

COURSES IN FOREIGN LANGUAGES for ERASMUS INCOMING STUDENTS
at Sofia University
2018/2019 academic year

Faculty: Physics

Faculty coordinator: Prof. Valentin Popov, vpopov@phys.uni-sofia.bg

Programme: All BA Programmes

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
E781	Laboratory Exercises in nuclear physics	English	BA	summer	4,5	0	0	45	Prof. Georgi Rainovski Assoc. Prof. Kalin Gladnishki	rig@phys.uni-sofia.bg kag@phys.uni-sofia.bg

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

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 enrolment: 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	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
E782	Nuclear symmetries	English	BA	summer	5,0	45	0	30	Assoc. Prof. Kalin Gladnishki	kag@phys.uni-sofia.bg

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

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 enrolment: 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	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
E783	Experimental Nuclear Physics	English	BA	summer	7,5	45	0	60	Prof.V. Rusanov Prof. Georgi Rainovski Assoc. Prof. Kalin Gladnishki	rusanov@phys.uni-sofia.bg rig@phys.uni-sofia.bg kag@phys.uni-sofia.bg

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

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 enrolment: 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	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
E784	Nuclear Physics	English	BA	summer	5,0	45	30	0	Prof. Georgi Rainovski	rig@phys.uni-sofia.bg

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

The course aims to give a simple and up-to-date 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 enrolment: 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	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
E785	Laboratory exercises in atomic physics and interaction of ionizing radiation with matter.	English	BA	winter	4,5	0	0	45	Prof. Georgi Rainovski Assoc. Prof. Kalin Gladnishki	rig@phys.uni-sofia.bg kag@phys.uni-sofia.bg

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

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 enrolment: 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	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
E786	Particle Physics	English	BA	winter	5.0	45	30	-	Assoc.Prof. Mariyan	marian@phys.uni-sofia.bg

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

The course is intended for bachelor students in all programs at the Faculty of Physics. A necessary prerequisite for choosing this course is formerly acquired basic knowledge of Mechanics, Electrodynamics, Quantum Mechanics, Nuclear Physics, Atomic Physics and Interaction of Ionizing Radiation with Matter. The present course is a natural extension to them because its 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 (\sim GeV), short lifetimes (\sim 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 enrolment: 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	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
E787	Nuclear electronics	English	BA	summer	6,0	45	0	45	Assoc.Prof. Ilko Rusinov	irusinov@phys.uni-sofia.bg

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

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 analysers, 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 discrete components.

Some pre-assembled modules are also used.

Requirements for enrolment: 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	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
E788	Cosmology and Particle Physics	English	BA	summer	2,5	45	0	0	Assoc. Prof. Venelin Kozhuharov	venelin@phys.uni-sofia.bg

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

The Standard Model in Particle Physics is one of the best tested theories in physics. The description of the micro world reflects our knowledge of the parameters of the Universe as a whole. Despite the numerous existing models we still lack complete understanding of the properties of the microscopic and macroscopic observables. The course aims to uncover how the present knowledge in Particle Physics is translated into Cosmology. The basics of the two directions, Particle Physics and Cosmology are reviewed. The problems of the matter-antimatter asymmetry and the existence of Dark matter are discussed in details together with their possible interpretations. The information extracted from the abundance of the light elements in the Universe is also shown. During the course the experimental and observational results dominate and the phenomenological interpretation of the results is preferred, where possible.

Requirements for enrolment: 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	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
E789	Object-Oriented Programming	English	BA	summer	5,0	45	0	30	Assoc. Prof. Borislav Pavlov	

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

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 analysing 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 enrolment: 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	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
E790	Theoretical Nuclear Physics	English	BA	summer	4,5	45	30	0	Assist. Prof. Martin Djongolov	mdj4d@phys.uni-sofia.bg

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

The course aims to provide an introduction to the basic nuclear models used to describing the atomic nucleus.

Requirements for enrolment: 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	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
E791	Modelling in finite-size systems	English	BA	winter	6,0	45	0	30	Prof. Ana Proykova	anap@phys.uni-sofia.bg

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

The course is optional for bachelor students who aim at understanding how to obtain results in several fields of physics with the help of computers (computer-aided physical results). Most of the cases studied are applications of physical methods in finite-size systems such as nanostructures, clusters of atoms (molecules). To achieve the goal, the students learn how to develop realistic models of measurable phenomena, how to select a suitable numerical method for analysing small systems (differential /integration methods), how to interpret the results obtained. The students perform computer experiments that illustrate the lectures.

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

Course	ECTS	Number of hours
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Course code	Course title (in English)	Language of instruction	offered to BA/BS, MA/MS, PhD	Semester		Lectures	Seminars	Practical work	Lecturer/s's name	Lecturer/s's E-mail
E792	Nuclear structure	English	BA	winter	5	45	0	15	Prof. Georgi Rainovski	rig@phys.uni-sofia.bg

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

The course present 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 enrolment: NO

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
E793	Medical Biophysics	English	BA	winter	6.0	45	15	30	Assist. Prof. Elitsa Pavlova	

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

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 enrolment: NO

If any, please describe the specific requirements:

			Course		ECTS	Number of hours		
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Course code	Course title (in English)	Language of instruction	offered to BA/BS, MA/MS, PhD	Semester		Lectures	Seminars	Practical work	Lecturer/s's name	Lecturer/s's E-mail
E794	Luminescent Methods for Analysis in the Medical and Biological Research	English	BA	summer	5.0	30	0	30	Assist. Prof. Elitsa Pavlova	

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

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 enrolment: NO

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
E795	Modelling of Interactions of Biological Molecules	English	BA	summer	5,0	30	0	30	Assoc. Prof. Leandar Litov	litov@phys.uni-sofia.bg

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

This course is an introduction to the modern methods of *in-silico* modelling 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 enrolment: NO

			Course		EC	Number of hours		
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Course code	Course title (in English)	Language of instruction	offered to BA/BS, MA/MS, PhD	Semester		Lectures	Seminars	Practical work	Lecturer/s's name	Lecturer/s's E-mail
E796	Introduction to the theory of elementary particles	English	BA	summer	4,5	45	0	0	Assoc. Prof. Leandar Litov	litov@phys.uni-sofia.bg

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

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 enrolment: NO

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
E772	Quantum Physics	English	BA	summer	8,0	60	30	0	Assoc. Prof.. Leandar Litov	litov@phys.uni-sofia.bg

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

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 enrolment: NO

			Course		EC	Number of hours		
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Course code	Course title (in English)	Language of instruction	offered to BA/BS, MA/MS, PhD	Semester		Lectures	Seminars	Practical work	Lecturer/s's name	Lecturer/s's E-mail
E797	Introduction to Biophysics	English	BA	winter	2.0	30	0	0	Assist. Prof. Elitsa Pavlova	

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

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 enrolment: NO

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
E798	Classical Mechanics	English	BS	Summer or winter	6.0	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 enrolment: YES

If any, please describe the specific requirements: Calculus, linear algebra

			Course		ECTS	Number of hours		
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Course code	Course title (in English)	Language of instruction	offered to BA/BS, MA/MS, PhD	Semester		Lectures	Seminars	Practical work	Lecturer/s's name	Lecturer/s's E-mail
E799	GENERAL BIOPHYSICS	English	BA	summer	4	30	0	15	Assoc. Prof. Katerina Stoitchkova	katys@phys.uni-sofia.bg

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

The purpose of the course is to teach the students on basic biophysics and to introduce them the possible applications of the physical laws and modern scientific research approaches to the biological systems. The course includes the main sections of this interdisciplinary area starting from the molecules to the complex systems. It is based on the knowledge of general and theoretical physics and organic chemistry. The methods for investigation of the biomolecules and the biological systems are discussed from the point of view of the information they provide for the structure and function of the biopolymers. The current conceptions for the electron transfer and the energy transformation in biomembranes, for the biophysics of the nerve impulse, biophysics of the contracting systems and perception biophysics are given. Special attention is paid to the structure and function of the membrane protein rhodopsin and the eye pigment – retinal. The laboratory classes aim at practical introduction to some physical methods applicable in biophysics investigations and at giving laboratory skills specific for the biophysical experimental work.

Requirements for enrolment: YES

If any, please describe the specific requirements: Knowledge of general and theoretical physics and organic chemistry.

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
E800	BIOPHYSICS OF PHOTOSYNTHESIS	English	BA	summer		30	0	15	Assoc. Prof. Katerina 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 enrolment: 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	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
E801	Computer practice in communication systems	English	BA	Winter or Summer	4,5	0	0	45	Assist. Prof. Nikolay Zografov	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; analyse and estimation of optimal conditions; discover reasons for limited connectivity and finding effective solutions for. The final grade is formed after multimedia presentation and defence of course project.										
Requirements for enrolment: NO										
Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
E802	Practical Chemistry	English	BA	Winter or Summer	3,5	0	15	30	Assist. Prof. Nikolay Zografov	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 defence of course project.										

Requirements for enrolment: NO										
Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
E803	Electricity and Magnetism	English	BA	Winter or Summer	7.5	60	30		Assoc. Prof. Victor Atanasov	vatanaso@phys.uni-sofia.bg
Short description of the course (in the language of instruction):										
<p>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.</p> <p>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.</p> <p>Seminars deepen and illustrate with appropriate problems the lectures. Demonstrations of the discussed phenomena are also included in the syllabus.</p>										
Requirements for enrolment: NO										
Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
E804	Measurement technique and Instrumentation;	English	BA	summer	6	45	0	30	Assoc. Prof. Djermanova	ninadj@phys.uni-sofia.bg
Short description of the course (in the language of instruction):										
<p>The objective of the course is to link theoretical principles with practical issues of electronic instrumentation. Students take practical work with modern electronic instrumentation using microcontrollers and PC-based applications. After completing the course, the students should be able to do the following: Understand the principles of electronic instrumentation. • Understand the main specification of a measuring system. • Utilize a PC-based hardware that provides interaction with external signals, sensors and devices. • Design simple measuring systems and micro-controller based applications.</p>										
Requirements for enrolment: NO										

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
E805	Sensor and sensor electronics	English	BA	winter	6	45	0	30	Assoc. Prof. Djermanova	ninadj@phys.uni-sofia.bg

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

The objective of the course is theoretical understanding of various physical phenomena behind the operation of different types of sensors and microsystems, as well as designing of sensors with appropriate electronic interface as a complete system. Various types of sensors discussed during this course are magnetic, optical, bio, chemical, radiation, electrical, mechanical etc. In general the students are introduced to the current technology of sensors: electronic, photonic, microfluidics and new materials. The course emphasis is on the integration of electronics with sensors to provide a smart transducer or a system on a chip with multiple integrated devices.

Requirements for enrolment: NO

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

Short description of the course (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 enrolment: NO

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

E807	Antenna systems and technology;	English	BA	summer	4	45	15	0	Assoc. Prof. Kissovski	kissov@phys.uni-sofia.bg
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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, and influence of the obstacles and some problems of the electromagnetic compatibility.

Requirements for enrolment: NO

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
E810	Introduction to Wireless Communication	English	BA	winter	5	30	30	0	Assoc. Prof. Plamen Dankov	dankov@phys.uni-sofia.bg

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

The Introduction to Wireless Communication is an interdisciplinary course. It combines sound physics knowledge of the students for the main processes in the wireless communications – signals, modulations, propagation, losses, radiation, transmission, reception, statistics, etc. with the engineering basis of the structure, characteristics and functionality of the main communication systems of the last 5 generations. The course considers the main four types of the modern communication systems – mobile, satellite, wireless and optical. It finished with an important problem – influence of the electromagnetic signals in communication over the humans.

Requirements for enrolment: NO

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
E811	Fixed and Mobile Satellite	English	BA	winter	5	30	15	15	Assoc. Prof.	dankov@phys.uni-sofia.bg

Communication Systems										Plamen Dankov; consultant Assoc. Prof. Mario Gachev	ni-sofia.bg
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Short description of the course (in the language of instruction):

The course aims to familiarize MSc. students with the modern fixed and mobile satellite communication systems, the corresponding equipment, the structure of the communications satellites, the characteristics of the different types of ground stations, as well as with the methods for system analysis and design. Special attention is paid to the design of satellite communication links, satellite communications networks, access systems and the most widely used methods for encoding and modulation of the analog and digital signals used in satellite communications. Discussed are also fast developing satellite networks using small aperture antennas, individual, portable and mobile antenna terminals for radio and television reception and bi-directional transmission data.

Requirements for enrolment: NO

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
E812	Microwave and Wireless Technique	English	BA	summer	6	45	15	15	Assoc. Prof. Plamen Dankov	dankov@phys.u-ni-sofia.bg

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

The higher education in the area of microwaves: wave propagation, RF components and devices, antennas, wireless communication, etc. is among the most sophisticated and costly educational processes for many reasons. First of all, the electromagnetic modelling of microwave structures is based on a mixed approximation, which combines the pure circuit approximation and pure wave approximation, combined to a specific extent in each particular case between. Therefore, students have to acquire sound knowledge both in the areas of electronics and electrodynamics. In addition, practice-orientated education in microwave physics and technology requires well-selected measurement equipment, components and devices, which are generally expensive and not easy to operate with. Moreover, the modern RF design is based on utilization of circuit and structural (2-D and 3-D) electrodynamics simulators, which needs additional efforts for provision (licenses, upgrading) and training (computer classes, student seminars). Incessant development of research and modernization of key facilities, technical solutions and applied approximations in the microwave range also urges lecturer to continuously upgrade his own knowledge and skills.

The course Microwave and Wireless Technique includes lectures, seminar and laboratory exercises. The lecture course is divided on three parts: MIC's and MMIC's technology, passive devices, and active devices. Students receive individual assignments in the seminar and laboratory classes – a packet of tasks. The final examination is based on 4 parts: common written test, two topic presentations and individual presentations on the individual tasks, selected in advance as projects.

Requirements for enrolment: 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	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
E808	Computer Design of Electronic Circuits	English	BA	Summer	6	30	-	45	Assoc. Prof. 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 enrolment: 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	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
E809	Signals and Systems	English	BA	Summer	4	30	30	-	Assoc. Prof. Stanimir Kolev	skolev@phys.uni-sofia.bg

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

The course introduces the basics of time and spectral representation of signals as well as a number of applications in communication systems and signal processing like Fast Fourier Transform, digital and analog modulations, signal modulation methods, signal discretization, feedback connections etc.

Requirements for enrolment: YES

If any, please describe the specific requirements: The course requires basic knowledge in the field of differential and integral calculus.

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
E813	Extragalactic astronomy	English	BA	2	4	30	15	0	Assoc. Prof. A.	valcheva@phys.uni-sofia.bg

									Valcheva	i-sofia.bg
Short description of the course (in the language of instruction):										
The course “EXTRAGALACTIC ASTRONOMY” is intended for undergraduate students in Astronomy/Astrophysics. The course provides an introduction to the basic properties of the galaxies in the Universe. Elliptical, spirals, irregulars and AGNs are discussed in details. Their stellar content, interstellar matter, spectral energy distribution, galactic structure, stellar dynamics and galactic shapes, etc. are presented with an emphasis on observational data. Current understanding of formation and evolution of matter and structures is also included in the course schedule. Different scenarios of galaxies evolution are discussed and observational evidences are presented.										
Requirements for enrolment: YES										
If any, please describe the specific requirements: It is recommended that the interested students have attended any course in General astronomy/astrophysics provided in the Faculty of Physics, University of Sofia or in other University.										
Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
E814	Introduction to experiment control system LabVIEW	English	BA	winter	3	45	0	0	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 enrolment: NO										
Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
E815	Seismology	English	BA	summer	4	4	0	0	Assoc. Prof.	rakovska@phys

									Reneta Raykova	.uni-sofia.bg
Short description of the course (in the language of instruction):										
This is a 3 th /4 th 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 enrolment: NO										
Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
E816	Geophysical Practice	English	BA	Summer	5	0	0	60	Assist. Prof. Gergana Georgieva	ggeorgieva@physics.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 enrolment: <u>NO</u>										
Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
E817	Seismological Practice	English	BA	Winter	4.5	0	0	45	Assist. Prof.	ggeorgieva@physics.uni-sofia.bg

										Gergana Georgieva	ys.uni-sofia.bg
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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 catalogues. Exercises for identifying of main seismic phases from local, regional and distant earthquakes, assessment of earthquake parameters (epicentre location, magnitude, focal mechanism), determine the statistical properties of seismic data from local and global earthquake catalogues 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 enrolment: 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	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
E817	Physics of Climate	English	BA	Summer	5	45	15	0	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 enrolment: YES

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

Programme: Nuclear and Particle Physics

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
M765	Object-Oriented Programming	English	MA	winter	10,5	45	0	60	Assoc. Prof. Borislav Pavlov	

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

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 analysing 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

Requirements for enrolment: NO

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
M471	Environmental Radioactivity and Radioecology	English	MA	winter	7,5	30	0	45	Prof. Dobromir Pressyanov	pressyan@phys.uni-sofia.bg

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

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 enrolment: NO

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
M767	Radiation biophysics	English	MA	winter	4,5	45	0	0	Prof. Dobromir	pressyan@phys.uni-sofia.bg

									Pressyanov	uni-sofia.bg
Short description of the course (in the language of instruction):										
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 enrolment: NO										
Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
M768	Nuclear Models	English	MA	winter	4,5	45	0	0	Assist. Prof. Martin Djongolov	mdj4d@phys.uni-sofia.bg
Short description of the course (in the language of instruction):										
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 enrolment: NO										
Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
M769	Standard model of electroweak and strong interactions	English	MA	winter	6,0	60	0	0	Assoc. Prof. Leandar Litov	litov@phys.uni-sofia.bg
Short description of the course (in the language of instruction):										
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 a 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 enrolment: NO

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
M770	Modelling of Physical Processes	English	MA	winter	6,0	30	0	30	Prof. Ana Proykova	anap@phys.uni-sofia.bg

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

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 modelling 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 enrolment: NO

Programme: Medical Physics

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
M771	Pathology of Biomembranes	English	MA	summer	3.0	30	0	15	Assist. Prof. Elitsa Pavlova	

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

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 enrolment: NO

Programme Astrophysics, Meteorology and Geophysics

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
M773	Boundary layer and interaction processes (atmosphere-ocean-land)	English	MA	winter	6	45	15	0	Assoc. Prof. Reneta Dimitrova	r.dimitrova@physics.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 enrolment: 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.

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
M774	Inversion methods in geophysics	English	MA	winter	6	45	30	0	Assoc. Prof. Reneta Raykova	rraykova@physics.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 enrolment: YES

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

Course code	Course title (in English)	Language of instruction	Course offered to BA/BS, MA/MS, PhD	Semester	ECTS	Number of hours			Lecturer/s's name	Lecturer/s's E-mail
						Lectures	Seminars	Practical work		
M775	Seismic hazard and risk	English	MA	Summer	4.5	45	15	0	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 enrolment: 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.