search for sources of geothermal energy.

Requirements for enrollment: YES

If any, please describe the specific requirements: Basic knowledge in geology and Earth's internal structure are needed, as well as in thermodynamics, differential equations and numerical methods.

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		

PH M756	**Geodynamics and tectonics**	**English**	**MS**	**summer**	**5**	**45**	**15**		**Assoc. Prof. Reneta Raykova**	**rraykova@phys.uni-sofia.bg**

Short description of the course (in the language of instruction):

The purpose of this course is to introduce the students with the problems of geodynamics and modern geotectonics. The course deals with issues of geodynamics in the Earth`s interior, and especially of the uppermost layer - the lithosphere. The seismic and non-seismic movements of the Earth's crust are discussed in detail. The basic aspects of plate tectonics (the geological discipline that studies the movements and deformations in the Earth`s lithosphere) are given, as well as some new hypotheses such as polarized plate tectonics. Common issues of faulting and deformation in the Earth`s lithosphere are also discussed.

Requirements for enrollment: YES

If any, please describe the specific requirements: It is desirable that students have taken the compulsory course in "Introduction to Geophysics" from the Bachelor's program "Astrophysics, meteorology and geophysics".

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH M774	**Inversion methods in geophysics**	**English**	**MS**	**winter**	**6**	**45**	**30**		**Assoc. Prof. Reneta Raykova**	**rraykova@phys.uni-sofia.bg**

Short description of the course (in the language of instruction):

The aim of this course is to introduce the main methods of solving the inverse problems in geophysics when a number of observations is used to obtain a model of a given geophysical characteristic. A small number of the inverse problems in geophysics are linear. Generally, inverse problems are nonlinear and the obtained solutions are ambiguous. A number of problems in geophysics are solved by parameterizing or linearizing the problem. An important part of the problem solving is also related to the evaluation of the obtained results.

Requirements for enrollment: YES

If any, please describe the specific requirements: Basic knowledge in linear algebra and geophysics

MS Programme: Meteorology, PHA262112

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH M773	**Boundary layer and interaction processes (atmosphere-ocean-land)**	**English**	**MS**	**winter**	**6**	**45**	**15**		**Assoc. Prof. Reneta Dimitrova**	**r.dimitrova@phys.uni-sofia.bg**
Short description of the course (in the language of instruction): The course is designed to provide basic knowledge of overall boundary layer (BL) dynamics of the atmosphere and interaction processes between the atmosphere, earth's surface and ocean. Fundamental theoretical models, based on the similarity theory and its generalizations, are presented and discussed. The importance of fluxes, the general diurnal structure of the BL, the principles of turbulent flow and parametrization using different methods are also explored. Various effects related to the slope, inversion, influence of vegetation, specific problems of urban areas and orography are taken into account. Evolution, structure and parametrization of convective and stable boundary layers are examined into detail. Some specific conditions and laws of the atmospheric – ocean boundary interactions are discussed, as well as processes of circulation in the deep ocean. Some basic concepts and parametrizations used in numerical weather and climate models are utilized to illustrate the implementation of existing theories.										
Requirements for enrollment: YES **If any, please describe the specific requirements:** The course is intended for graduate level students who have already attained an undergraduate degree in Meteorology or Atmospheric Science or the consent of the instructor. Basic knowledge in physics, mathematics, and computer science is required, as well as some specific courses in Meteorology.										

MS Programme: Physics of the Earth, the Atmosphere and the Ocean, PHA312117

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH M720	**Natural Disasters II**	**English**	**MA/MS**	**summer**	**3**	**45**			**Assist. Prof. Gergana Georgieva**	**ggeorgieva@phys.uni-sofia.bg**

Short description of the course (in the language of instruction):

There is no region on Earth unaffected by natural disasters. Against the background of an ever-increasing population, studying the natural disasters is very important.

In this course, students will gain knowledge of the physical processes which lead the most common natural disasters subject to geophysics - earthquakes, volcanoes, landslides. The reasons for their occurrence, methods for their investigation and ways of risk reduction will be discussed. History knows many examples of major disasters - strong earthquakes, for example, that move science development forward. These cases will be considered and discussed and special attention will be paid to how people have dealt with the effects in the particular case. This will also outline the main ways to prevent and reduce the risk of natural disasters.

The characteristic and most common natural disasters in Bulgaria will be examined. A separate lecture is planned for disaster management in Bulgaria.

Requirements for enrollment: YES

If any, please describe the specific requirements: No preliminary requirements for this course, but it is recommended for students first to pass one of the basic geophyscial courses or to have basic knowledge in Geophysics.

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH M728	**Weather prediction and presentation**	**English**	**MS**	**Winter**	**5**	**30**		**30**	**Assoc. Prof. Guergana Guerova**	**guerova@phys.uni-sofia.bg**

Short description of the course (in the language of instruction): The aim of the course is to present to the students the modern methods used in the operational weather prediction namely, synoptic analysis, satellite image interpretation and numerical weather prediction models. The course gives basic knowledge about the weather diagnosis and forecasting. Students are given the skills to analyze the weather situation and become familiar with the principles of forecasting different meteorological elements. In addition, the course will cover the various types of weather representation as well as the practical weather prediction exercise. The students will also learn to work with a text/audio-visual tools used in the mass media (newspapers, television, internet).

Requirements for enrollment: NO

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH M729	**Seismic hazard and risk**	**English**	**MS**	**Summer**	**4.5**	**45**	**15**		**Assist. Prof. Milen Tsekov**	**tsekov@phys.uni-sofia.bg**

Short description of the course (in the language of instruction):

The course considers earthquake effects on soils and structures, as well as the main seismic hazard and risk assessment methods. Seismic hazard specifics in interplate and intraplate tectonic settings are considered. Special attention is given to earthquakes and seismic hazard in Bulgaria and the Balkan Peninsula region.

Requirements for enrollment: YES

If any, please describe the specific requirements: Basic knowledge in seismology or permission by the lecturer. In the latter case additional consultation on earthquake basics and study material for individual home work will be given to the students.

MS Programme: Medical Physics, PHM232115

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH M004	**Pathology of Biomembranes**	**English**	**MS**	**summer**	**3**	**30**		**15**	**Head Assist. Prof. Elitsa Pavlova**	**elli_pavlova@abv.bg**

Short description of the course:

The course is focused to the Master students in Medical Physics of the Faculty of Physics. This is a specialized, biological discipline that studies the physicochemical and biological processes responsible for the cellular and metabolic damage. One of the major goals of the cytological research is to clarify the detailed mechanisms of the processes associated with damage to the functions and structures on the cellular level of organization of the organisms. The students are going to achieve common fundamental and specific knowledge, which will be very helpful to the future professionals, in the development of biomedical technologies, designed mostly for diagnostic and therapeutic purposes. A part of the lecture and practical material is devoted to the most frequently applied and/or specialized methods for measuring and testing the indicators of cellular damages in the process of the disease development.

Requirements for enrollment: YES/NO

If any, please describe the specific requirements:

MS Programme: Nuclear and Particle Physics, PHP322412

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH M465	**Modeling of Physical Processes**	**English**	**MS**	**winter**	**6**	**30**		**30**	**Prof. Dr. Habil. Ana Proykova**	**anap@phys.uni-sofia.bg**

Short description of the course:

Optional specializing course MODELING OF NATURAL PROCESSES is intended for students in master's programs in Theoretical Physics, Nuclear Physics and elementary particle physics. It is useful for students and young researchers who want to deepen their knowledge of computer methods in statistical physics, quantum physics and to acquire specialized methods for numerical integration and differentiation and optimization procedures. The aim of the course is to gain experience in solving problems that modeling plays a major role: division (fragmentation) of cores passage of radiation (radioactive and high frequency) in various substances, phase transitions in small systems, chaos in deterministic systems

During the practice the students use computer programs modules that can then be used to develop a personal project.

Requirements for enrollment: YES/NO

If any, please describe the specific requirements:

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH M470	**Radiation Biophysics**	**English**	**MS**	**winter**	**4,5**	**45**			**Prof. Dr. habil. Dobromir Pressyanov**	**pressyan@phys.uni-sofia.bg**

Short description of the course: Basic biophysical mechanisms responsible for the biological effects of ionizing radiations are considered. Because the target audience are physicists, special attention is given to dosimetry and to the physical principles of the methods for measurement. Basic harmful effects (deterministic and stochastic) of ionizing radiation are considered. Methodology and statistics employed for the assessment of the risk of stochastic effects are considered. A review of the contemporary knowledge of the radiation risk is made. Current problems in low-dose risk estimates and the consequences for risk communications and the radiation protection policy are discussed.

Requirements for enrollment: YES/NO
If any, please describe the specific requirements:

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH M471	**Environmental Radioactivity and Radioecology**	**English**	**MS**	**winter**	**7,5**	**30**		**45**	**Prof. Dr. habil. Dobromir Pressyanov**	**pressyan@phys.uni-sofia.bg**

Short description of the course: The course aims to give basic knowledge about the environmental radioactivity and its influence on the humans. Biological effects of ionizing radiations are considered and basic quantities and units are defined. Both natural and man-made radioactivity is considered. Some principal radioecology problems are considered in detail – radon problem, nuclear fuel cycle, radiation monitoring around nuclear power plants, radioactive wastes, fall-out from nuclear tests in the atmosphere, nuclear incidents etc. The emphasized topics are radioactive contamination from the uranium industry, radiation monitoring around nuclear power plants, consequences of nuclear emergency, radioactive wastes treatment and storage, radon in dwellings etc.

Requirements for enrollment: YES/NO
If any, please describe the specific requirements:

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH M474	**Standard model of electroweak and strong interactions**	**English**	**MS**	**winter**	**6**	**60**			**Prof. Dr. Leandar Litov**	**litov@phys.uni-sofia.bg**

Short description of the course:

The course is a natural extension and continuation of the bachelor degree courses "Physic of Elementary particles" and "Introduction in theory of elementary particles". The goal is to give a deeper description of the fundamental interactions of the elementary particles and experimental methods for their investigation. The recent theoretical and experimental results are presented.

The different types of symmetry of the fundamental interactions are discussed. Description of the interactions with the help of local gauge symmetries are considered. The Standard model of electroweak and strong interactions (SM) is given. The basics of Quantum Chromo

Dynamics, the theory of strong interactions, are presented. A significant part of the course is devoted to the unified description of electromagnetic and weak interactions in the framework of Glashow- Weinberg – Salam model. The results of the precise experimental test of the SM are discussed.

Models giving an unified description of electroweak and strong interactions (Grand Unified Theory) are considered. The basics of the super symmetric extensions of the SM are discussed. The ongoing experiments testing the predictions of these models are described in details. The main open questions and unsolved problems together with future perspectives of the particle physics are considered.

Requirements for enrollment: YES/NO

If any, please describe the specific requirements:

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester (winter/ summer)	ECTS	Workload (hours)			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Exercises/ Seminars	Practical work		
PH M479	**Nuclear Models**	**English**	**MA**	**winter**	**4,5**	**45**			**Assist. Prof. Martin Djongolov**	**mdj4d@phys.uni-sofia.bg**

Short description of the course:

The course is oriented towards students at a Graduate level – Particle physics and Theoretical physics. The goal of the course is to introduce the students to theoretical models of the atomic nucleus that are commonly applied to problems such as Nuclear structure and Nuclear fission, as well as more advanced topics like restoration of broken symmetry.

Requirements for enrollment: YES/NO

If any, please describe the specific requirements: