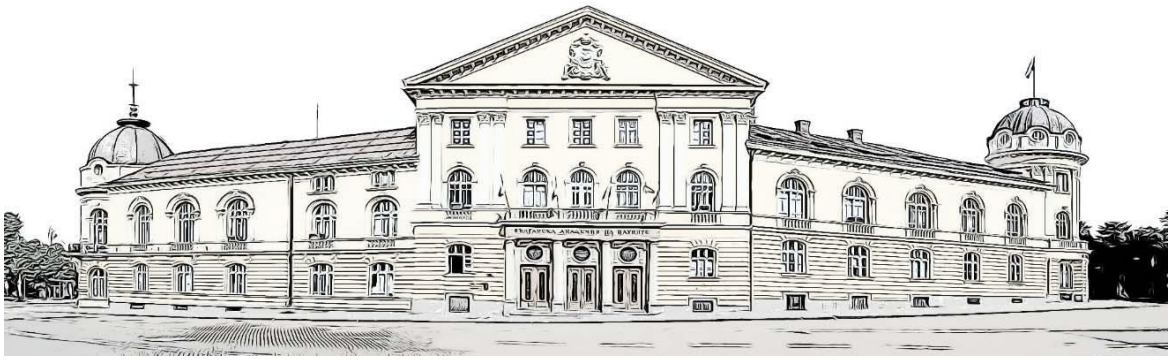
Erasmus+

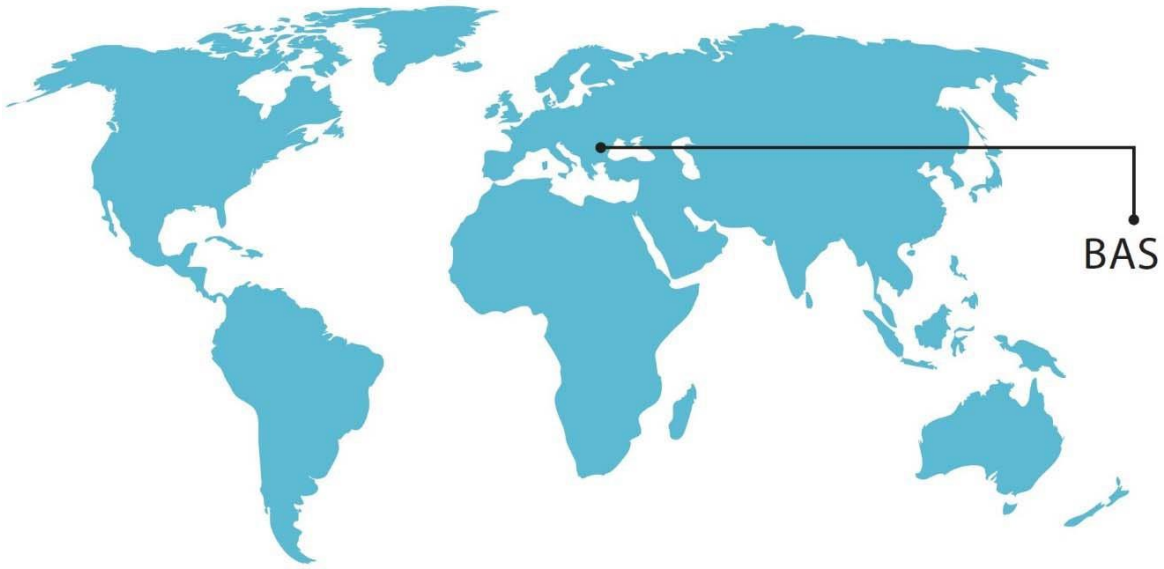
COURSE CATALOGUE

2022 – 2023



BULGARIAN ACADEMY OF SCIENCES

1869



The Bulgarian Academy of Sciences is a Higher Education Institution which trains third cycle (PhD/doctoral) students. Incoming PhD students may attend courses at any of the 42 units of the Academy (institutes/laboratories/scientific centres) as long as there is a group to begin the course, and they correspond to the student's subject area of study. The units of the Academy correspond to faculties/departments of universities, they are as follows:

Bulgarian Academy of Sciences

Complete list

Not all of them teach courses in English

1. Information and Communication Sciences and Technologies

1.1. Institute of Mathematics and Informatics

1.2. Institute of Mechanics

1.3. Institute of Robotics

1.4. Institute of Information and Communication Technologies

1.5. National Laboratory of Computer Virology

1.6. Laboratory of Telematics

2. Energy Resources and Energy Efficiency

2.1. Institute of Nuclear Research and Nuclear Energy

2.2. Institute of Electrochemistry and Energy Systems

2.3. Institute of Chemical Engineering

2.4. Central Laboratory of Solar Energy and New Energy Sources

3. Nanosciences, New Materials and Technologies

3.1. Institute of Solid State Physics

3.2. Institute of Electronics

3.3. Institute of Optical Materials and Technologies

3.4. Institute of Mineralogy and Crystallography

3.5. Institute of Metal Science, Equipment and Technologies with Hydro- and Aerodynamics Centre

3.6. Institute of General and Inorganic Chemistry

3.7. Institute of Organic Chemistry with Center of Phytochemistry

3.8. Institute of Physical Chemistry

3.9. Institute of Polymers

3.10. Institute of Catalysis

3.11. Central Laboratory of Applied Physics – Plovdiv

4. Biomedicine and Quality of Life

4.1. Institute of Molecular Biology

4.2. Institute of Neurobiology

4.3. Institute of Microbiology

4.4. Institute of Biophysics and Biomedical Engineering

4.5. Institute of Biology and Immunology of Reproduction

4.6. Institute of Experimental Morphology, Pathology and Anthropology with Museum

5. Biodiversity, Bioresources and Ecology

5.1. Institute of Biodiversity and Ecosystem Research

5.2. Forest Research Institute

5.3. Institute of Plant Physiology and Genetics

5.4. National Museum of Natural History

5.5. Botanical Garden at BAS

6. Climate Change, Hazards and Natural Resources

6.1. Geological Institute

6.2. National Institute of Geophysics, Geodesy and Geography

6.3. Climate, Atmosphere and Water Research Institute

6.4. Institute of Oceanology

7. Astronomy, Space Research and Technologies

7.1. Institute of Astronomy and National Astronomical Observatory

7.2. Institute of Space Research and Technologies

8. Cultural-historical Heritage and National Identity

8.1. Institute for Bulgarian Language

8.2. Institute for Literature

8.3. Institute of Balkan Studies and Centre of Thracology

8.4. Institute of Ethnology and Folklore Studies with Ethnographic Museum

8.5. Institute for Historical Studies

8.6. Institute of Art Studies

8.7. National Archaeological Institute with Museum

8.8. Cyrillo-Methodian Research Centre

9. Man and Society

9.1. Economic Research Institute

9.2. Institute for Legal Studies

9.3. Institute for Population and Human Studies

9.4. Institute of Philosophy and Sociology

1. Information and Communication Sciences and Technologies

1.1. Institute of Mechanics

1.1.1. Mechanics of Carbon Nanostructures and Biomembranes

This lecture course is an introduction to the continuum mechanics of carbon nanostructures and biomembranes. Despite of the different physical and chemical nature of these two types of nano-scale structures, it turns out that each such structure can be regarded as twodimensional elastic continuum. This is because both of the foregoing structures are observed to exhibit elastic behaviour within a large scale, in continuum limit the geometry of the respective atomic or molecular lattices being two-dimensional even after a significant deformation due to external excitations.

The particular problems envisaged to be addressed in this course are: mechanics of two-

dimensional elastic continuum whose mechanical behaviour depends on a few material con- stants; analytic description of cylindrical and axisymmetric equilibrium shapes of carbon nano- tubes and biomembranes subjected to hydrostatic pressure; equilibrium shapes of red blood cells; deformation of injected cells adhering to flat rigid substrates; junctions of carbon nano- tubes to graphene sheet or to other carbon nano-tubes.

Lecturer: Vassil M. Vassilev, Ph.D., Prof.
Phone: +359 2 979 64 78
E-mail: vasilvas@imbm.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

1.1.2. Biorheology, Hemorheology and Hemodynamics

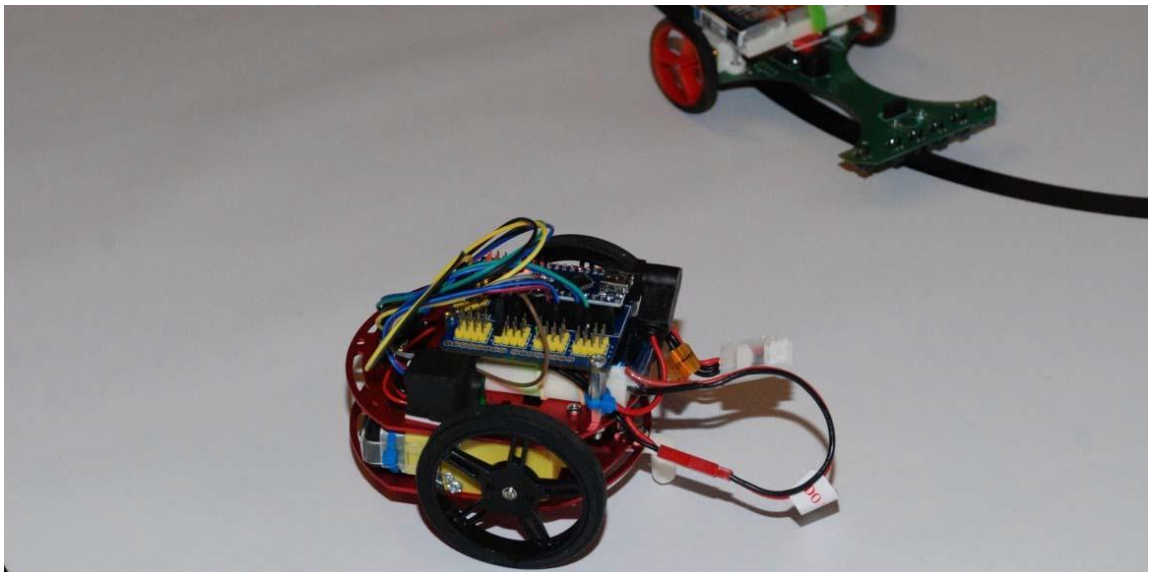
The course aims to provide the subject, fundamentals, major problems and tasks of the modern development of Bio- and Hemorheology and Hemodynamics, theoretical and experi- mental, physical and mathematical methods, concepts models and analysis tasks for deforma- tion under load and shear flow of biological materials and fluids, including and blood and its formed elements and the factors and processes that define them.

The course aims to provide contemporary knowledge and to emphasize the greatest discov- eries in the field of Biorheology, Hemorheology and Hemodynamics. Ph D Students will acquire experience in conducting certain types of rheological experiments, analyze biorheological and hemorheological data through constitutive models and clarify the role of hemorheological dis- turbances for breaches of hemodynamics as well as epidemiology and prognosis in the study of various diseases. On the other hand, the course aims to motivate prospective graduate students to further research beyond what is known as the rheological aspects of aggregation of red blood cells, transmigration of white blood cells in tissues and activation of platelets in a shear flow as and challenges for the development of experimental techniques, theories, diagnostic tests and therapeutic procedures that contribute to elucidate the mechanisms of these disorders by improving the selection of therapeutic and preventive approach in patients with various diseases.

The course will be useful for PhD Students in the field of natural interdisciplinary oriented biological and medical sciences as well as to researchers who wish to acquire a more extensive background and to do fundamental research in the area of biorheology, hemorheology and hemodynamics.

Lecturer: Nadia Antonova, Ph.D., Prof.
Phone: +359 2 979 64 13, 979 64 21
E-mail: antonova@imbm.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

1.2. Institute of Robotics



1.2.1. Fundamentals of Patent Law and Ability to Invent

Within this lecture course students are introduced to the basic principles and rules laid down in national and European patent law and law of copyright and related rights. Skills for formulating the criteria required for the presence of inventive solution. Clarified practical peculiarities of formation of patent applications in the format (1) devices or appliances, (2) methods and approaches and (3) combination method and device. Through concrete examples illustrate the variety of inventive tasks and ways of their solution.

The course will give a contemporary analysis of the psychological attitude and assumptions giving rise to innovation hypothesis, its maturation, the ability to apply the principles of the so-called “Horizon vision” and “brainstorming” and approbation of the final decision. Provide detailed information on the specifics of the inventive manner to assess the scientific results in order to use them to create inventions.

Upon request by the PhD students to prepare their inventive applications, provides advice and assistance from lecturers and staff of the Innovation Center.

Lecturer: Chavdar Roumenin, D.Sc., Prof., Academician of BAS
Phone: +359 2 873 78 22
E-mail: roumenin@bas.bg
Academic hours: 20 lecture hours
ECTS credits: 20 ECTS

1.2.2. How to Formulate the Goals, Objectives, Conclusions and Contributions in Ph.D. Thesises and Scientific Papers

The course will explain the skills and techniques in shaping dissertations. Describe the specific ways of formulating objectives and resulting tasks in the thesis. Give examples of the most common mistakes and approaches to overcome them. Features in putting the contributions in dissertations and scientific publications. Typical mistakes and means for their removal. Public defense of the thesis as a unity of scientific competence and stage performance and learning techniques for acquisition. Speaker-audience dialogue and psychoanalysis feedback PhD-jury- audience. Features of oral reporting of scientific forums. Persuasion and verbal behavior. The duration of the exhibition - specificity and regularities.

Lecturer: Chavdar Roumenin, D.Sc., Prof., Academican of BAS
Phone: +359 2 873 78 22
E-mail: roumenin@bas.bg
Academic hours: 20 lecture hours
ECTS credits: 20 ECTS

1.2.3. Modeling and Control of Biotechnological Processes

The course is designed to prepare professionals and graduate students (engineers, technologists and biotechnologists) of specialties 02.21.08 “Automation of production (by industry)”,

02.21.10 “Application of the principles and methods of cybernetics in various fields of science”. The aim of the course is to introduce modern methods of modeling, monitoring and management of (bio) technological processes.

The course will trace all stages of the design of a modern system of direct digital control: building a database; creation of (bio) technological models and management models; structural and parametric identification of models; construction of linearising non-linear systems of objects and their application to the synthesis of adaptive control. Each of the stages will be illustrated with examples.

To the students will be given the opportunity to work with a new interactive system

for bioprocess modelling. The system is realized in Graphical User Interface Development Environment of MATLAB. During the exercises the students will start different programs without the necessity to be familiar with the software programmes built in the system.

Lecturer: Velislava Lyubenova, D.Sc., Prof.
Phone: +359 2 870 04 71, +359 885 504 228
E-mail: v lubenova@hotmail.com
Academic hours: 20 lecture hours, 10 lab hours
ECTS credits: 20 ECTS

1.2.4. Identification and Recognition of Robots and Manipulators

The aim of the course is to gain enough knowledge to analyze the necessary information for research and calibration of the site - mechatronic robotic system. To achieve the objective described the process of creating an adequate model reflecting the actual situation and the functions of the object. Made selection of suitable mathematical apparatus for description and study of the model.

The course will analyze the kinematic and dynamic characteristics of the segments of the mechatronic system, as is shown its structure. Also disclosed is a process of mechanical and mathematical modeling used to describe the regional structure of the handler being considered separately modeling processes of global and local kinematic systems. Addressed are issues of use of sensory information to the robot in order to identify its mechanical properties and its use in the process of calibration of the manipulator. Within mechatronic robotic system are shown possibilities to lead the process of identification of the mechanical structure and its recognition in the organization of optimal control in real time with preset certain restrictions.

The program is designed to train graduate students, specialists in the creation and testing of mechatronic systems, robots and manipulators.

Lecturer: Roman Zahariev, Ph.D., Prof.
Phone: +359 2 872 35 71
E-mail: r.zahariev@ir.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

1.3. Institute of Information and Communication Technologies

1.3.1. High Performance and distributed computing

The aim of the course is to acquaint the participants with the opportunities of using High Performance and distributed computational resources for scientific computations and data storage.

Currently the Institute of Information and Communication Technologies has significant computational and data storage capabilities, including the supercomputer Avithol (member of the Top500 list of supercomputers in 2015). Avitohol has 150 servers with a total theoretical performance of more than 400 Teraflops in double precision, as well as access to Petabytes of hard disk and SSD storage. The low-latency infiniband interconnection allows tasks to use efficiently multiple servers, combining their

computational capabilities into one. The most popular protocol to use on such machines is

MPI.

The course includes introduction to some of the the operating system Linux: installation, basic commands, installation of rpm packages, bash shell scripting. The procedures for installing additional software and then for compiling own codes will be considered. Access for execution of sequential and parallel jobs on a high performance cluster will be provided. The opportunities of HPC computing will

be studied in the following sequence: obtaining access to the supercomputer, submitting simple jobs and then jobs that use multiple servers, running example MPI codes. The most important MPI calls and the typical organization of a parallel program using MPI will be studied. Another popular option for running parallel programs is OpenMP, which is even easier to understand and use. Examples using OpenMP will be discussed and executed on the supercomputer. The question of efficient storing large volumes of data will be tackled. After completing the course the participants should be able to start their own programs on Linux clusters or on powerful workstations. The participants must have knowledge of at least one popular programming language, for example C/C++, JAVA, Fortran, Python. The course will include a course work.

Lecturer: Prof. PhD Emanouil Atanassov, PhD, Prof.
Phone: +359 2 979 67 93
E-mail: emanouil.atanassov@iict.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

1.3.2. Internet Technologies for System Management

This course is an introduction to network management, network operations and communication technologies. The information protocols, based on the TCP/IP protocol stack are under consideration. The different levels of functionalities, protocol parameters and architectures are studied. The course gives ground for system management in network environments, testing and diagnoses of network operations.

Lecturer: Todor Stoilov, D.Sc., Prof.
Phone: +359 2 979 27 74
E-mail: todor.stoilov@iict.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

1.3.3. Mathematical foundations of neurobiology

The course offers introduction in the methods for mathematical modelling of the processes in the brain at level of neural cells and their interactions. Its aim is to familiarize mathematicians and engineers with the basic terminology in neurobiology needed to work in this interdisciplinary fields as well as to make neurobiologists acquainted with possibilities for simulation investigations of different brain structures. The course includes the following topics: introduction to neurobiology and neural cell models (from Hodgink- Huxley to spike timing); models of connections between neurons (dendrites and synapses); brain structures and their modelling at neural cell level; NEST library and its implementation for simulation of neural structures via Python.

Lecturer: Petia Koprinkova-Hristova, PhD, Prof.
Phone: +359 2 979 66 22, +359 887 330 498
E-mail: pkoprinkova@yahoo.com, petia.koprinkova@iict.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

1.3.4. Optimization methods

The aim of this course is to provide knowledge about the methods, techniques and approaches for single and multiple objective optimization.

This knowledge could be useful for everybody, who intends to solve optimization problems. The course is useful for engineers, economists, persons making decisions (decision makers) in the management of enterprises and production processes, as well as for experts in distributing districts, resources, political distribution of peoples in vote sections, and for all kinds of experts, who solve real optimization problems in their activities.

The material about the single criterion optimization starts by consideration of optimality conditions, after that the methods for solving optimization problems without any constraints, the methods for problems with constraints from type equalities, the methods for problems from type inequalities, the methods for problems with linear constraints and the methods for problems with nonlinear constraints are consecutively considered. Also metaheuristic methods for global optimization are considered. The course includes some aspects of mathematical modeling. Four types of multi-criteria optimization methodc are considered, as well as some methods of multi-criteria analysis of alternatives.

Lecturer: Vassil Guliashki, Ph.D., Assoc. Prof.
Phone: +359 898 537 431
E-mail: vassil.guliashki@iict.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

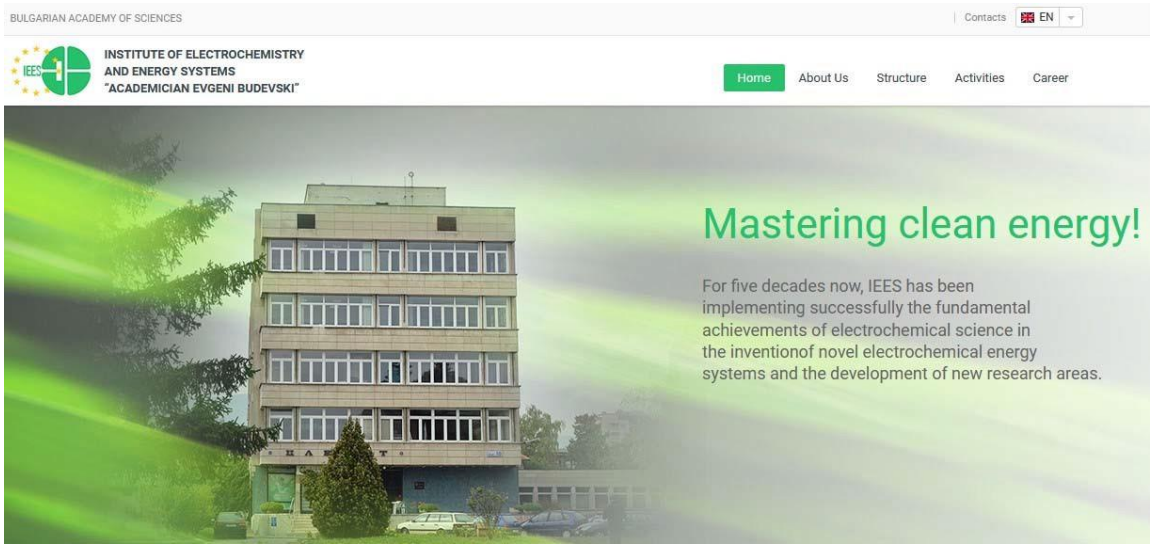
1.3.5. Advanced sensor information processing

This course discusses modern methods used to process sensory data. The course includes methods for data pre-processing (noise filtering, outlier elimination, recovery of lost data, compression and aggregation of data), communication protocols of the sensor / sensors with the processing center, methods of integration of homogeneous and heterogeneous sensory information (sensor data fusion), methods for analysis of sensory information. Theoretical methods are considered in the context of solving specific application problems using different sensors such as different types of cameras (IP PTZ, acoustic, infrared, ultrafast), different navigation sensors (for satellite navigation, inertial navigation - accelerometers, magnetometers and gyro sensors), various sensors for eye tracking, etc. The course is designed for PhD students interested in the current state in this field of research. The range of unsolved problems in applications such as intelligent surveillance systems, telemedicine, "smart" houses, intelligent transport systems, multimedia information processing, etc. is also outlined.

Lecturer: Kiril Alexiev, Ph.D., Assoc. Prof.
Phone: +359 2 979 66 20
E-mail: kiril.alexiev@iict.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

2. Energy Resources and Energy Efficiency

2.1. Institute of Electrochemistry and Energy Systems



2.1.1. Electrochemical Impedance Spectroscopy – Theoretical Principles and Modern Analytical Methods

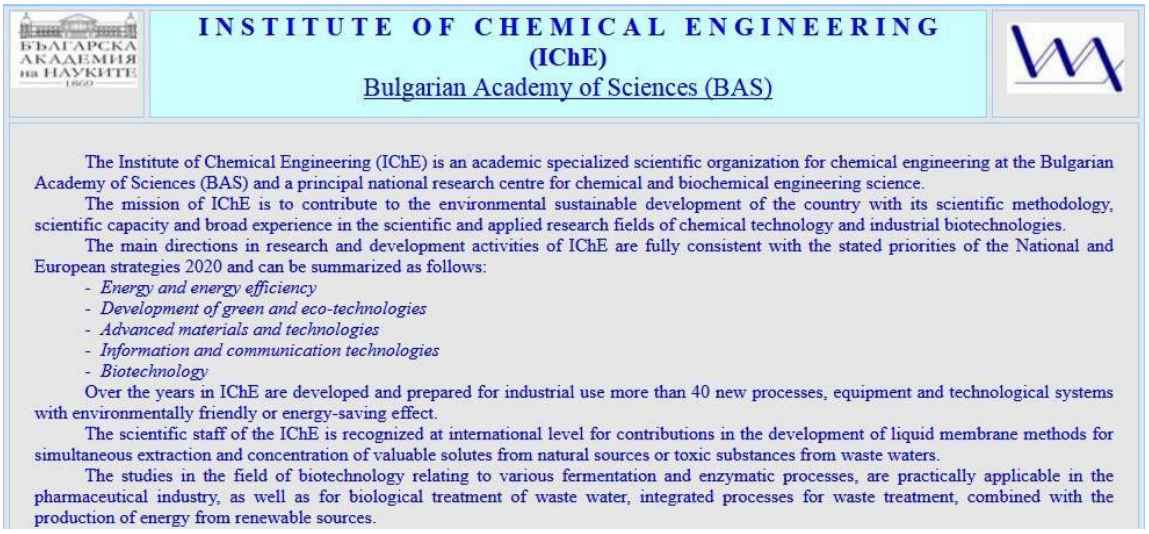
The course is intended for both Ph.D. students and post-doctoral fellows. In light of the wide range of scientific fields where electrochemical impedance can be applied, the course spans beyond the classical educational scope. It is beneficial for qualification improvement in the fields of solid state chemistry, materials science, electroceramic materials, semiconductors, energy systems (batteries, field cells), etc. Part of the course has been published electronically on the POEMES Centre of Excellence section of the Institute of Electrochemistry and Energy Systems (IEES) website.

The course has been split into two parts. Part I introduces the science and technology of electrochemical impedance spectroscopy: fundamental principles and nomenclature, electrical and electrochemical elements, basic kinetic models and methods for their identification. Part II focuses on the Differential Impedance Analysis (DIA) method, an innovative approach to impedance data analysis created at IEES. DIA significantly augments the information potential of impedance spectroscopy. The course includes various examples of applying DIA to real and modeled objects of study. Part II of the course can also include impedance analysis additional objects related to the study areas of the students.

The seminar exercises aid the learning process and the comprehension of the theoretical material. They include impedance diagram construction from existing data as well as identifi- cation of elements and models. At the end of the course, students have a discussion and a test similar to the seminar exercises. Upon successful completion, the students receive a certificate of completion (without a course grade).

Lecturer: Daria Vladikova, D.Sc., Prof.
Phone: +359 2 979 27 65, +359 884 202 150
E-mail: d.vladikova@iees.bas.bg, d.vladikova@bas.bg
Academic hours: 30 lecture hours, 5 study hours
ECTS credits: 20 ECTS

2.2. Institute of Chemical Engineering



2.2.1. Selected Topics in Energy Efficiency of Process Technology

The course aims at introducing contemporary investigation areas and engineering solutions directed towards energy efficiency and reduction of harmful emissions in the atmosphere from combustion systems. It shows current developments in chemical and thermal engineering including methods for investigation and modelling of typical for these areas complex flows and heat and mass transfer in gas-liquid systems aimed at innovative technology solutions and design of apparatuses. In focus are flue gas purification, utilization of flue gas heat and advanced energy conversion and storage systems. Experimental set-up is available for the training.

The course comprises 10 hours lectures, 8 hours experimental work and/or computer simulation tutorials and 12 hours of self-preparation on an assignment of 4000 words connected with the interests of the trainee.

Lecturer: Daniela Dzhonova, Ph.D., Assoc. Prof.
Phone: +359 2 979 32 27
E-mail: dzhonova@bas.bg
Academic hours: 10 lecture hours, 8 lab hours, 12 self-study hours
ECTS credits: 20 ECTS

2.2.2. Phase Equilibria and Modern Practice

The course is focused on current techniques, new applications, and today's revolutionary computerized tools employed to solve challenging chemical engineering thermodynamics prob- lems in process design, and simulation. It will introduce the students to the philosophy and practice of developing new generation thermodynamic modeling framework that overcomes the existing challenges and has the potential predict, interpret, model, and calculate phase equilibria of complex systems in chemical and biochemical engineering, petroleum processing, nanotechnology, bio-fuels production, etc.

The course is aimed to fill the gap between introductory texts on thermodynamics that are long on theory but short on applications and specialized courses that are applications oriented, but directed to a very narrow audience of students. The course on the phase equilibria of multicomponent strongly non-ideal systems will help students master the fundamentals of chemical engineering thermodynamics as practiced today: with a molecular perspective and extensive use of process simulators.

The course will be oriented for graduate students (MSc and PhD alike) in chemical and bio-chemical engineering, physical chemistry, chemistry, mechanical engineering, etc. who, upon completing their education, may be involved in chemical and petrochemical processing, research, development and design of new processes and materials, heat exchanger design, environmental remediation, etc.

Lecturer: Roumiana P. Stateva, Ph.D., Prof.
Phone: +359 2 979 34 81
E-mail: thermod@bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

3. Nanosciences, New Materials and Technologies

3.1. Institute of Solid State Physics

3.1.1. Liquid Crystal Approach in the Living Matter Physics

This course offers theoretical and experimental description of some of the most important technocrystal biostructures - biological membranes. The necessary information from the physics of liquid crystals is given during the course itself, respectively, consistent with the two-dimensional nature of objects. Discussed are sequentially mechanical, electrical and flexo- electrical membranes, the relevant material constants are derived from the molecular structure of the membranes. Experimental methods for studying these properties are considered. The idea of of biomembranes as liquid crystal device with a number of generalized degrees of free- dom, which interact through a system of forward and reverse effects is developed. Red vital functions are described by this general idea.

Lecturer: Alexander G. Petrov, D.Sc., Prof., Academician of BAS
Phone: +359 2 875 80 61
E-mail: agpetrov@issp.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

3.1.2. Metal Vapor Lasers

The specialized course “Metal Vapor Lasers” is intended for PhD students in laser physics, radiophysics, physics and quantum electronics, atomic and molecular physics and plasma physics. The course includes the study of physical processes in lasers with metallic vapor, the different types of lasers with metal vapor and their practical application. The course considers in detail the characteristics of the main types of metal vapor lasers and their dependence on the conditions of flow of laser generation. During the course the various types of bits where the laser generation is realized, and the methods used to obtain the necessary for laser gen- eration, the concentration of metal atoms and ions are studied. Shown are the opportunities for practical applications, both in research and in the medical industry. Examined are also the commercial realization of various types of metal vapor lasers worldwide.

Lecturer: Nikola Sabotinov, D.Sc., Prof., Academician of BAS
Phone: +359 2 875 60 09
E-mail: n.sabotinov@issp.bas.bg
Academic hours: 20 lecture hours, 5 lab hours
ECTS credits: 20 ECTS

3.1.3. Experimental Methods in Atomic Physics

The course will look at experimental methods for determining the characteristics of the atomic shell and atomic spectra - energy of the excited atomic and ionic states, the wavelengths of spectral lines, the forces of oscillators of the spectral lines, and ultra fine structure of spectral lines intensity and width of the spectral lines, transition probabilities, radiative life- times of excited states, Lande factors. Furthermore, The modern experimental methods and instrumentation and comparison with classical methods will be discussed.

Lecturer: Kiril Blagoev, D.Sc., Prof.
Phone: +359 2 979 57 90
E-mail: kblagoev@issp.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

3.1.4. Introduction in the Theory of Phase Transitions

The course provides basic knowledge of the concepts, methods and models used in the theory of phase transitions and critical phenomena. The approach puts Landau and discussed within certain exactly solvable models used in the theory. Particular attention is paid to the phenomenon of spontaneous symmetry breaking quasi-moderate method of Bogolyubov and method of approximating Hamilto-Nianel. Presented the ideas of universality and scaling. Discussed the main issues of critical phenomena by examining some exactly solvable models used in the theory of magnetism, superconductivity and structural phase transitions.

Basic knowledge of quantum mechanics and statistical physics are required.

Lecturer: Nikolay Tonchev, D.Sc., Prof.
Phone: +359 2 979 57 02
E-mail: tonchev@issp.bas.bg
Academic hours: 28 lecture hours
ECTS credits: 20 ECT

3.1.5. Superconductivity and Superconducting Materials

This course is a brief introduction to superconductivity, superconducting materials and their application. We focus on thermo-dynamical and electro-dynamical description of superconduc- tivity, phenomenological Ginsburg-Landau theory and microscopic theory of conventional su- perconductors. We discuss the main types of superconducting materials: low temperature and high temperature (cuprates and discovered in 2008 iron-based superconductors). The methods for materials preparation and investigation of their critical parameters (critical temperature, the upper critical magnetic field, critical current) are discussed. The course is intended for PhD students and graduate students with interests in the field of condensed matter physics and materials science.

Lecturer: Elena Nazarova, D.Sc., Assoc. Prof.
Phone: +359 2 979 56 79, +359 2 979 57 74
E-mail: nazarova@issp.bas.bg
Academic hours: 18 lecture hours
ECTS credits: 20 ECTS

3.1.6. Kinds and Features of Gas Discharges Used in Lasers

The specialized course “Kinds and properties of gas discharges, used in lasers” is intended for PhD students in laser physics, physics and quantum electronics, atomic and molecular physics and plasma physics. The course includes the study of various types of gas discharges and elementary processes in the gas discharge plasma, leading to the formation of inverse densities in different types of lasers with metal vapor (LMP), rare gases and molecules. Special attention is paid to the methods of measurement and calculation of sections for interaction in these processes.

Contemplated are methods for the introduction of electrical energy in the discharge plasma by using different excitation schemes.

Lecturer: Krasimir Temelkov, Ph.D., Assoc. Prof.
Phone: +359 2 979 57 08
E-mail: temelkov@issp.bas.bg
Academic hours: 20 lecture hours, 5 lab hours
ECTS credits: 20 ECTS

3.1.7. Lasers in Diagnostics, Restoration and Conservation of Cultural Her- itage

With the rapid development of lasers, laser methods very quickly established itself as an indispensable tool for the diagnosis, restoration and conservation of cultural monuments. The course includes a brief introduction to the properties of laser radiation and the various methods used for analysis, restoration and conservation of archaeological artifacts and other objects of cultural heritage: laser spectroscopy, LIBS, Raman spectroscopy, optical coherence tomography (OCT), laser interferometry, laser-induced fluorescence (LIF), remote analysis (LIDAR), 3D laser scanning, laser ablation and others. Discussed are the advantages of laser cleaning of various monuments and methods to control the influence of the environment; different methods of preservation, reconstruction, documentation, study and promotion of archaeological sites and artifacts.

The course is interdisciplinary and is suitable for students interested in the physical and chemical sciences, archaeologists, restorers and others specializing in archaeometry.

Lecturer: Margarita Grozeva, Ph.D., Assoc. Prof.
Phone: +359 2 979 57 17
E-mail: margo@issp.bas.bg
Academic hours: 22 lecture hours, 8 lab hours
ECTS credits: 20 ECTS

3.1.8. Optical Properties of Thin Dielectric and Semiconductor Layers and Determination of Their Optical Constants by Means of Spectroscopic Ellipsometry

The basic principles of ellipsometry are created in the last century, but this method of optical materials research began rapid development after the 90s thanks to rapid advances in computer technology, allowing not only to automate the measurement, but also to analyze elipsometric data.

Currently, the method of the spectral ellipsometry became standard for measuring the thickness of layers and their optical constants and is useful for the characterization of all mate- rials (dielectrics, semiconductors, metals, organic and bio-organic material). Nevertheless, the principles of ellipsometry are difficult, and information from the calculated values (elipsometric angles Ψ and Δ) is not obvious, for the analysis of elipsometric angles Ψ and Δ is necessary application of different optical models and powerful optimization programs.

The purpose of this course is to introduce the basic concepts of spectral ellipsometry re- searchers who want to use this optical method in their work. We will consider briefly the principles of optics, optical properties of materials, such as the propagation of light and dielec- tric polarization, reflection and light transmittance and optical constants. During the course will be considered polarization parameters and matrices required for displaying the basic equa- tion of ellipsometry, parametric dispersion models for analysis of elipsometric data and analysis of the dispersion dependences of the optical constants n and k, determined by elipsometric measurements.

Lecturer: Anna Szekeres, Ph.D., Assoc. Prof.
Phone: +359 2 979 57 88
E-mail: szekeres@issp.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

3.2. Institute of Electronics

3.2.1. Nanophotonics

Basic principles are stated of sub-wavelength optics, i.e. the fundamentals of the theory of electromagnetic field and Maxwell equations. The concept is given of the surface plasmons and propagation of the of plasmon wave in dielectrics and metals. The propagation of electromagnetic waves in metal structures having sub-wavelength dimensions, as well as algorithm for stationary and dynamic analyses is described.

Based on Mie theory, the analytical methods for analyses are presented as multiple multipole program - MMP, beam propagation method - BMP, Fourier model method - FMM , as well as the most modern computational algorithms as the discrete dipole approximation - DDA and the finite difference and time domain method - FDTD method. Some top-down and bottom-up technologies are described. The most important features of plasmonic and nano- photonic devises are described. Methods of creation of metal nanostructures and nanoparticles in vacuum and in liquid are proposed. Application of metal nanoparticles for photo-thermal therapy, fs lasers based on surface plasmons, data storage based on atom force microscope

- AFM are given in brief. The advantages and challenges of sub-wavelength optics are also presented.

Lecturer: Petar Asenov Atanasov, D.Sc., Prof., Academician of BAS
Phone: +359 2 979 58 61
E-mail: paatanas@hotmail.com
Academic hours: 20 lecture hours
ECTS credits: 20 ECTS

3.2.2. Interaction of Laser Radiation with Matter

The basics of interaction between laser radiation with matter are stated: absorption of laser radiation (optical properties of metals, semiconductors and dielectrics, phase transforma- tion), laser heating (heat conduction into solids, processes during laser treatment), melting and solidification, evaporation and plasma formation during laser-matter interaction. Some examples for modeling of the processes of laser processing are described. The most advanced and modern laser micro- and nano-technologies are given. High pulsed solid states laser sys- tems are described and interaction of ultra-short laser pulses with matter is presented. Laser ablation by ultra-short laser pulses is described as well as formation of plume in vacuum.

Lecturer: Petar Asenov Atanasov, D.Sc., Prof., Academician of BAS
Phone: +359 2 979 58 61
E-mail: paatanas@hotmail.com
Academic hours: 22 lecture hours
ECTS credits: 20 ECTS

3.2.3. Physics of the Waves – Laser Physics

In the course are considered common positions amplification and generation of light in quantum systems, the characteristics of laser radiation and methods of management and control. Special attention is paid to the various types of lasers - solid, gas, semiconductor and such liquid active environment.

Lecturer: Petar Asenov Atanasov, D.Sc., Prof., Academician of BAS
Phone: +359 2 979 58 61
E-mail: paatanas@hotmail.com
Academic hours: 20 lecture hours
ECTS credits: 20 ECTS

3.2.4. Laser Deposition and Structuring of Thin Films

The course addresses the main issues and principles of pulsed laser deposition of different layers - optical, magnetic, high temperature superconducting. Present ed and discussed are the most basic and important features of the method. Identification and typical difficulties and shortcomings, as well as methods for their removal are talked about. Discussed are specific examples in decaying of LiNbO3, Y2O3 and KGd(WO4)2.

Lecturer: Petar Asenov Atanasov, D.Sc., Prof., Academician of BAS
Phone: +359 2 979 58 61
E-mail: paatanas@hotmail.com
Academic hours: 22 lecture hours
ECTS credits: 20 ECTS

3.2.5. Random Processes and Statistical Methods on Practical Examples from Natural Sciences, Engineering and Social Sciences

Using a wide range of models from different branches of the natural sciences, engineering and social sciences, the course will introduce doctoral students to basic concepts and methods of the modern theory of random processes and fields. The emphasis of the course is on practical applications. For this purpose, the material is built entirely on examples and tasks.

Specific topics in the first part of the course include stationary / homogeneous stochastic processes / fields of discrete and continuous type with primary focus on the spectral (Fourier) properties of these fields. The second part covers the assessment methods of statistical vari- ables and functions of a sample of experimental data as in the time / space area and also in the frequency domain. This part also studied thoroughly and methods for evaluation of errors of experimental data, confidence intervals in the estimates of parameters and algorithms for generating random lines with desired properties.

The content of the third part is largely determined by the choice and interests of doc-

toral students. The choice of topics include: filters and predicting the behavior of time series; Kalman filter, nonlinear and non-stationary processes, examples of evolutionary spectra and spectra of higher order stochastic differential equations, equations of Fokker-Planck and Kolmogorov-Chapman.

Lecturer: Petar Oleg Yordanov, Ph.D., Prof.
Phone: +359 2 979 59 13
E-mail: oleg.yordanov@gmail.com
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

3.3. Institute of Optical Materials and Technologies

3.3.1. Fundamentals of Photonics

This course covers the basic principles of electromagnetic optics and interaction of the light with matter. Sub-topics will focused on a brief introduction of monochromatic waves (interfer- ence and diffraction of light), electromagnetic optics (electromagnetic waves, absorption and dispersion of light; slow and fast light in resonant media, optics in magnetic and metamateri- als); polarization optics (reflection and refraction of light, evanescent waves, dispersion); optics of anisotropic media (crystal optics, optics of liquid crystals, polarization devices); semicon- ductor optics (interaction of photons with charge carriers, semiconductor photon sources and devices); principles of electro-optics (electro-optics of anisotropic media, photorefractivity) and non-linear optics (anisotropic and dispersive non-linear media). The purpose of fundamentals of photonics teaching is to introduce some of current issues of modern technology for develop- ment of advanced multifunctional materials (including graphene and 2D materials) and device fabrication that take place in the subwavelength (nanometer) scales.

Lecturer: Vera Marinova, D.Sc., Prof.
Phone: +359 886 895 767
E-mail: vmarinova@iomt.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

3.3.2. Optical Properties of Organic/Inorganic Hybrid Materials and Structures

The course is suitable for young scientists, specialists and PhD students - physicists and chemists. The knowledge in optics is not obligatory. The aim of the course is students to gain knowledge of the foundation of thin film optics and methods for optical modeling of homogenous and heterogeneous media. The program consists of Maxwell equations for lin- ear medium, refraction and reflection laws, Snell's law, Fresnel's equations, transmission and reflection coefficients of thin film and film/substrate, transfer matrix approach, multilayers systems. The widely accepted effective medium theories of Maxwell-Garnett, Lorentz-Lorenz and Bruggeman used for modeling of the optical behavior of hybrid structures are also con- sidered. The emphasis is laid on the advantages and disadvantages of different theories and their applications. Some examples of advanced applications of hybrid structures in photonics is discussed.

Lecturer: Tsvetanka Babeva, Ph.D., Prof.
Phone: +359 2 979 35 26, +359 884 220 351
E-mail: babeva@iomt.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

3.3.3. Electron Microscopy and Electron Diffraction as a Tool for Structure and Phase Composition Analysis of Materials

The lecture course is addressed to PhD students in specialty 01.05.05 Physical Chemistry with background in theory of matter structure, geometrical and wave optics. The essentials of this course are transmission (TEM) and scanning (SEM) electron mycroscopy, electron crys- tallography and some analytical methods for chemical composition, related with the electron microscopy, as well as the existing different techniques for sample preparation.

Naturally, the course starts with an introduction, concerning the matter's structure theory, fundamentals of crystallography and crystal chemistry, electron - matter interaction. In the main parts, after a historical review of the prerequisites for transmission and scanning electron microscopes elaboration, their set-up and working methods are presented in details. The different microscopes' modes, additional devices and their functions are discussed. The main phenomena and processes, related with the image and diffraction patterns formation and registration are presented. In conclusion, some examples, demonstrating the relation of the electron microscopy and analytical methods, with the contemporary trends of the science and technologies, as synthesis of new materials, nanotechnology, nanoelectronics and new energy sources, are done. An attention to the created computer programmes for imaging and TEM analysis results treatment is paid.

A practical course will be held, also. It aims to acquaint the participants with the sample preparation techniques for TEM and SEM, with the procedures of instruments manipulation (starting, stopping and alignment), as well as to work in different modes of the microscopes and to analyze the obtained results.

Lecturer: Daniela Karashanova, Ph.D., Assoc. Prof.
Phone: +359 2 979 35 19, +359 879 888 149
E-mail: dkarashanova@yahoo.com
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

3.3.4. Digital Holography and Optical Metrology

Digital holography, which records interference pattern of a reference beam with a light beam, reflected from an object, and reconstructs the holographic image by means of computer, finds wide application due to recent advances in laser sources, 2D photosensors, (CCD or CMOS cameras) and digital signal processing. Optical and digital holographic methods are an effective tool for precise remote registration of data about the relief, mechanical and physical properties of macro and micro-objects as well as for 3D visualization of objects. PhD students get accustomed with the principles of Fourier optics, reconstruction algorithms of dig- ital holograms (Fresnel approach, convolution approach and phase-shifting algorithm). Main approaches for computer generation of holograms are also considered. Holographic interfer- ometry, digital holographic microscopy and visualization of phase objects are also included. Lectures include the theory of speckle phenomena in optics and implementation of speckle- interferometric methods. The main algorithms in optical metrology for processing of fringe patterns as phase-stepping method, Fourier analysis, wavelet techmique, minimization of cost- function are discussed. One of the main advantages of this lecture course is the possibility for MatLab programming for composing codes for digital reconstruction of holograms and processing of real images.

Lecturer: Elena Stoykova, D.Sc., Prof.
Phone: +359 2 872 00 73, +359 887 386 175
E-mail: estoykova@iomt.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

3.3.5. Materials for Optical Data Storage: Disposable, Reversable and New Organic/Inorganic Composites

The course studies the most commonly used in recent years, light sensitive media for holographic recording. The basic requirements for these materials are presented, which are important to ensure full transfer of the fine interference picture. The basic characteristics, mechanisms for the image formation, specific treatment processes and methods of storage are also studied. This lecture course also introduces recent trends of research for the development and application of new composite materials, consisting mainly of photopolymer matrices as well as some anisotropic materials containing nanoparticles with different forms, consistence and structures.

Lecturer: Dimana Nazarova, Ph.D., Assoc. Prof.
Phone: +359 2 979 35 31
E-mail: dimana@iomt.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

3.3.6. Polarization Holography and Applications: Holographic Data Storage in Anisotropic Materials

This lecture course gradually introduces the audience to the history and main concept of holography, the terminology used in the field and the general requirements for making a hologram. Some of the most interesting features of the holograms are presented - the parallax effect and the ability to reproduce the entire image of an object even from a small piece of the hologram. Different applications of holography are discussed and the focus is placed on holographic data storage - a technology of the future, offering more than 300 GB of capacity on a CD-sized disc.

Polarization holography allows to register not only the intensity and phase of light, but also

its state of polarization i.e. to record the entire information carried by the light field. This is possible only in certain type of materials called photoanisotropic materials. The most effective and therefore most commonly used class of these materials are described - the azopolymers - which have been intensively investigated during the last decades. The applications of azopoly- mers include recording of optical elements with unique properties, formation of chiral structures that can be used for all-optical switching as well as polarization multiplexing. Stilbene ma- terials enable polarization recording in the UV and hence allow to increase even further the density and capacity on polarization holographic data storage. The key advantage of this course is that it presents a modern field of research with very high publication activity in easy to understand way.

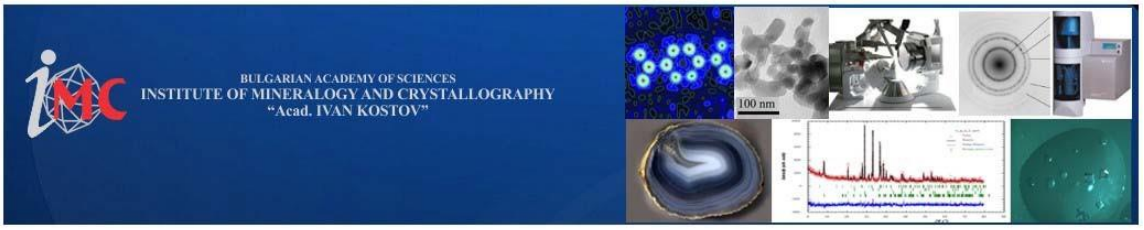
Lecturer: Lian Nedelchev, Ph.D., Assoc. Prof.
Phone: +359 2 979 35 31, +359 896 587 254
E-mail: lian@iomt.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

3.3.7. Introduction to New Materials

The aim of the course is to introduce PhD students to the field of new materials. The course includes a brief history of the use and creation of materials, the scientific methods, methods of preparation of advanced materials, and briefly discusses the techniques of analysis and their application areas. The course shows examples of scientific publications and video materials, as well as cited prestigious awards and patents related to the field of new materials. Particular attention is paid to the functionalized materials and their methods of preparation.

Lecturer: Dessislava Kostadinova, D.Sc., Assist. Prof.
Phone: +359 876 280 270
E-mail: dessie.kostadinova@gmail.com
Academic hours: 20 lecture hours
ECTS credits: 20 ECTS

3.4. Institute of Mineralogy and Crystallography



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INSTITUTE OF MINERALOGY AND CRYSTALLOGRAPHY "Acad. IVAN KOSTOV"

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SCIENTIFIC LECTURES

01 November 2017 (Friday) at 14:00 in the meeting room of IMC - BAS

Academic lecture : ***In situ*** **isotopic mass spectrometry of solid phase materials,**
lecturer Assoc. Prof. Valentin Ganev, PhD.

Academic lecture: **Metasomatic minerals and products of their change: crystallochemistry, structural characteristics and their application as indicators of the conditions of formation**
lecturer Assoc. Prof. Dr. Yana Tsvetanova, PhD.

3.4.1. X-Ray Structural Analyses

The course aims to give basic knowledge on X-ray analysis. The course discusses the three main parts related to the determination of the crystal structure of the new substances: symmetry of crystal structures, the X-ray diffraction, determination of the structure of the crystalline solid. The exercises are conducted in the laboratory of structural analysis and time allows each student to determine the crystal structure of its own crystal or substances, and to prepare the data for publication.

Lecturer: Rositsa Nikolova, Ph.D., Prof.
Phone: +359 2 979 70 55, +359 2 8700161 1047
E-mail: rosica.pn@clmc.bas.bg
Academic hours: 30 lecture hours, 30 practical hours
ECTS credits: 20 ECTS

3.4.2. Minerals as Indicators of Magmatic and Metamorphic Processes

The course is addressed to mineralogists, petrologists, sedimentologists and other special- ists, working in the field of the Earth Sciences. The course aims to introduce the PhD students with the possibilities and perspectives of application of the indicative properties (chemical composition, structural state, habitus, structural, chemical and phase inhomogeneity, etc.) of accessory minerals (magnetite, ilmenite, monazite, xenotime, zircon, allanite, etc.) from igneous and metamorphic rocks for assessment of the genesis and physicochemical condi- tions of crystallization and alteration of the host rocks. Special attention will be paid to the methods and approaches for extraction and identification of accessory minerals and to the methods commonly applied for investigation of the indicative properties of the minerals as op- tical microscopy, electron microscopy (SEM , TEM , electron probe microanalysis), vibration spectroscopy (Raman and IR).

Lecturer: Mihail Tarassov, Ph.D., Prof.
Phone: +359 2 8700161 1011
E-mail: mptarass@dir.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

3.4.3. Thermal Analysis – Basic Concepts, Methods and Applications

The course is intended for PhD students and young researchers using methods of thermal analysis in their work. The results of thermal analysis allow to clarify the chemistry of the re- actions of dehydration, decomposition, phase transition, reduction and oxidation; to determine the purity of the substances and the presence of impurities, the temperatures of the phase transitions, melting and/or crystallization depending on both the nature of the substances and the selection of the specific experimental conditions; to calculate the kinetic parameters of the degradation of investigated sample; to present phase diagrams; to determine the heat of reaction and specific heat capacity, etc. The method is suitable for testing of synthetic and natural samples.

The program of the course includes several modules: I. Basic concepts and nature of methods; II. Thermogravimetry (TG); III. Differential thermal analysis (DTA); IV. Simultane- ous TG-DT G-DTA measurements - options modes, interpretation of results and applications in materials science; V. Calorimetry- types, nature and basic principles of measurement in calorimetry; applications in the field of materials science; VI Practical activities and work with the available equipment TG-DTA -DSC (SETARAM) and the CALISTO specialized thermal Software.

Lecturer: Nadia Petrova, Ph.D., Assoc. Prof.
Phone: +359 2 8700161 1030
E-mail: nadia5@mail.bg
Academic hours: 28 lecture hours
ECTS credits: 20 ECTS

3.4.4. Epithermal Low-Sulfidation Precious-Metal Deposits: Geodynamics and Geology, Wall-Rock Alterations, Mineralogy, Textures, Geochem- istry and Ore-Forming Processes

The course aims to give basic knowledge on the epithermal, low-sulfidation precious-metal deposits. Several topics are into consideration: geodynamics; regional and local geology; wall- rock alterations; ore and gangue mineralogy; mineral macro- and micro-textures; geochemical signature; ore-forming processes as well as similarities with and differences from other types of precious-metal deposits. Classes take place in an office with a binocular microscope and exposed hand specimens and in Laboratory of optical microscopy. Provided time is enough each of the students to become familiar with the basic macro- and micro-textures and mineral aggregates. The course provides field introduction to a deposit in Bulgaria, representative of this type deposits worldwide.

Lectures

The lectures include: Geodynamic setting; Geological setting, associated magmatism, host rocks; Wall-rock alterations; Mineralogy; Textures indicative of fluid flow, fluid turbulence, for- mation of flocs and gel growth; Geochemistry - major and minor elements and trace-elements in ores, gangue minerals and rocks; Speciation of precious metals in hydrothermal solutions and ore-forming processes; Similarities with and differences from other types of precious-metal de- posits; Representatives of epithermal, low-sulfidation deposits: textures, mineralogy, indicative trace-elements and indicative elemental ratios in some minerals.

Laboratory work

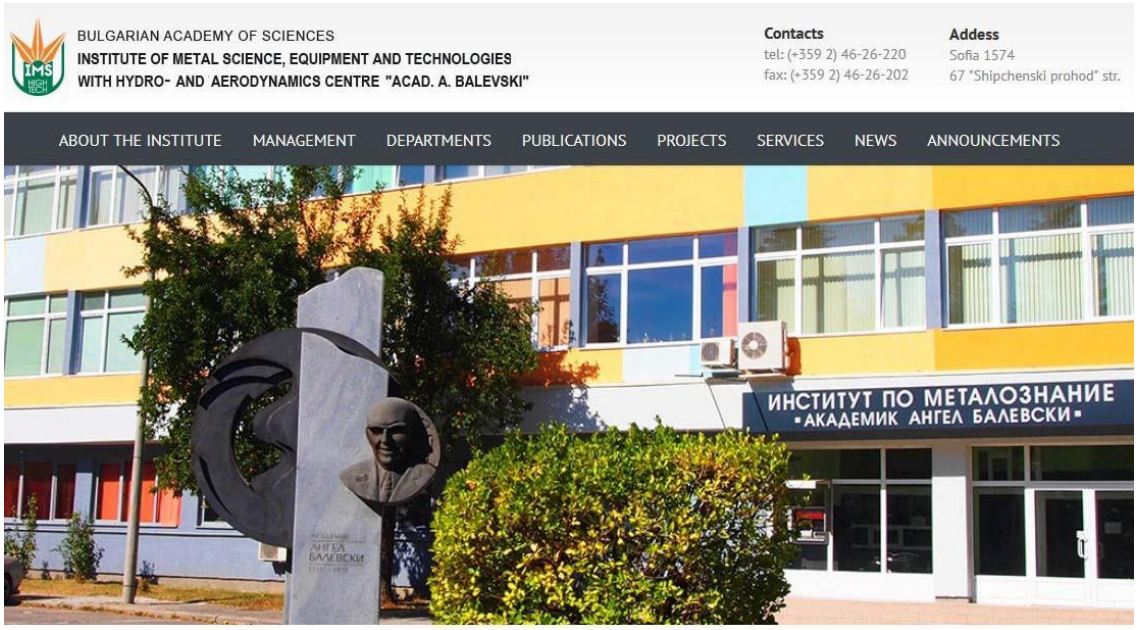
All classes are conducted under guidance of lecturer and aim at strengthening and practi- cal application of the lectures: Mineral macro-textures; Mineral composition; Mineral micro- textures; Wall-rock alterations.

Field work

Field introduction to a representative of epithermal, low-sulfidation precious-metal deposits: Visit of the Khan Krum deposit, Krumovgrad area, with studying of geological setting, styles of mineralization and mineral textures.

Lecturer: Irina Marinova, Ph.D., Assoc. Prof.
Phone: +359 2 8700161 1019, +359 885 453 470
E-mail: irimari@gmail.com
Academic hours: 21 lecture hours, 10 practical hours, 5 field work hours
ECTS credits: 20 ECTS

3.5. Institute of Metal Science, Equipment and Technologies with Hydro- and Aerodynamics Centre



3.5.1. Welding Deformations, Stresses and Displacements

The course is suitable for doctorate candidates with engineering education and qualification. Welding deformations, stresses and displacements are one of the main factors which define the technological strength and workability of the welded joints and constructions. They always accompany to a certain extent the welding process.

The aims of the learning process are to be acquire fundamental knowledge in the following directions:

– type and classification of welding deformations, stresses and displacements;

– the reasons for their arising;

– the means and mechanisms of their development;

– their influence on the properties, reliability, workability and safety of the welded joints and constructions;

– their residual values and the possibilities for their reduction and redistribution.

Lecturer: Stefan Christov Christov, D.Sc., Prof., Corr. Member of BAS
Phone: +359 2 46 26 240, +359 889 671 493
E-mail: s.christov@ims.bas.bg
Academic hours: 24 lecture hours
ECTS credits: 20 ECTS

3.5.2. Internal Friction in Metals and Alloys

This is a PhD student program of the specialty 02.09.01. The aim of the course is to introduce the students to the principles and the potential of the “internal fiction” method for investigation of metals and alloys and especially the alloys based on iron. Requirement of the program is possession of Master Degree (MA) of the following specialties: “Technology of Metals” - TU-Sofia, “Material Science” - University of Chemical Technology and Metallurgy - Sofia or “Solid State Physics” - SU-Sofia.

Lecturer: Ivan Maximov Parshorov, D.Sc., Prof.
Phone: +359 2 46 26 217, +359 885 453 470
E-mail: parsh@ims.bas.bg
Academic hours: 25 lecture hours
ECTS credits: 20 ECTS

3.5.3. Introduction to Ocean Engineering

The course is intended for basic training of specialists and Ph.D. students in ship theory and design, marine technologies, oceanology as well as extraction and processing of ocean deposited industrial resources.
The course provides acquaintance with:
– The basic types of structures for ocean resources exploration, economical conditions and prospects;
– The basic operations in research, installation and operation of marine engineering structures;
– The fundamentals of design and investigation of the interaction of marine facilities with external conditions;
– Marine renewable energy resources;
– Functions of institutions involved in the utilization of marine resources, current regulations and standards.
Laboratory classes include participation in preparing and carrying out model tests of marine engineering structures in a model tests basin.

Lecturer: Rumen Kishev, Ph.D., Prof.
Phone: +359 52 370 501
E-mail: r.kishev@bshc.bg
Academic hours: 24 lecture hours, 6 practical hours
ECTS credits: 20 ECTS

3.5.4. Metallography – Theory and Practice

This is a Ph.D. student program of the specialties 02.01.02 (materials science and technology) and 02.09.01 (metal science and heat treatment of metals). The aim of the course is to introduce the students to the principles and the potential of the optical microscopy for the investigation of metals and alloys microstructure.

Knowledge in materials science and metallography of Master Degree of specialties as "Mechanical engineering" - TU-Sofia, "Metallurgy" and "Materials science" - UCTM-Sofia is required.

Lecturer: Rumiana Lazarova, Ph.D., Prof.
Phone: +359 2 46 26 304
E-mail: r.lazarova@ims.bas.bg
Academic hours: 28 lecture hours
ECTS credits: 20 ECTS

3.5.5. Introduction to Processing of Information from the Sensory Systems

The program is intended for educational and scientific degree "doctor" in scientific specialty 02.19.07 "Protecting the population and the national economy in critical situations (technologies and tools for security and critical infrastructure protection, crisis)". The various physical principles on which is based the work of various sensors requires a good knowledge of general theoretical approaches and methods for processing information from them. The course is trained to provide basic fundamental knowledge related to the processing of information in sensory systems which is one of the main factors determining their effectiveness.

Lecturer: Nikolay Litchkov Georgiev, D.Sc., Prof.
Phone: +359 2 46 26 250
E-mail: niki0611@abv.bg
Academic hours: 34 lecture hours
ECTS credits: 20 ECTS

3.5.6. Business Continuity Management of Critical Infrastructure

The program is intended for educational and scientific degree “doctor” in scientific specialty

02.19.07 “Protecting the population and the national economy in critical situations (technologies and tools for security and critical infrastructure protection, crisis)”. The aim of the course is to be provided to the students with basic and advanced knowledge in creating advance arrangements for the construction and management of a particular project, a comprehensive business continuity management system for sites of the critical infrastructure, incl. and criteria for security, to prevent and control the emergency situation in time of terrorist acts.

Lecturer: Dimitar Lubenov Dimitrov, Ph.D., Assoc. Prof.
Phone: +359 2 46 26 207
E-mail: ddimitrov@ims.bas.bg
Academic hours: 20 lecture hours
ECTS credits: 20 ECTS

3.6. Institute of General and Inorganic Chemistry

3.6.1. Inorganic Crystal Chemistry and X-Ray Diffraction Analysis

The separation chemistry of the solid state as an independent scientific discipline and theoretical basis of modern materials science, a fact well acknowledged and accepted in the international scientific environment. It is a consequence of the rapid development of modern solid-state technology using non-traditional materials in electronics, mechanical engineering, energy, IT and the media, medicine, space and military technology, environmental protection and so on.

According to Prof. M. Stanley Whiting from the state University of New York, every third chemist deals with problems related to the matter in its crystalline state. For inorganic chemists this share is much higher. Against this background, the university training of Bulgarian chemists in the field of crystal is extremely unsatisfactory. Indeed, in various different courses students acquire knowledge about the elements of crystallography, solid state physics, crystal, but in the absence of one single course, the probability to find someone prepared to work in this field is almost zero. Moreover, the majority of Bulgarian inorganic chemists per- ceive the matter at the molecular and not crystal level. The introduction of modern technology in the chemical and electronic industries in the country and the world conclusively proved the need for professionals who can think in terms of structure-properties. This type of training gives them a worldview that allows for finding innovative solutions through logical generalization of the knowledge and experience of narrow specialists and technologists.

Lecturer: Daniela Kovacheva, Ph.D., Prof.
Phone: +359 2 979 25 87
E-mail: didka@svr.igic.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

3.6.2. Spectroscopic Methods for Bulk and Surface Analysis of Materials

The concept of developing new materials with controlled properties and special uses is governed by general principles that are based on the organization of matter at an atomic and a molecular level, i.e. on their local structure. In this respect the use of spectroscopic methods of characterization allows to go insight into the local structure of materials. This course covers the application of the basic principles of spectroscopy in studying the relationship “structure-properties-reactivity”.

The course aims to deepen and to expand the knowledge of PhD students on the char-

acterization of the materials volume and surface by means of spectroscopic methods, as well as to build practical skills for working with modern spectroscopic equipment. The course will be focused on the acquiring new knowledge of some modern spectroscopic methods such as infrared spectroscopy, X-ray photoelectron spectroscopy, electron paramagnetic resonance and solid state nuclear magnetic resonance. During the course, PhD students will become famil- iar with the application of IR spectroscopy to characterize the materials surface, as well as to gain new skilling on the selection of probe molecules and the use of isotopically labeled probe molecules. Complementary to the IR spectroscopy, it will be considered the use of X-ray photoelectron spectroscopy for the identification and determination of quantity and chemical state of elements on the surface. The local structure of materials in the volume and at the surface will be described based on the application of electronic paramagnetic resonance. A comparative analysis of the information received by electronic paramagnetic resonance and nu- clear magnetic resonance will be made. Seminars, demonstrations and practices with modern equipment are planned. The available modern facilities at the Institute will be used in practical exercises. Special attention will be devoted to computer processing and interpretation of the results collected from the specific analytical method. The course can be attended by PhD students, as well as by a wide range of students and specialists with bachelor’s or master’s degree in chemistry, physics, geology, ecology, metallurgy, chemical technology, chemistry and physics, etc.

The course will provide an opportunity to acquire the necessary knowledge in two areas,

spectroscopy and material science, which will give priority to the graduates in future realization in the field of small and medium enterprises, in the system of administration (Bulgarian and European), in scientific research organizations and higher education institutions, etc. The course will be delivered by leading researchers and experts from the Institute.

Lecturer: Radostina Stoyanova, Ph.D., Prof.
Phone: +359 2 979 39 15
E-mail: radstoy@svr.igic.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

3.6.3. Atomic Absorption Spectrometric Analysis

Atomic absorption analysis is an analytical method that is increasingly applied because of the high sensitivity which determines over 70 elements of the periodic table, its high selectivity and accessible tools. In the course Atomic absorption analysis are discussed theoretical foundations of analytical chemistry, instrumental methods of chemical analysis, the principle of operation and characteristics of Atomic absorption spectrometry with flame and flameless atomizers, interfering influences, and how their elimination or reduction. Special attention is paid to the direct electrothermal methods for analysis of solid samples. The course is intended for PhD students (chemistry and physics) and for professionals using atomic absorption analysis methods (postgraduate).

Lecturer: Albena Detcheva, Ph.D., Assoc. Prof.
Phone: +359 2 979 25 04
E-mail: albena@svr.igic.bas.bg
Academic hours: 20 lecture hours
ECTS credits: 20 ECTS

3.6.4. Sample Pre-Treatment in Chemical Analysis

In the determination of trace elements in samples with a complex matrix composition is necessary analysis to bring in a suitable form and to take measures for separation and concentration of determinable elements in order to increase the sensitivity of the analysis and to avoid or reduce interfering. In the course Sample preparation in chemical analysis are discussed on the chemical analysis, various methods to bring the samples in solution, as well as methods for separating and concentrating before analytical determination.

The course is intended for PhD students (chemists or physicists) and for professionals working in the field of chemical analysis (postgraduate).

Lecturer: Albena Detcheva, Ph.D., Assoc. Prof.
Phone: +359 2 979 25 04
E-mail: albena@svr.igic.bas.bg
Academic hours: 12 lecture hours
ECTS credits: 20 ECTS

3.6.5. Computational Materials Science

The aim of the course is to present to the PhD students the advanced theoretical and computational methods and their specific applications for investigation of inorganic systems and materials as well as for prediction of their properties from first principles.

The atomic scale computer simulations is a powerful tool providing access to the microscopic processes of inorganic systems and can thereby contribute enormously to the under- standing of chemical structures, properties and reactions. First-principles methods treat the electrons in the model explicitly (quantum-mechanically) and therefore they provide for ac- curate description of the electronic structure and chemical bonding of the inorganic systems. The benefit of the computational modeling is that it significantly reduces the time of the ma- terials investigation, describes and predicts properties that are not experimentally accessible and directs the design of materials with novel or improved properties. Therefore, the compu- tational modeling and simulations are of great importance for the new materials development in different branches of the industry, ecology and medicine in Bulgaria and at European level. The program of the course envisages to illustrate the theoretical basis of the computational methods as well as their application for: (1) modeling of molecules, clusters and periodic sys- tems; (2) simulation of spectroscopic data (IR, Raman, NMR and electronic spectra) and (3) description of systems in specific environment (gas phase, solution and solid state).

Lecturer: Ivelina Georgieva, Ph.D., Assoc. Prof.
Phone: +359 2 979 25 92
E-mail: ivelina@svr.igic.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

3.6.6. Synthesis of Inorganic Materials

The selection of suitable synthesis method is a key issue in the design of advanced materials. The course of lectures provides profound fundamental knowledge and practice on the variety of the synthetic approaches for the preparation of inorganic materials. This course is suitable for Ph.D students and specialists in the field of chemistry, biochemistry and physics in order to assess the most appropriate methods for the synthesis of the target materials. The preparative methods reviewed and compared are: high-temperature methods (solid state synthesis and melt quenching method); “soft” chemistry routes (sol-gel, co-precipitation, precursor methods, topochemical reactions); high pressure synthesis methods (hydrothermal and solvothermal, etc.), mechanochemical reactions, etc. The general principles, advantages and drawbacks of the different synthesis approaches are discussed. The potential of the specific methods and their combination for the preparation of inorganic materials with pre-set properties, such as optical, electrochemical, electrical, magnetic, catalytic, etc. is demonstrated.

Lecturer: Violeta Koleva, Ph.D., Prof.
Phone: +359 2 979 37 25
E-mail: vkoleva@svr.igic.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

3.6.7. QUANTUM CHEMICAL METHODS

"Quantum-Chemical Methods" course is intended for the training of PhD students in theoretical chemistry. Due to the interdisciplinary character of the scientific field covered in the lectures, they are suitable for PhD students and young scientists working on topics in physical chemistry, inorganic chemistry, organic chemistry, biochemistry, catalysis, polymers and modeling of biological systems.

The aim of the course is to acquaint the PhD students with the theoretical foundations of the most used quantum-chemical methods for studying the structure of different compounds and modeling chemical reactions in the ground and excited states, as well as simulating the UV, IR, Raman, fluorescence and NMR spectra.

The course is selected to be an upgrade from the Master's degree programs, contributing to the development of a scientific approach in the selection of appropriate quantum-chemical methods of study with regard to specific practical requirements.

Lecturer: Venelin Enchev, Prof., DSc
Phone: +359 2 979 37 25
E-mail: venelin@svr.igic.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

3.7. Institute of Physical Chemistry

3.7.1. Applied Electrochemistry

The aim of the lecture course is to help the PhD students with some practical aspects in the electrochemistry, especially electrodeposition of galvanic and chemically deposited coatings (including alloys) with special properties like corrosion protection, electrodes for the generation and storage of hydrogen, for electrocatalytic materials in the fuel cells, for treatment of polluted water and air, etc. - obtaining; methods for studying their properties and phase structure; preliminary sample preparation; bath compositions. The course will be of interest to doctoral and post-doctoral students working in the fields of electrochemistry and material science.

Lecturer: Nikolai Boshkov, Ph.D., Prof.
Phone: +359 2 979 25 21
E-mail: nbojkov@ipc.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

3.7.2. Fundamentals of Electrochemistry

The aim of the course is to introduce the basic concepts and basic measuring techniques in electrochemistry. The course focuses on practical useful knowledge for successful application of electrochemical techniques for characterization of electroactive materials, tracking of electrochemical processes in the formation of new phases and elektroanalitycal and sensor applications.
The course is useful for PhD students and professionals working in the field of electrochemistry, electroanalytical methods, physical chemistry and materials science.

Lecturer: Vessela Tsakova, D.Sc., Prof.
Phone: +359 2 979 25 57
E-mail: tsakova@ipc.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

3.7.3. Phase Formation and Crystal Growth – Theory and Experiment

The present ensemble of lectures introduces students in the fundamentals of theory and experiment of phase transitions in contemporary condensed matter physics. The lectures are focused on the thermodynamics and kinetics of phase formation and crystal growth phenom- ena, structure and properties of solid surfaces and interfaces, nanoscale phenomena in material science. The course provides a modern upgrade of the basic students' knowledge in condensed matter physics, bridging over classical and nano concepts in the field. Paying special attention to the cutting edge topics in material science related to nanomaterials and nanoscale phenom- ena, epitaxial interfaces, surface design and atomic templates, modeling of quantum atomic ensembles, catalysis the lectures demonstrate the exotic ability to manipulate crystalline struc- tures at atomic level and to form new smart materials with exotic physical features, non-existing in nature.
The course is prepared in two mutually dependent parts. The first, devoted to the classical thermodynamics and statistical physics, deals with theoretical background of phase formation, two-dimensional phase transitions, nucleation, mechanisms of crystal growth, thermodynamics of interfaces, growth of thin epitaxial layers, formation of atomic superstructures, quantum clusters and quantum wires, computer modeling of structures and properties of real physical system. The second part presents state of the art experimental methods and instruments for structural analysis in material science. In line with modern theory, variety of mechanisms of crystal growth are demonstrated by reflection electron microscopy observations of atomic steps, atomic terraces, two-dimensional nucleation and growth of atomic layers, normal and spiral growth of crystals. Diversity of methods for preparation of bare crystal surfaces is presented. Special discussion takes note of the structure and physical properties of silicon crystals. Diffraction methods for structural and elemental analysis of crystals along with practical studies in electron spectroscopy laboratory are included

Lecturer: Bogdan Ranguelov, Ph.D., Assoc. Prof.
Phone: +359 2 979 25 33
E-mail: rangelov@ipc.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

3.7.4. Complex Fluids

The goal is to introduce major developments and recent achievements of the new interdisciplinary scientific field, namely Complex Fluids. The aim is to present a detailed overview on the experimental and theoretical concepts and the research methodology. The course target audience includes PhD students, PostDocs and young researchers who are actively engaged in investigations on various topics of biophysics, biophysical chemistry, physical organic chemistry, polymers and biopolymers, liquid crystals, theoretical modeling of fluid media, etc.

The course is composed of two sections. The accent in the first section (20 hours) is

on smart fluid systems which contain finely-tunable self-assembled (nano)structures. The lec- tures will present the basic design principles of the liquid formulations leading to the onset of well-defined bulk and interfacial complex species with tunable properties, and aimed at vari- ous applications in biotechnology, biomedicine, food, pharmaceutical and petroleum industries. The most widely used research instrumentations for the characterization of these systems will be reviewed. The second section of the course (10 hours) is devoted to a particular type of the complex fluid systems: microscopic thin liquid films. Their specific kinetic and thermo- dynamic properties promote them as a simple and comprehensible model for the investigation of surface forces and the stability of disperse systems (foams, emulsions, colloid suspensions). Due to the progress of the original microinterferometric thin film instrumentation, the liquid films have become a basic research tool in the colloid and interface science bridging the funda- mental physicochemical knowledge with various innovative applications (e.g. in biomedicine, biotechnologies, life sciences and environmental protection).

Lecturer: Elena Mileva, D.Sc., Prof.
Phone: +359 2 979 25 86
E-mail: mileva@ipc.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

3.7.5. Thin Liquid Films – Biomedical Applications

The aim of the lecture course is to introduce the methods for formation of thin liquid films (foam, emulsion and wetting) and their study. Particular attention will be given to the experimentally measured parameters characterizing the film formation and stability, the transition from long to short range surface forces and bi and multilayer structures. Foam, emulsion and wetting films from amphiphile molecules: lipids and polymers (proteins and biocompatible molecules) and their mixtures as a model of the interactions at the interfaces (in biology, pharmacy and medicine) will be presented. The lecture course is suitable for PhD and post-doctoral students working in the fields of material science, physical chemistry, biophysics and biotechnology.

Students and Ph.D. students should have basic knowledge in Physical chemistry, Biophysical Chemistry and Biophysics.

Lecturer: Elena Mileva, D.Sc., Prof.
Phone: +359 2 979 25 86
E-mail: mileva@ipc.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

3.7.6. Electric, Optic and Electro-Optic Methods for Characterization of Nanoparticles and Macromolecules (Colloids, Polymers, Biopolymers and Biological Particles)

The aim of the course is students to gain knowledge of the classic and modern methods for investigation of electric state of colloidal systems, for characterization of the electrical properties of colloidal particles and their connection with the stability of colloids, being of great practical importance. The emphasis is laid on the advantages of electro-optical methods to provide information on the shape, size distribution, molecular mass, refractive index and other characteristics of macromolecules and colloidal particles.

The course is addressed to PhD students in the field of physical chemistry, chemistry of polymers, biophysics, biochemistry, biotechnologies, etc.

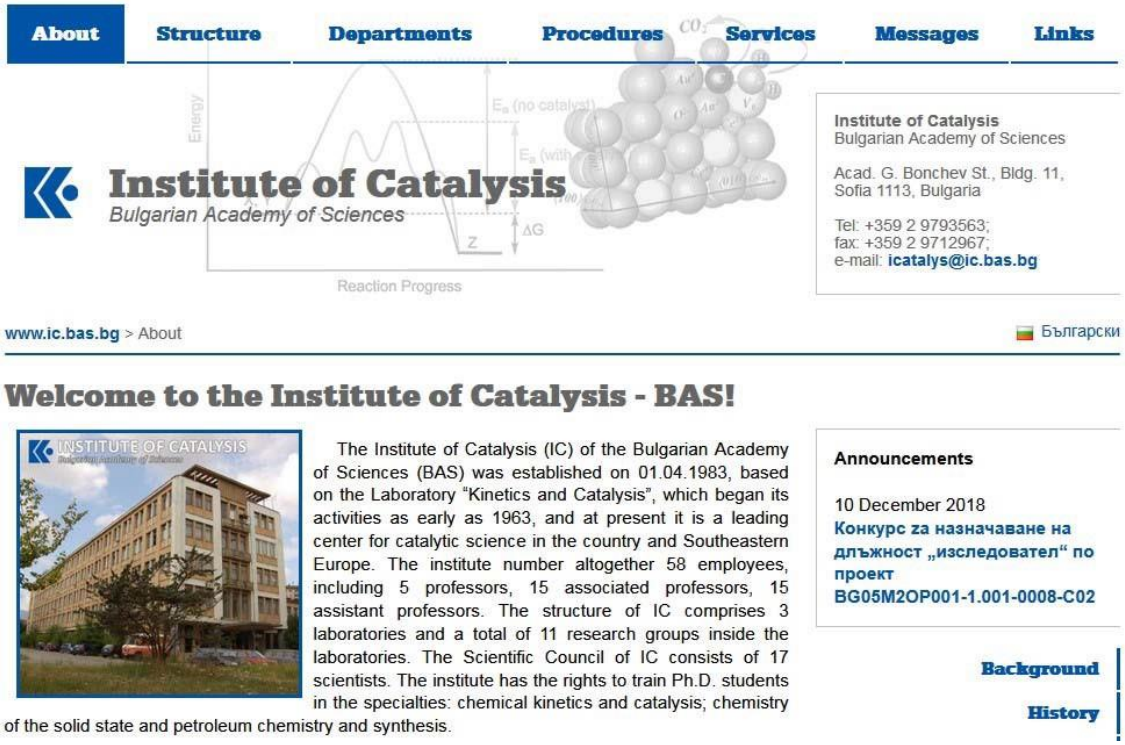
Lecturer: Viktoria Milkova, Ph.D., Assoc. Prof.
Phone: +359 2 979 39 22
E-mail: vmilkova@ipc.bas.bg
Academic hours: 20 lecture hours
ECTS credits: 20 ECTS

3.7.7. Functional Nanostructures

The development of innovative nanostructures with specific properties is a challenge for the modern science. Therefore, the presented lectures are focused on the discussion of different structures suitable for various applications in the field of bionanotechnology. The lectures goals to provide basic knowledge in formation, structure and properties of different nanostructures.
The program is structured in three interconnected modules.
The biopolymers are main components in the systems. That is way, the first module from the program is focused on theory of the polyelectrolyte adsorption on charged surface. In the lectures are considered the factors that influence on the adsorbed amount and the thickness of polymer layer. The second module is addressed to the investigation of the stability of disperse systems (suspensions and emulsions).
The discussion of nanostructures with different structure, composition and functionality are presented in the third module from the program. The methods for their preparation and characterization are also presented.
In the last lectures are described functional nanostructures with real application, for example heart-targeted drug delivery nanosystems, development of self-cleaning surfaces or prevention of biofouling on macroscopic surfaces.
The lectures are addressed to PhD students working in the field of physical chemistry, polymer chemistry and bionanotechnology.

Lecturer: Viktoria Milkova, Ph.D., Assoc. Prof.
Phone: +359 2 979 39 22
E-mail: vmilkova@ipc.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

3.8. Institute of Catalysis



3.8.1. Fundamentals of the Chemical Kinetics. Kinetics of Heterogeneous Catalytic Reactions. Methods of Measurements of the Catalytic Activity

The training course is focused on the contemporary state of the fundamental aspects of the chemical kinetics. The course considers consecutively the basic theories of the chemical kinetics, the methods of calculation of the rates of the chemical reactions and the interpretation of the results from the experimental measurements and their
juxtaposition with the theoretically calculated values. Special attention is paid to the theory of the transition state and the respective task, associated with it to calculate the potential surface of a system, consisting of interacting particles. Theoretical aspects of monomolecular and bimolecular processes are revealed as well as the reactions,
occurring in condensed phase.
The main aspects of the theory of the kinetics of heterogeneous catalytic reactions are considered. The methods applied for constructing kinetic models are described at length, the respective types of laboratory catalytic reactors, the methods of evaluation of kinetic parameters, the approaches applied for planning the experimental set i.e. the consecutive experimental design, the sources of experimental errors and how to reduce the errors in determining the catalytic activity.

Lecturer: Alexander Eliyas, PhD, Prof.
Phone: +359 2 979 25 69
E-mail: alel@ic.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

3.8.2. Application of Mossbauer Spectroscopy in Solid State Chemistry for the Study of New and Nano-Sized Materials

The lecture course is oriented towards PhD students with interests in the field of solid state chemistry and catalysis. Basic knowledge of structure of the materials considered in the solid-state aspect, instrumental characterization methods, methods for processing of experimental data are needed.

The lecture material is aimed at studying the principles and applications of Mossbauer spectroscopy in the field of material science and catalysis. It is a powerful tool for characterizing the local electronic structure of a studied element (mostly iron or tin) in both crystal and nanostructured or amorphous materials, glass, etc. by determining the local coordination, binding and oxidation state. The tracking of various stages of the synthesis and operation of the catalyst with the Mossbauer spectroscopy can be used to determine the mechanism of the catalytic reaction. For this purpose, modern techniques for

recording the spectra under different conditions - room temperature, liquid nitrogen temperature, transmission and conversion spectra will be considered. The resulting experimental Mossbauer spectra will be interpreted using modern approaches for processing and interpreting spectral data using specialized software and databases. It is envisaged that this will be realized in the conditions of the lecture course and in separate practical exercises for working with specialized Mossbauer software.

Lecturer: Daniela Paneva, Ph.D., Assoc. Prof.
Phone: +359 2 979 35 77
E-mail: daniela@ic.bas.bg
Academic hours: 30 lecture hours, 15 practical hours
ECTS credits: 20 ECTS

3.8.3. Solutions for Critical Raw Materials Substitution in Catalysts and Different Advanced Industrial Materials

The lecture course is addressed to PhD students with interests in the field of solid state chemistry and catalysis. Background in matter structure and characterization methods will be appreciated.

The challenge of critical raw materials (CRMs): advanced multidisciplinary view. The lecture focus is on the specific issues of the CRMs. Motivation: Difficulties in their access has a negative impact and depress industrial sectors vital to Europe https://ec.europa.eu/growth/sectors/raw-materials/specific-interest/critical_en. This is an advanced and priority area in material science, which integrates fundamental and applied research addressing the substitution of CRMs in catalysts, high value alloys and metal- matrix composites. Special issues will be material production, microstructure evolution characterization, (in-situ) property characterization, optimization of the full material life- cycle, such as usage, life-time, and recycling. An overview of appropriate characterization methods as a way of solving scientific and technical problems in understanding of CRM role in different type industrial materials. Characterization metods for study of materials properties at different levels (macro-, micro-, nanometer and atomic scale) whith use of X- ray analysis (diffraction and spectroscopy), Electron microscopy, Mössbauer analysis, etc. will be discussed.

A practical course will also be held. It aims to familiarize the participants with the specificscientific and technical challenges in the study, design and preparation of improved and nanomaterials with reduced or without CRM content. Skills related to preparation of nano-dimensional multifunctional composite materials based on transition metal or transition metal-precious metal compounds by mechanochemical synthesis and activation, thermal and sol-gel synthesis.

Lecturer: Zara Cherkezova-Zheleva, Ph.D., Prof.
Phone: +359 2 979 35 77
E-mail: zzhel@ic.bas.bg
Academic hours: 30 lecture hours, 15 practical hours
ECTS credits: 20 ECTS

3.8.4. Quantum-Chemical Methods in Catalysis

The aim of the course is to allow the acquaintance of the PhD students with the actual quantum- chemical methods such as method of Hartree-Fock, Functional Density Theory, Correlation methods, hybrid methods such as molecular mechanics and the method of the strong bonding.The above mentioned methods will be applied to some simple molecular systems and surfaces. The students will get practical knowledge in the application of the quantum-chemical programs Demon, Gaussian -03 and Crystall-03

Lecturer: Valentin Alexiev, Ph.D., Assoc. Prof.
Phone: (+359 2) 979 25 50
E-mail: valexiev@ic.bas.bg
Academic hours: 30
lecture hours ECTS credits: 20 ECTS

3.8.5. SCIENTIFIC BASES FOR THE PREPARATION OF HETEROGENEOUS CATALYSTS

The aim of the course is to allow the acquaintance of the PhD students with the actual methods and theory of catalysis preparation, the chemical processes during preparation procedure. The fundamental aspects in the preparation of heterogeneous catalysts starting from catalyst design up to the catalyst in its final form will be discussed. The course will consider the different methods of catalysis preparation (as precipitation, adsorption, ion-exchange and impregnation), the key factors in each preparation, the main differences between laboratory and industrial scale preparations.

Lecturer: Margarita Gabrovska, PhD, Prof.
Phone: (+359 2) 979 35 78
E-mail: margo@ic.bas.bg
Academic hours: 30
lecture hours ECTS credits: 20 ECTS

3.8.6. MODERN INSTRUMENTAL METHODS FOR CHARACTERIZATION OF CATALYSTS

The aim of the course is to present methods for analysis of the composition and structure both in the bulk and on the surface of catalytic materials such as Temperature programmed methods for analysis (TPR, TPD and TPO); X-ray phase analysis; Modern Spectral methods- IR, EPR, NMR of solid state samples, XPS and Mossbauer Spectrscopy.

Lecturer: Georgy Tiuliev, PhD, Prof.
Phone: (+359 2) 979 66 38
E-mail: tyuliev@ic.bas.bg
Academic hours: 30
lecture hours ECTS credits: 20 ECTS

3.8.7. CATALYSIS FOR ENVIRONMENTAL PRPOTECTION AND ENERGY PRODUCTION

The aim of the course is to introduce PhD students with selection, obtaining, characterization and testing of catalysts for important processes related to environmental protection (purification of exhaust pollutants) and processes related to energy (production and purification of hydrogen).

The catalytic processes that will be emphasized are: catalytic combustion of volatile organic substances and processes for fine purification of hydrogen. PhD students will be acquainted with the types of catalysts, the mechanism of the processes and the influence of various factors for the formation of the active phase.

Lecturer: Silviya Todorova, PhD, Prof.
Phone: (+359 2) 979 25 76
E-mail: todorova@ic.bas.bg
Academic hours: 30
lecture hours ECTS credits: 20 ECTS

3.8.8. FUNDAMENTAL AND APPLIED EPR SPECTROSCOPY

The aim of the course is to introduce PhD students with the theory and practical application of EPR spectroscopy. The main theoretical principles of the EPR method such as Zeeman interaction, electron-nuclear interactions, EPR spectra in solutions and disordered systems, g anisotropy, hyperfine splitting and others will be considered.

Special attention will be paid to the application of the method in catalysis, dosimetry, identification of irradiated foods, environmental protection, dating of archaeological objects.

Lecturer: Katerina Aleksieva, PhD, Assoc. Prof.
Phone: (+359 2) 979 39 17
E-mail: kati@ic.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

3.8.9. MECHANOCHEMISTRY FOR GREEN PREPARATION AND RECYCLING OF CATALYSTS AND ADVANCED NANOMATERIALS

The lecture course is addressed to PhD students with interests in the field of material research and catalysis. Basic knowledge of structure in the material's structure and characterization methods will be appreciated.

The lecture focus is on the use of mechanochemistry as a green and sustainable method for synthesis, activation and recycling of advanced nanomaterials and catalysts. Different mechanochemical protocols that can offer advantages over existing solution-based methods will be discussed. Number of ex situ and in situ emergency characterization methods will be covered in order to follow and understand mechanochemical transformations in materials and to find out new synthetic or recycling procedures.

A practical course will also be held to build skills related to preparation and recycling of multifunctional composite materials and catalysts by mechanochemical method. It aims to familiarize the participants with the specific scientific and technical challenges in the field of laboratory and industrial application of mechanochemistry.

Lecturer: Zara Cherkezova-Zheleva, Ph.D., Prof.
Phone: +359 2 979 35 77
E-mail: zzhel@ic.bas.bg
Academic hours: 30 lecture hours, 15 practical hours
ECTS credits: 20 ECTS

3.8.10. Synthesis and properties of zeolite catalysts

The aim of the course is to introduce PhD students to the structure, the nomenclature and the unique properties of zeolites. The methods of zeolite synthesis are reviewed, paying attention to synthetic and post-synthetic techniques for overcoming diffuse problems during adsorption and catalytic processes. A number of examples of catalytic processes are considered, which are performed only on zeolites and/or zeolites modified with active metals, with a focus on reactions for clean energy, as well as reactions important for environmental protection.

Lecturer: Prof. Yuri Kalvachev, PhD
Phone: (+359 2) 979 39 89
E-mail: kalvachev@ic.bas.bg
Academic hours: 30
lecture hours ECTS credits: 20 ECTS

3.8.11. SYNTHESIS AND STUDY OF PHOTOCHROMIC COMPOUNDS

The aim of the course is to introduce PhD students with design, synthesis and study of the properties of photochromic compounds. The synthesis methods of compounds from the group of spiropyrans, spirooxazines and diarylethenes will be studied. The PhD students will get acquainted with the physical methods for characterization of photochromic compounds – IR, NMR and UV spectroscopy. The influence of the substituents, the medium (solution, solid matrix, or ionic liquid) on the properties of the compounds and their application as a dynamic biosensors in the optical recording and storage of information on optical switches, for accumulation of solar energy, in catalysis and in the optical electronics and bioelectronics will be studied.

Lecturer: Stela Minkovska, PhD, Assoc. Prof.
Phone: (+359 2) 979 35 76
E-mail: stelamin@ic.bas.bg
Academic hours: 30
lecture hours ECTS credits: 20 ECTS

4. Biomedicine and Quality of Life

4.1 Institute of Neurobiology

4.1.1. PHYSIOLOGICAL BASIS OF MEMORY AND LEARNING

The optional elective course "Physiological basis of memory and learning" is intended for PhD students working in the fields of physiology, pathophysiology and pharmacology of memory and learning. The aim of the course is to acquaint PhD students with the main structures and physiological mechanisms involved in the processes of formation of different types of memory, selective attention, motivation and learning. Within the lectures, PhD students have the opportunity to get acquainted with the latest advances in elucidation of the structural, cellular and biochemical mechanisms participating in the encoding, storage, reproduction and loss of information in the brain during learning and memory storage. The course will review some basic experimental preclinical models of The additional practical guideline of the course allows elucidating the influence of a number of endogenous and exogenous factors on the processes of memory formation and loss.

Lecturer: Daniela Pechlivanova, Assoc. Professor
Phone: +359 979 2172
Email: pechlivanova@yahoo.com
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

4.1.2. THEORETICAL BASIS AND METHODS FOR IN VITRO INVESTIGATION OF THE BIOMECHANICAL CHARACTERISTICS OF BIOLOGICAL TISSUES

The present specialized course “Theoretical basis and methods for in vitro investigation of the biomechanical characteristics of biological tissues” is intended for PhD students with a previous specialty mainly in biology, pharmacy, and medicine but it could be also useful for PhD students with any other specialty who are working on the characterization of the physiological behavior of biological tissues in norm and pathology as well as who are studying the pharmacological and physical influences on that behavior when the neural and humoral regulation of the living organism is eliminated.

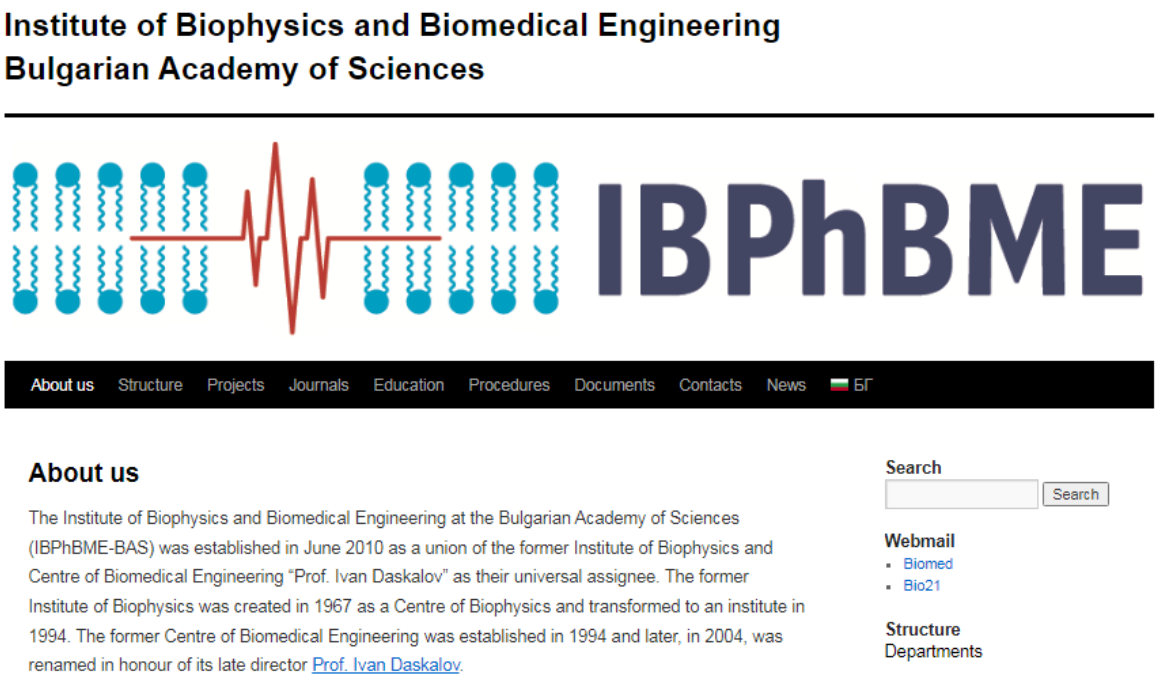
The purpose of the course is the PhD students to be educated in different methods for investigation of the direct effect of various influences and diseases on the biomechanical characteristics (viscoelasticity) of vital tissue preparations in vitro. The methods described in the course are applicable on various biological tissues (blood vessels, skin, and various organs especially with smooth muscle) but here blood vessels will be especially taken in mind. The knowledge about the biological tissues viscoelasticity might be considered as additional assortment of investigations that might contribute to a complete description of their characteristics and behavior in various conditions as well as the direct response of the tissues on the environmental changes. The values of the biomechanical characteristics could be used in mathematical modeling of the studied tissues behavior. That knowledge might be helpful to the PhD students in their education as well as they would contribute to a well-grounded optimal choice of the method for envisaged method of investigation.

The material is separated in 15 topics. The presentation is planned as seminars, lessons or lessons with practical class - the whole program in 30 hours (15 hours lessons). It begins with the basic principles in physiology of smooth muscles and the cardiovascular system that is directed especially to non-medics. This first part is designed to describe the problems in blood vessels wall studies in vitro, outlining the opportunities of the biomechanics aimed to obtain the direct effect of physical, pathological, and drug factors on it. Except the lessons on synapse and smooth muscles physiology and neural and humoral regulation of the vessel tone, the lessons of the circulation and especially on blood pressure and velocity as well as on hydraulic resistance, are considered from a hydrodynamic point of view with application in the hemodynamics. The second part of the course presents an introduction into the blood vessels biomechanics, some elements of the viscoelasticity theory and the opportunities for its application in studying in vitro of biological tissues. Methods for uni- and bi-axial static experiments are considered as well as the method of force oscillations, electric and mechanical stimulation of preparations. The mathematical apparatus used, is adapted to the specificity of biological, pharmaceutical, and medical education with the idea not to be too much trouble for these specialists. A special attention is paid to the physical meaning of the used methods, quantities, and dependencies as well as to the interpretation of the experimental results.

Every method is developed in a separate item with a special view to those that might be applied here but without disregarding the methods widely used abroad. There is an opportunity for practical education on some of the methods with colleagues, who apply them in their research.

Lecturer: Maria Antonova, Assoc. Professor
Phone: +359 979 2167
Email: mariya.antonova@gmail.com; antonova@bio.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

4.2. Institute of Biophysics and Biomedical Engineering (IBPhBME)



4.2.1. Computer-Aided Drug Design

The course aims to introduce the PhD students to the basic principles and methods for drug development by using computational approaches (also known as in silico approaches to drug design) and to give them the basic skills for their implementation. The subject matter is highly interdisciplinary: it uses knowledge of pharmacology, molecular biology, organic and quantum chemistry molecular mechanics, analytical methods for structural analysis, mathematical and engineering disciplines (statistics, pattern recognition, informatics, etc.).

The program of the course includes ligand-and structure-based approaches based on quantitative structure- activity relationships (QSAR) analysis and molecular modeling. The goal is to characterize the relationship between the chemical structure of the compounds and their effects expressed by models (twodimensional or 3D (molecular)), where the effect can be therapeutic, toxic, etc. The aim is, on one hand, to better understand the molecular mechanisms leading to these effects; on the other hand - to predict the effects from the models. In practical terms, the PhD students will learn about the latest molecular modeling software and its application for building structures, optimization, calculation of structural descriptors, deriving structure-activity models, analyzing ligand-protein interactions etc.

Lecturer: Ilza Pajeva, D.Sc., Prof., Corr. Member of BAS
Phone: +359 2 979 36 05
E-mail: pajeva@biomed.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

4.2.2. Models of Control of Human Motor Activity

The aim of the course is to introduce PhD students to basic knowledge concerning functioning and modeling of the action of muscles of the human limbs and their control during different motor tasks. Basic knowledge in biomechanics, anatomy and physiology of the muscles and their motor units as well as about basic mechanism for their control from brain will be included in the course. Different methods for modeling and investigation of the bone- joint-muscle apparatus of the upper and lower human limbs will be considered. PhD students will be introduced to optimization methods for solving indeterminate problems in biomechanics (appearing because of existing too many muscle forces than the number of equations for equilibrium in the joints) and with the software package MOTCO developed in IBPhBME for modeling and control of muscle motor units.

In this program a muscle is modeled as a composition of different in number and type

motor units and using a hierarchical genetic algorithm the necessary for performing a given motion impulsation of all motor units is predicted.

Lecturer: Rositsa Raikova, D.Sc., Prof.
Phone: +359 2 979 36 54
E-mail: rosi.raikova@biomed.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

4.2.3. Photo Processes in Biological Membranes

Molecular mechanisms of the photosynthetic process are the subject of continuing interest. The optimum activity of the photosynthetic apparatus depends on the efficient absorption of the light and the regulation of energy transfer to reaction centres, which is performed by light harvesting complexes. Research of the photosynthetic membranes in recent years shows their dynamic features, including changes in structure, composition and function of the photosynthetic apparatus under the influence of environmental conditions.
During the course PhD students can learn about current knowledge of the organization and processes occurring in the photosynthetic membranes, as well as the influence of environmental changes on the structure and functional activity of these membranes. Throughout, practical exercises PhD students will study the equipment and the principles of some basic biophysical methods used for investigation of the photosynthetic membranes.
The lectures and exercises are suitable for PhD students in biophysics, biology, plant physiology and biotechnology.

Lecturer: Emilia Apostolova, Ph.D., Prof.
Phone: +359 2 979 26 21
E-mail: emya@bio21.bas.bg
Academic hours: 20 lecture hours, 10 practical hours
ECTS credits: 20 ECTS

4.2.4. Intuitionistic Fuzzy Sets

For over 20 years, the lecture course has been given in IBPhBME during the first full week of the year.

Course aims: The course gives knowledge in the area of fuzzy and intuitionistic fuzzy sets

and skills for using them for evaluation of the parameters of real processes.

Methods for evaluation: Examination with a syllabus, or (elective) preparation of a research paper or a conference communication.

Course contents: The course contains the basic elements of the theories of fuzzy and intu-

itionistic fuzzy sets and discusses their basic applications in artificial Intelligence, economics, industry, medicine and other areas.

Lecturer: Acad. Krassimir Atanassov
Phone: +359 2 979 36 02
E-mail: krat@bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

4.2.5. Generalized Nets

Generalized Nets (GNs) are extensions of the Petri nets and the rest of other their modifications. The course gives the basic results of GN theory and discusses their main applications in the areas of Artificial Intelligence, medicine, chemistry, transport, computer science and others. Information about the software tools for GN models implementation is given.

Lecturer: Acad. Krassimir Atanassov
Phone: +359 2 979 36 02
E-mail: krat@bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

4.2.6. Transfer of Scientific Knowledge from Academia to Society by the Electronic Encyclopedia Wikipedia

In recent years in Bulgaria, Wikipedia and its impact as an internet and social phenomenon have become an increasingly popular topic. On one hand, the principle of the voluntarily contributed user generated content, on which Wikipedia is based, generates numerous concerns about the quality and reliability of its content. On the other hand, not surprisingly, Wikipedia is one of the most popular websites (ranked 5th globally) and the only one non-commercial site in Top 100 as well as the only one from the category of reference sites. This makes Wikipedia an exceptionally effective way for transfer of knowledge from the academic community to society, which is one of the main socially engaged missions of the Bulgarian Academy of Sciences.

The present lecture course is oriented to PhD students, young researchers as well as more experienced researchers who are willing to share their scientific and encyclopaedic knowledge with the largest possible audience. The course aims to form a thorough understanding of the philosophy and technology of the user generated content, of wiki software and Wikipedia in particular, the principles and rules of creation of encyclopedic knowledge, both textual and multimedia, the tools for data retrieval from Wikipedia and Wikidata, and also to show the opportunities of application of wiki technology in other contexts. Within the exercises, the course attendants will learn to effectively navigate the wiki environment, create, edit and format pages by using text, tables, formulas, multimedia, and templates. They will additionally be presented with some related topics such as copyrights, basic free licenses used in the Internet, bibliographic citation, and principles of reliability of various kinds of information sources.

The lecturer has contributed to Wikipedia since 2006 and is experienced in presenting the topic in front of various academic and professional audiences. She has worked with lecturers of Sofia University, New Bulgarian University, University of National and World Economy, University of Library Sciences and Information Technologies etc., for including Wikipedia among their educational practices and for encouraging students to contribute to the improvement of the Bulgarian version of Wikipedia with encyclopedic content in different fields of knowledge. She is the creator of the first Bulgarian university lecture course specifically dedicated to Wikipedia as a subject of research: the elective course “Wikipedia and Wiki Technologies” in the Faculty of Mathematics and Informatics of Plovdiv University “Paisii Hilendarski” (2011-

2014). In 2018 she educated librarians from several regional libraries around Bulgaria how to contribute to Wikipedia and use it in their professional work.

Lecturer: Vassia Atanassova, Ph.D., Assoc. Prof.
Phone: +359 2 979 36 09
E-mail: vassia.atanassova@gmail.com
Academic hours: 15 lecture hours, 15 practical hours
ECTS credits: 20 ECTS

4.2.7. Photosynthetic membranes. Approaches for structural and functional analysis

The course is targeted towards PhD students interested in plant biophysics and physiology. More specifically the topics include structural organization of photosynthetic membranes, its role for the optimization of the photosynthetic processes and for plant adaptation to the environment. The basic methods for characterization of photosynthetic membranes in higher plants and cyanobacteria, in structural and functional aspects, will be reviewed.

Main topics:

• Methods for characterization of the structural organization of photosynthetic membranes. Role of thylakoid stacking for the optimization of the photosynthetic process.

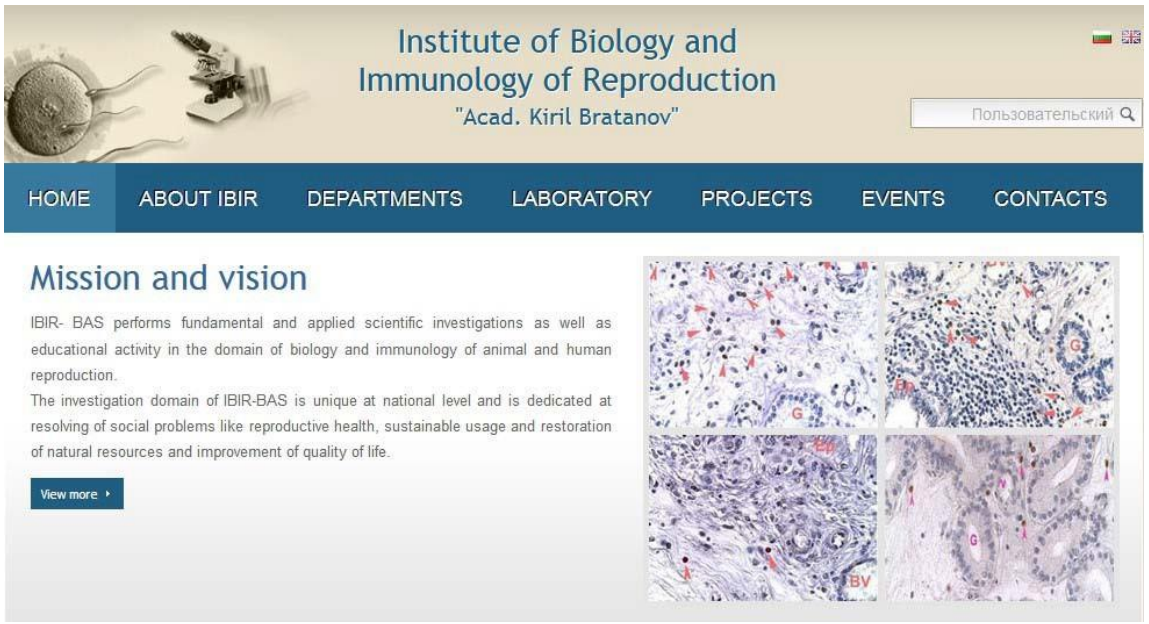
• Pigment-protein complexes and supercomplexes. Structure, macroorganization and role of lipids and protein subunits.

• Lipid polymorphism in photosynthetic membranes. Experimental approaches for its characterization and physiological role.

• Photoprotection mechanisms. Non-photochemical quenching of chlorophyll fluorescence. Xanthophyll cycle. Role of the light-harvesting complexes of photosystem I and II.

Lecturer: Sashka Krumova, PhD, Prof.
Phone: +359 2 979 2608
E-mail: sashka.b.krumova@gmail.com
Academic hours: 30 lecture hours
ECTS Credits: 20 ECTS

4.3. Institute of Biology and Immunology of Reproduction



4.3.1. Fundamental and Reproductive Immunology

Immunology is a fast growing biomedical science that covers the study of immune system and organism protection from cells or products bearing foreign genetic information. From an immunological point of view the fertilization, implantation and development of the semi-allogeneic fetus is a paradox, still unresolved by the reproductive immunologists. In contrast to well-accepted dogma about basic function of the immune system to recognize and respond to foreign antigens, during pregnancy the maternal immune system accepts and supports the de- velopment of the fetus bearing father's genes. The main immunological puzzle is why mother's mature and functional immune system tolerates the fetus, expressing foreign antigens. On the other hand, the fetus develops its own immune system and could also react against maternal antigens as well as against pathogens. Reproductive immunology is a field of medicine that studies interactions between the immune system and components related to the reproduc- tive system, such as immunological interactions during formation of gametes, fertilization and maternal immune tolerance towards the fetus as well as infertility, recurrent miscarriages and pregnancy complications due to immune disregulation.

This course is addressed to PhD students working in the field of biological sciences. The

course is for PhD students who have basic knowledge about structure, organization and func- tion of the immune system and aims to present up-to-date issues on molecular and cellular mechanisms of innate and acquired immunity and how the immunity influences reproduction.

The course is structured as a series of lectures on both fundamental immunology and

reproductive immunology.

Lecturer: Tanya Dimova, Ph.D., Assoc. Prof.
Phone: +359 2 971 13 95, +359 882 412 742
E-mail: tanyadimova@yahoo.com
Academic hours: 26 lecture hours
ECTS credits: 20 ECTS

4.3.2. Mesenchymal Stem Cells

Mesenchymal stem cells (MSCs) are adult stem cells usually obtained from bone marrow stroma but identified also in other tissues, such as fat, epidermis, and cord blood. They are attractive candidates for cell-based therapeutic strategies, primarily because of their intrinsic ability to self-renewal and undergo multipotential differentiation, amenability to genetic ma- nipulation as well as the possibility to use them as autologous immunosuppressive cells. Given the correct stimuli and local environment, they develop into various cell types in vitro and regenerate tissues in vivo.

The course will address the following topics: Types of MSC and markers; Isolation and culture of MSC; Biological functions of MSC; Immunogenicity; Interactions with tumor cells; Therapeutic approaches using mesenchymal stem cells or their products.

Lecturer: Milena Mourdjeva, Ph.D., Assoc. Prof.
Phone: +359 894 224 865
E-mail: milena mourdjeva@abv.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

4.3.3. Autoimmune Response and Autoimmune Diseases

The task of the immune system is to protect the body from foreign invaders carrying other genetic information. It is designed to distinguish what is non-self (foreign) from what is self. There are certain pathological conditions when the immune system makes it possible to attack our own cells and tissues as foreign. The problem of autoimmunity and autoimmune diseases is a major challenge in specialized medicine for more than a century. The course is suitable for medical students, molecular and cell biologists, biochemists and other specialists working in the field of biology and medical biochemistry. The mechanisms of the immune response and the resulting autoimmune response, as well as some of the autoimmune diseases and the principles of their treatment, will be analyzed and explained.

The course will address the following topics: Structure and function of the immune system; Processes of antigen presentation and recognition – T-cell receptor, main complex of tissue compatibility; Autoimmune diseases in clinical aspect; Organ-specific autoimmune diseases; Systemic autoimmune diseases; Principles of Autoimmune Disease Treatment.

Lecturer: Teodora Daneva, Ph.D., Assoc. Prof.
Phone: +359 876 144 677
E-mail: danevadoki@abv.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

4.3.4. Embriobiotechnology in Farm Animals

The purpose of this course is to expand students' knowledge in the field of embriobiotechnologies in animals. Will be held theoretical and practical preparation to study the character- istics in in vitro breeding methods, modern approaches and specific features of the biological aspects of the application of biotechnology in vitro, as well as opportunities for non-surgical embriotransplantation in animals.

The course is addressed to PhD students working in the field of animal husbandry and veterinary medicine, biological and biomedical sciences.

Lecturer: Boyko Georgiev, Ph.D., Assoc. Prof.
Phone: +359 888 272 529
E-mail: boykog@netbg.com
Academic hours: 26 lecture hours
ECTS credits: 20 ECTS

4.3.5. Methods in the Human Embryology Lab

The aim of the present course is to provide a comprehensive review of the methods used in laboratory for assisted reproductive technologies. It is recommended for professionals in the field of reproductive science, clinical embryologists and students. The topics covered will include:

• legislation and funding aspects of assisted reproductive technologies, laboratory layout, necessary equipment and safety requirements;

• work organization and quality control;

• culture media and systems;

• semen quality analysis – traditional approaches, CASA (computer assisted sperm analysis), WHO criteria, sperm DNA fragmentation assays, HBA-test, methods for sperm processing for IVF and ICSI and their advantages/disadvantages, IUI (intrauterine insemination);

• oocyte assessment – traditional and novel methodology, oocyte denudation and activation, in vitro maturation;

• fertilization procedures - conventional IVF, ICSI and IMSI; PESA, TESE and MESA;

• embryo culture and evaluation;

• additional micromanipulation techniques in ART - assisted hatching, embryo biopsy, PGS, nuclear and mitochondrial transfer;

• embryo transfer;

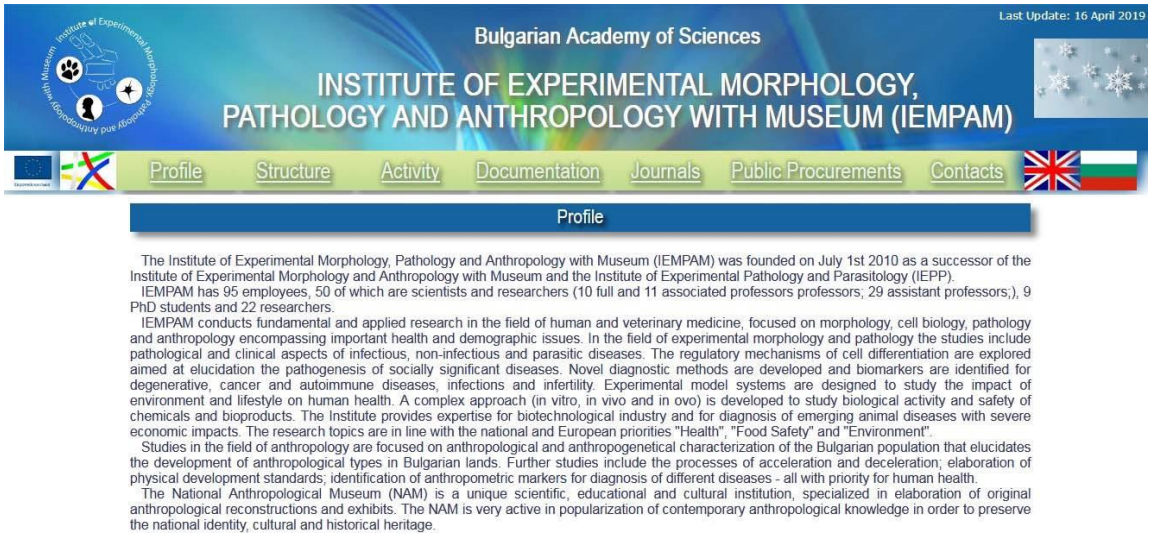
• methods for cryopreservation of gametes, embryos and reproductive tissues;

• stem cells in reproductive biology and embryology.

During the course, the latest developments in reproductive science and their relevance in clinical practice will be discussed. The novel and emerging methods, how can they be applied and a critical analysis of their advantages and disadvantages for laboratory performance will also be covered. As a part of the course, the students will be able to visit an IVF clinic and to observe its work organization, interaction with other specialists and management.

Lecturer: Elena Hristova, Ph.D., ESHRE certificate for clinical embryologist
Phone: +359 884 582 870
E-mail: hristova.elena@gmail.com
Academic hours: 24 lecture hours, 6 practical hours
ECTS credits: 20 ECTS

4.4. Institute of Experimental Morphology, Pathology and Anthropology with Museum



4.4.1. Theory and Practice of Classic and Contemporary Histological Techniques

The specialized course aims to provide knowledge and training for PhD students on principles and practice of classical and advanced histological techniques that are widely applied in the field of experimental morphology and pathology and cell biology. The course program is designed according to the mission and priorities of the Institute of Experimental Morphol- ogy, Pathology and Anthropology with Museum. The training accentuates on the importance of the advanced techniques for fundamental achievements in the field of cell biology relating to elucidation of regulatory mechanisms of cell interaction mediated by hormones and growth factors. The course also focuses on the application and practical use of different techniques for clinical investigations in terms of development and improvement of diagnostic markers of vari- ous diseases. The course is addressed to PhD students in the field of experimental morphology and pathology, cellular and molecular biology.

Lecturer: Nina Nedeva Atanassova, D.Sc., Prof., Corresponding member
Phone: +359 2 979 23 36
E-mail: ninaatanassova@yahoo.com
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

4.4.2. Animal Cell Culture

The techniques of animal cells cultivation have been used in almost all areas of contemporary biology in the recent years. The present course aims to give the PhD students basic knowledge in the field of cell and organ cultivation, to introduce the evaluation methods of cell growth and survival in culture, cryoconservation of animal cells and application of animal cells for the measurement of the biological activity of drugs and other active substances. The course is focused on all PhD students aiming to use cell cultures in their future work - morphologists, cytologists, cell and molecular biologists.

Lecturer: Assoc. Prof. Ivan Angelov Iliev, PhD
Тел.: +359 2 979 2362
E-mail: taparsky@abv.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

4.4.3. Introduction in Cell and Tissue Engineering

The aim of the course is to present the experimental models and strategies in current cell and tissue engineering, the advantages, challenges and perspectives for this new and innovative field of biomedical research. Development of genetically engineered cell lines and animal models. Why to say “Yes” and when to say “No”? Do stem cells can help us to faith against cancer, heart disease, diabetes, neurodegenerative disorders? Why is not so easy to prepare “artificial” organs and tissues? What is the role of nanotechnologies? These are some of the questions that will be discussed during the course. Special interest will be focused on hybridoma technique and preparation and application of monoclonal antibodies as well as on possible application of mesenchimal stem cells in the treatment of bone defects and cancer. Demonstration of some methods for biocompatibily assessment of new materials will be also performed.

Lecturer: Radostina Alexandrova, Ph.D., Prof.
Phone: +359 2 979 36 78
E-mail: rialexandrova@hotmail.com
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

4.4.4. Viruses and Immunity – Challenges and Opportunities

The course will briefly present the biology of innate and acquired immunity. Cells, molecules and mechanisms of cellular and humoral immune response, systems for regulation and control of immune processes, as well as the participation of viruses in some immunopathologies (hypersensitivity reactions, immune deficiencies, etc.) will be discussed. How do viruses escape the immune response? Can they trigger autoimmune reactions? What is their role in organ and tissue transplantation? Part of the lectures will acquaint students with the application of some immunological, molecular biological and genetic methods in experimental and clinical virological practice. Special attention will be paid to the challenges of emerging viruses, epidemics and pandemics, opportunities and prospects for non-specific and specific immunoprophylaxis and immunotherapy of viral infections.

Lecturer: Radostina Alexandrova, Ph.D., Prof.
Phone: +359 2 979 36 78
E-mail: rialexandrova@hotmail.com
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

4.4.5. Molecular Mechanisms of Cancerogenesis and New Strategies in Cancer Prevention, Diagnosis and Treatment

The course will summarize the data available about molecular mechanisms (signal pathways, oncogenes, tumor suppressor genes) of cancerogenesis, tumor progression and sponta- neous regression, metastases. In vitro and in vivo model systems, principles and methods in experimental oncology and oncopharmacology will be presented. Challenges in current can- cer chemotherapy (heterogeneity of tumor cells, multidrug resistance, cancer stem cells, the escape of cancer cells from the immune system) and promising new strategies for targeted can- cer treatment (application of monoclonal antibodies, photodynamic and boron neutron capture therapy, gene therapy, nanotechologies) will be one of the main topics. Special attention will be given to the new opportunities for early diagnosis and prevention.

Lecturer: Radostina Alexandrova, Ph.D., Prof.
Phone: +359 2 979 36 78
E-mail: rialexandrova@hotmail.com
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

4.4.6. DNA-Replication, RNA-Transcription, Proteine Translation and Cell Division – Morphological Aspect

The course aims to expand knowledge of the PhD students /biologists, doctors, veterinarians and others/ about the possibilities of electronic microscopy and molecular morphology as a tool for visualization of the fundamental biological processes in the cell as DNA replication, RNA transcription, translation of proteins and cell division.

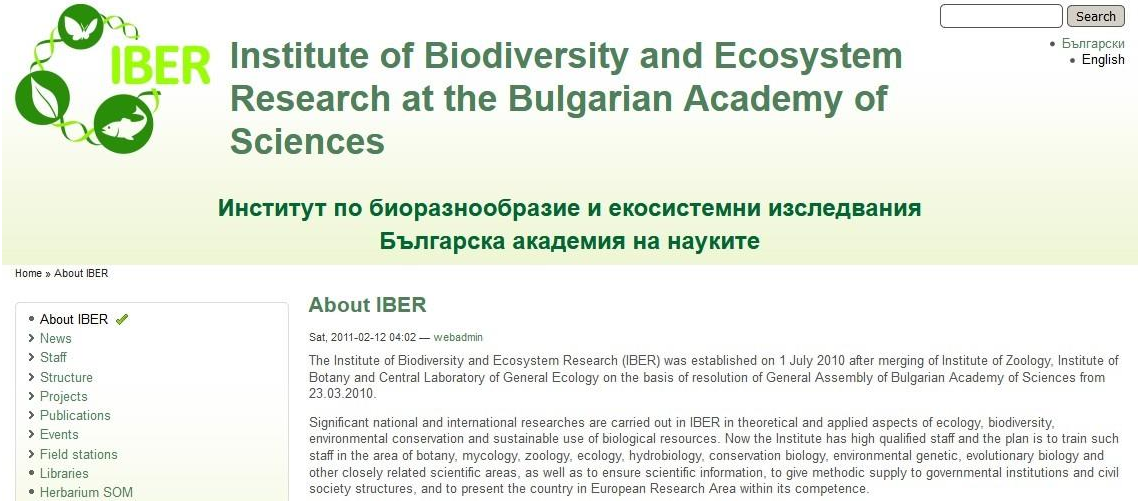
An accent will be given to the peculiarities of the structure and functions of all cellular

organelles involved in these processes, will be presented as well and original data for certain structures in the cell nucleus and their functions as such as nuclear matrix, RNP-structures, NOR, etc. Prepared material for illustration /78 slides and 14 schemes/ is the result of our long-standing research presented as publications in prestigious international journals. PhD students will became familiar with the methods used in these studies - these are the most modern morphological methods routine in a small number of leading European laboratories such like the “Spread” Mieler technique for visualization of DNA and RNA, electron microscopic autoradiography, electron microscopic imunohistochemistry and others. It is expected this training course to be complementary to the notion of fundamental biological processes in the cell, obtained from university education and to benefit the completion of the general biological culture of the students.

Lecturer: Russy Russev, Ph.D., Assoc. Prof.
Phone: +359 2 979 23 89
E-mail: rusy rusev@abv.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

5. Biodiversity, Bioresources and Ecolog

5.1. Institute of Biodiversity and Ecosystem Research



5.1.1. Contemporary Methods and Approaches in Taxonomy

The development of modern taxonomy is connected with the application of new cytogenetical and molecular biological methods and approaches. Every species has a species specific organized genome, which has been formed in the evolutionary process as a result of many struc- tural chromosome and genome alterations. It is important to know the species specific genome characteristics and mechanisms involved in genome reorganization during the evolution.

In the course presented will be studied the structural and functional characteristics of eukaryotic chromosome which are important for taxonomy an systematic. Different chromosome types and heterochromatin structure will be analyzed. Heterochromatin will be considered as a “dynamic structure” in evolutionary process. Special stress will be done on the structural chromosome and genome rearrangements, their role in the creating of reproductive isolating mechanisms. The population mutability will be shown on many examples among the animals and plants, the population heterogeneity and the significance of population mutability for evo- lutionary process will be considered. Study of the structural and functional organization of the genome will provide the important information of different processes at individual, population and community levels. The development of modern taxonomy is connected with the appli- cation of new cytogenetical and molecular biological methods and approaches. Every species has a species specific organized genome, which has been formed in the evolutionary process as a result of many structural chromosome and genome alterations. It is important to know the species specific genome characteristics and mechanisms involved in genome reorganization during the evolution.

Lecturer: Paraskeva Michailova, D.Sc., Prof.
Phone: +359 2 988 51 15
E-mail: michailova@zoology.bas.bg
Academic hours: 20 lecture hours
ECTS credits: 20 ECTS

5.1.2. Conservation of Biological Diversity: Theoretical Aspects and Method- ological Approaches

This course aims to present basic knowledge of the biological diversity concept and the principles of the conservation biology. The introductory series of lectures is devoted to the roots and development of the concept of biodiversity, the elements of the International Research Programme DIVERSITAS, factors determining the biodiversity loss at global scale and mechanisms responsible for it and the main international agreements on the biodiversity.

The second part introduces principles of the conservation biology: organization levels and quantification of the biodiversity; indicator and key species, key structures and ecosystem "engineers"; invasive species, trophic cascades and behavioral ecology; main concepts of the metapopulation theory; conservation of habitats and principles of the development of the pro- tected areas and ecological networks. The course is targeting PhD students in ecology and ecosystem conservation, zoology, botany, hydrobiology, entomology, parasitology and mycol- ogy. It might be also of interest for PhD students working on aspects of biodiversity studies and nature conservation in the frames of other branches of science (e.g. microbiology, molecular biology, genetics and forestry).

Lecturer: Boyko B. Georgiev, D.Sc., Prof.
Phone: +359 2 870 50 12
E-mail: bbg@ecolab.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

5.1.3. Light microscopy and photomicrography

Main objective of the lecture course are the basic principles of operation of the optical microscope and practical skills in its use. Various optical and mechanical components in a standard optical microscope are considered: objectives, eyepieces, condensers, illuminators. The students are introduced to some special microscopic techniques: phase contrast, differ- ential interference contrast, polarized light, fluorescence and confocal microscopy. Different designs of stereomicroscopes are presented. Particular attention is paid to the use of main types of digital cameras and to some of the specifics of digital photographs, including their processing for production of scientific illustration, as well as drawing of objects through camera lucida.

Lecturer: Snezhana Grozeva, Ph.D., Prof.
Phone: +359 888 673 619
E-mail: sngrov@gmail.com
Academic hours: 15 lecture hours, 15 practical hours
ECTS credits: 20 ECTS

5.1.4. Plant Biotechnologies for Preservation of Rare and Medicinal Plants

The course in plant biotechnologies for preservation of rare and medicinal plants is addressed mainly to biotechnologists and biologists- botanists, but could be useful for those working in the field of the phytochemistry and the medicine sciences as well. . During the last decades the problem of biodiversity loss is becoming more and more important all over the world. Medicinal plants are especially vulnerable because of their gathering from the nature due to the increasing market demand of drugs. Plant biotechnologies are considered as alternative and complementary means for preservation of rare, threatened, and medicinal plant species, in parallel with application of in situ measures. The course includes different in vitro techniques: rapid micropropagation and ex vitro adaptation, somatic embryogenesis and artificial seeds, cryopreservation, cultivation in temporary immersion system and bioreactors, etc. The effects of different factors on the culture growth and the in vitro biosynthesis of bioactive substances are discussed: genotype, type of the culture, medium composition, cultivation conditions. The advantages and the challenges of the in vitro biosynthesis of secondary metabolites are outlined, and examples of successful industrial production are given.

Beside the theoretical course, the PhD-students will benefit by the opportunity to get some

experience on basic in vitro techniques during the laboratory practice.

The course will help the PhD-students to plan their own experimental work correctly, in order to apply statistical analyses of the data. The result interpretation in case of interaction between several tested factors will be examined on the basis of the scientific experience of the Biotechnological laboratory of medicinal plants, at the Institute of biodiversity and ecosystem research.

Lecturer: Marina Stanilova, Ph.D., Assoc. Prof.
Phone: +359 2 979 21 98
E-mail: maris@bio.bas.bg
Academic hours: 20 lecture hours
ECTS credits: 20 ECTS

5.2. Institute of Plant Physiology and Genetics

5.2.1. Biogenic Volatile Organic Compounds

Continuous exchange of gases and aerosols between the Earth's surface and the atmosphere plays a fundamental role in determining air quality. It is an important driver of climate at both regional and global scales. In turn, biological communities and the physical environment change in response to changes in climate and atmospheric pollution. The biosphere and atmosphere are dynamic, constantly reflecting these interactions and feedbacks.

The chemical and physical properties of the atmosphere are substantially affected by the biogenic volatile organic compounds (BVOCs), which plants emit into the atmosphere. However, BVOC emissions are associated with considerable metabolic cost, both in terms of energy and carbon to the plants and, thus it is assumed that these compounds play fundamental roles in protecting plants from environmental stresses.

The course includes the following topics: Distribution and biodiversity of BVOCs, BVOC biosynthesis, BVOC emission measurements - techniques and modeling, Importance of BVOCs for atmospheric chemistry, Factors controlling BVOC emissions, Functional roles of biogenic isoprenoids - study approaches, BVOCs in abiotic stress interactions, BVOCs in biotic stress interactions, Impact of climate changes on BVOC emissions and ecological consequences of altered BVOC emissions.

Lecturer: Violeta Velikova, Ph.D., Prof.
Phone: +359 2 979 26 83
E-mail: violeta.velikova@gmail.com
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

6. Climate Change, Hazards and Natural Resources

6.1. Geological Institute

6.1.1. Methods of Mineral Identification

The course is targeted on PhD students in Mineralogy, but can also be useful for all kinds of researchers from the solid state branch of the geological sciences: petrology, geochemistry, geo-ecology, lithology, coal geology, as well as for some engineering branches, dealing with natural or synthetic materials with macromolecular structure.

Mineral identification is based on a complementary set of methods for determination of both chemical composition and crystal structure. Since the term Mineral refers to solid state compounds with specific chemical composition and crystal structure, special attention will be paid to inherent inhomogeneity phenomena which need to be respected during identification. Taxonomic difficulties related to sector zoning, isomorphism, polytypism will be considered in respect to mineral identification methodology.

The course will include a critical review of the classical mineral identification methods and

will focus on modern analytical tools like EPMA , XRD, software for processing of row analytical data and databases for mineral identification. The applicability field of each component method will be outlined, using proper examples.

Lecturer: Thomas Kerestedjian, Ph.D., Prof.
Phone: +359 2 979 22 44
E-mail: thomas@geology.bas.bg
Academic hours: 20 lecture hours
ECTS credits: 20 ECTS

6.1.2. Basic of the Linear Geostatistics and its Application for the Nature Sciences

The conventional statistics are based on random and independent variables, and the presumption of no existence of data continuity. Thus, it is impossible to enlarge the impact of the variable in the space. The Geostatistics are also using the statistical approaches, but at the same time the method integrates the space distribution of the data, as well the mathematical theories of correlation functions, random fields and fractals. The method is used for analyses of data depending of their space position, and for consecutive creation of 2-D, 3-D, even 4-D models, grounded on the data interpretation.

Prof. G. Matheron from the High National School of Mines of Paris (France) created at the end of the 70-teen years of the past century the elegant Theory of the Regionalized Variables and the Random Functions, aimed to resolve some specific problems of the more precise evaluation of the reserves of natural mineral deposits. The Geostatistics, as a method for practical purposes, has been developed from a number of centres worldwide, the most known from them are the the Centre of geostatistics of the High National School of Mines of Paris (Fontainebleau, France), the Department for Applied Earth Sciences, Stanford, CA (USA), Bryan Mining and Geology Research Centre in Australia, and others. During the process of perfection of the methodology powerful software packages have been created for computer processing of enormous volumes of data. The application of the method now is far surpassing the borders of the geological and mining investigations. At the moment the method is used widely for processing and interpretation of data from the agriculture (crop, vermin, content of useful elements in the soil), fishing in the ocean (assessment of the quantitative volume of fishes), ecology (pollution of the air and the soil), engineering geology (assessment and characteristics of the ground and sites of particularly important facilities), oil and gas explorations (evaluation of the collectors capability of the layers), zoology (different types of analyses on animal populations), mapping (optimisation of the interpolation between the points of measurements), etc.

The course is oriented for a wide circle of Ph.D. students and specialists from different branches of the Natural sciences. The participants in the course need to have basic knowledge on the classic mathematical statistics and to be familiar with the personal computers. The aim of the course is to introduce the Ph.D. students in the Linear Geostatistics and to show through examples from different type of studies (geology, geophysics, zoology, ecology, agriculture and others) the possibility for more correct analyses of the information and discovering of intrinsic, often hidden characteristics of the studied phenomena. Practically, the participants will acquire a knowledge to work with one intelligent tool for analysis of discrete data in the time and the space.

Lecturer: Stefan Boyanov Shanov, D.Sc., Prof.
Phone: +359 2 979 22 47, +359 888 443 706
E-mail: s shanov@abv.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

6.1.3. Palaeoecology. Main Methods Used in Palaeoecological Studies

This course is addressed to geologists, geomorphologists, biologists and other specialists who are interested in ecology. The course emphasizes understanding the interrelation organ- ism/environment in the geologic past: living conditions in past geological periods; interrelations between organisms and their environment (biotic and abiotic factors); variation in the organ- isms during the processes of life evolution on the Earth. Particular interest is the methods applied in paleoecological studies: morphofunctional, actualistic, taphonomic, quantitative, experimental and biogeochemical (paleotemperature, paleohalometry). Other aspects in the applying palaeoecology are also discussed: the trends in the climatic changes; the using of dif- ferent index organisms for the palaeoecological reconstructions in paleobasins; determinations the trends of acidification, eutrophication, etc. in modern basins.

Lecturer: Nadja Ognjanova-Rumenova, Ph.D., Prof.
Phone: +359 2 979 22 28
E-mail: nognjan@geology.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

6.1.4. Isotope Hydrogeology

The course is intended for hydrogeologists but could be also useful for hydrologists and geologists.

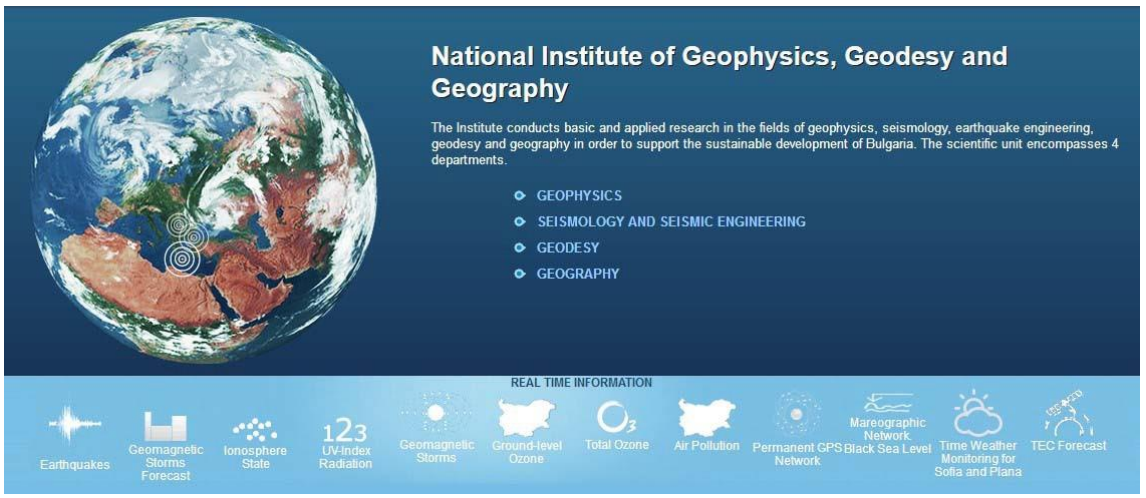
Recently, hydro-chemical and isotope methods in a large scale are applied in hydrogeology at many countries. This investigation is relatively a new scientific tendency in hydrogeology and usually it is preliminarily applied - before expensive research and exploitation drilling. The main advantage of isotope methods is their relatively prompt implementation and low price for field and laboratory works.

The course “Isotope Hydrogeology” include general information about some hydro-chemical

methods as well important data about stable and radioactive isotopes; application of different isotope methods in hydrogeology for tracing ground waters genesis and dynamic; ground water velocity of movement and age (residence time) etc.

Lecturer: Vladimir Hristov, Ph.D., Prof.
Phone: +359 2 979 34 73, +359 884 788 726
E-mail: vhh@geology.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

6.2. National Institute of Geophysics, Geodesy and Geography



6.2.1. Palaeo- and Archaeomagnetism

The course will be of interest for PhD students in Earth Sciences, studying different aspects of geological and tectonic evolution at regional level, palaeogeographical reconstructions and application of interdisciplinary methods in geology and archaeology.

Palaeo- and archaeomagnetism are methods widely applied in geology, geophysics and archaeology.

The main aim of palaeomagnetism is the reconstruction of geomagnetic field during historical and geological past. Only the data, provided by palaeomagnetic investigations serve as a basis for establishment of the theories for generation of the geomagnetic field (e.g. periods of variation, frequency of geomagnetic field inversions, etc.); resolving global geological prob- lems like continental drift; investigation of the evolution and consecutive phases in different tectonic processes and movements at regional scale. Archaeomagnetic investigations use dif- ferent materials of burnt clay from archaeological sites (pottery, ovens, kilns, etc.) and give information about the Declination, Inclination and Intensity of the ancient geomagnetic field during historical past. The available extensive archaeomagnetic data base for Bulgaria allows archaeomagnetic dating of different remains of burnt clay to be successfully done. The main subjects in the proposed course concern: basic rock magnetism; methods applied in palaeo- magnetism; examples on the application of palaeo- and archaeomagnetis for solving different problems in geophysics, geology, geography, archaeology.

Lecturer: Daniela Jordanova, D.Sc., Prof.
Phone: +359 2 979 39 58
E-mail: neli jordanova@hotmail.com
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

6.2.2. Environmental Magnetism

This course is intended for PhD students interested in past climate change, environmental protection and application of up-to-date geophysical methods in ecology. The course consists in two major parts - (1) utilization of magnetic signal in sediments and rocks for palaeocli- mate reconstructions in geological past, and (2) application of magnetic properties of soils, sediments, urban dust and vegetation for evaluation of the degree of anthropogenic pollution of our environment.

Both parts are based on the well established link between concentration, grain size and

other magnetic parameters of strongly magnetic minerals in different materials on one hand, and climatic factors and/or anthropogenic environmental pollution degree, on the other. The main themes of the course are: foundations of magnetism of solids; study of relations between magnetic signal and the environmental factors, determining the observed magnetic character- istics of the studied materials; characterization of the magnetic fraction in waste products of various anthropogenic products; theories about the link between palaeoclimate and the mag- netism of palaeosols. Each of these themes will include both theoretical considerations and presentation of practical examples of the application of environmental magnetic methods for solving specific problems.

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Phone: +359 2 979 39 58
E-mail: neli jordanova@hotmail.com
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

6.2.3. Introduction to the most popular meso-scale system of the atmospheric dynamic (WRF), the air quality (CMA Q) and emission modelling in the context of environmental hazard assessment and human health

The main course objective is to give the bases of the most popular system consists of three meso-scale models: of the atmospheric dynamics (Weather Research and Forecasting - WRF modelling system), of the air quality(Community Multiscale Air Quality Model - CMA Q) and emission modelling (Sparse Matrix Operator Kernel Emissions - SMOKE) and training to work with these models. The participants in this course will be able to gather knowledge of model's structure, the necessary input conditions and available data bases, model's configuration based on general physical parameters for model set up and different steps for model's run during the exercise. The practice will help learning basic commands working under Linux system and running in parallel environment for better adoption of the models (WRF, CMA Q, SMOKE) and gain skills working with different visualization tools (IDV, PAVE).

Lecturer: Georgi Gadzhev, Ph.D., Assoc. Prof.
Phone: +359 2 979 37 08, +359 898 466 610
E-mail: ggadjev@geophys.bas.bg
Academic hours: 15 lecture hours, 15 practical hours
ECTS credits: 20 ECTS

6.2.4. Eurasian Geopolitics in the 21 Century: Russia and its Neighbors

The 30-hour course will consist of lectures, discussions, and preparation of a research paper. The course analyzes the geographic context of the foreign policies of the 15 states that be- longed to the Soviet Union. In addition to the contemporary Russian geopolitical perspectives, particular attention will be extended to the Black Sea region, where many states are currently

in search of “adequate” geo-strategy and foreign policy.

The course will synthesize the ongoing dramatic geopolitical realignments and relate them to the past political and economic realities, religious, nationalist, and ethnic issues along the periphery of the largest state in the world. Students will be encouraged to conduct their own “handson” research and work extensively with maps to develop deeper specialization in a particular state from this area. The main goal of the course is to generate informed discussions of current issues and developments and enable students to better understand and appreciate the distinctive relationship between politics and its geographic context in this vast and extremely dynamic region.

Lecturer: Boian Koulov, Ph.D., Assoc. Prof.
Phone: +359 2 979 33 67
E-mail: bkoulov@yahoo.com
Academic hours: 6 lecture hours, 12 practical hours
ECTS credits: 20 ECTS

6.2.5. Landscape Change Analysis Using Remote Sensing and GIS

The proposed course is focused on the using of Remote Sensing and GIS in the mapping, assessment and analysis of landscape changes for different applications, such as landscape management, natural resources assessment, and, more generally to support economic, social, and environmental policies. The theoretical-methodological aspects of the application of re- mote sensing and land cover/land use data to landscape change identification will be presented and discussed.

The course introduces satellite image interpretation for land cover/land use mapping and change detection based on a computer aided visual interpretation (CA VI) of images. The basic concepts of land cover classification and mapping will be presented. The landscape change identification and analysis based on land cover/land use changes and various indicators characterizing the state of the landscape will be introduced. Some applications at national, regional and local level, for instance, in case of changes concerning urbanized, agricultural or forest landscape will be given and discussed.

Prerequisites: Basic understanding of computer operations and basic Remote Sensing and GIS-knowledge.

Lecturer: Rumiana Vatseva, D.Sc., Prof.
Phone: +359 2 870 02 04, +359 2 979 33 70
E-mail: rvatseva@gmail.com
Academic hours: 16 lecture hours, 16 practical hours, 4 seminar hours
ECTS credits: 20 ECTS

6.2.6. Spatial analysis and assessment of ecosystem services using GIS based tools

The main objective of the course is to present the basis of the ecoystem services concept, the methods for their assessment and the GIS based application for mapping and assessment of ecosystem services. The course is organized into 3 modules: 1) Introduction to ecosystem services; 2) Mapping and assessment of ecosystem services; 3) GIS based tools for mapping and assessment of ecosystem services. The participant will learn about the main approaches for identification of ecosystem services, their classification, supply and demand, methods for biophysical, social and economical assessment, approaches and tools for mapping and assess- ment. They will acquire practical skills to work with spatial data for mapping and assessment of ecosystem services in GIS environment as well as skills to work with special GIS tools.

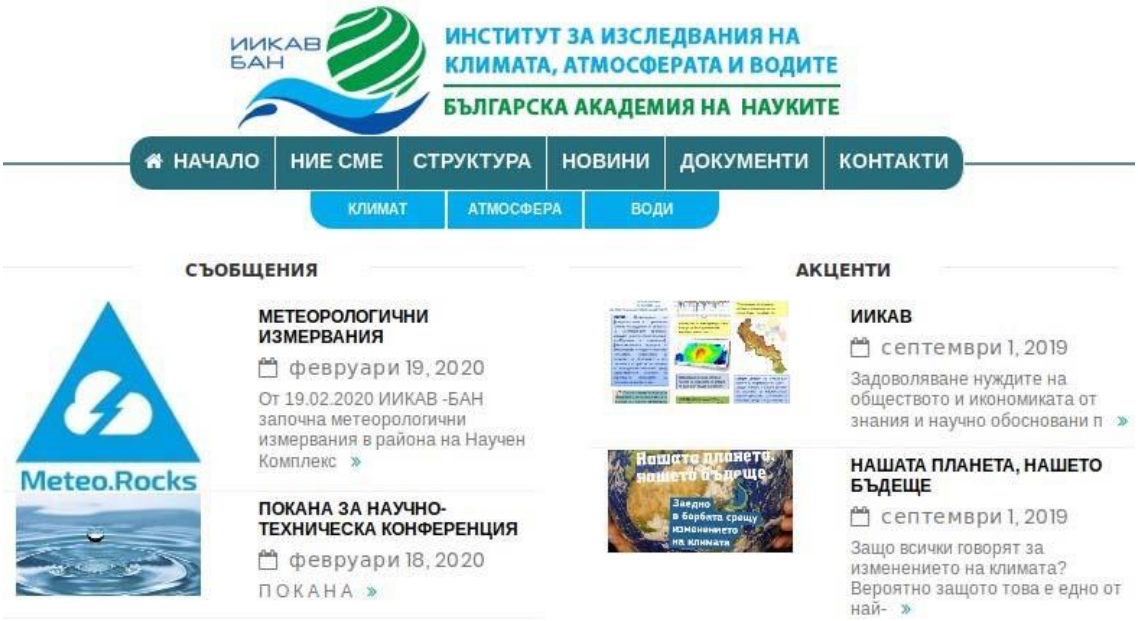
Lecturer: Stoyan Nedkov, Ph.D., Assoc. Prof.
Phone: +359 2 979 33 60
E-mail: snedkov@abv.bg
Academic hours: 15 lecture hours, 15 practical hours
ECTS credits: 20 ECTS

6.2.7. Introduction to GIS and Work with ArcGIS

The main objective of the course is to give the basics of the Geographic Information Systems (GIS) and skills for working with ArcGIS software. The course participants will gain knowledge on the main features and principles of Geographic Information Systems, data models and structures in GIS, coordinate systems and different tools in ArcGIS. They will also develop skills in data editing in GIS , mapping, use of spatial analysis and modeling within ArcGIS.

Lecturer: Stoyan Nedkov, Ph.D., Assoc. Prof.
Phone: +359 2 979 33 60
E-mail: snedkov@abv.bg
Academic hours: 15 lecture hours, 15 practical hours
ECTS credits: 20 ECTS

6.3. Climate, Atmosphere and Water Research Institute



6.3.1. Characteristics of the Atmospheric Boundary Layer – Applications in Everyday Life

The main course objective is to give knowledge about some of the physical processes within the Atmospheric Boundary Layer (ABL) and their importance for human life. The activities of society are concentrated mainly within the ABL as the adjacent to surface part of the atmosphere. Therefore, the characteristics or the peculiarity of the ABL are among the drivers of weather and climate, atmospheric pollution, urban microclimate, propagation of electromagnetic waves, renewable energy assessments, conditions for the development of flora and fauna. From physical point of view, it is important to study the characteristics of the ABL in order to model the exchange processes of energy, momentum and substances between the surface and the upper layers of the atmosphere. It is the ABL and surface parameterizations that define the accuracy of climate models and weather predictions, as society asks for finer and finer detail of them in space and time.

Lecturer: Ekaterina Batchvarova, D.Sc., Prof., Corr. Member of BAS
Phone: +359 887 507 283
E-mail: ekbatch@cawri.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

6.3.2. Time Series Processing Methods

Modern, high-precision methods, proven in practice, for time series analysis are presented. These methods allow complete processing, analysis and interpretation of observational infor- mation in various fields of science. Ready to use Fortran programs and specific examples of data analysis in the fields of Geodesy, Geophysics, solar activity, and climate change are presented. The chosen methods are:

1. Time series preprocessing:
• Linear interpolation
• Spline interpolation
• Chebishev Approximation
• Fourier Approximation
• High-frequency filtration, Vondrak-Whittaker data smoothing

2. Estimation Methods:

• Method of Least Squares
• Danish Method
• Hampel's Method in Shomogy modification
• Method ARIST

3. Time series oscillation determination:

• Spectral Methods (FFT, MESA)
• Seasonal components in sliding window
• Partial Fourier Approximation
• Wavelets
• Caterpillar Method

4. Interconnection determination:

• Correlation analysis
• Regression
• Time lag determination

5. High-sensitive method of jump detection.

Lecturer: Yavor Chapanov,, D.Sc., Prof.
Phone: +359 885 896 891
E-mail: yavor.chapanov@cawri.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

6.3.3 Water Resource Balance and River Basin Management

The purpose of the course is to introduce PhD students with methodological framework, the basic methods, tools and their application when compiling water resources balance and water resources allocation at river basin level, priorities in the management of water allocation and integrated water management.

The educational course is envisaged primarily for PhD students in the field of water management and water resources usage in the territory of the Republic of Bulgaria. It could be useful for professionals as well whose professional activity is related to the management of water resources systems, dams and river basins.

Lecturer: Donka Shopova
Phone: +359 885 896 891
E-mail: dshopova@gmail.com; doni73@cawri.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

6.4. Институт по океанология „Фритьоф Нансен“

6.4.1. BIOLOGICAL OCEANOGRAPHY

This course is targeted to PhD students interested in marine biology, ecology and ecosystem protection. The aim of the course is building interdisciplinary knowledge about the basics of biological oceanography: marine environment (abiotic conditions), biological communities, biogeochemical interactions, ecosystem energy transfer, production and metabolism, theoretical and practical knowledge of advanced methodology of biological oceanography with focus on the processes of interaction between marine biota and the marine environment. The comprehensive coverage of this course encompasses the properties of seawater which affect the life of marine ecosystem, classification of marine environments and organisms, phytoplankton and zooplankton, fish, marine food webs, marine mammals, life on the seafloor, and the way in which humans affect marine ecosystems.

The oceans have a critical function for the supply of food and raw materials, and marine ecosystems are crucial in the regulation of Earth's climate and biogeochemical cycles. Biological oceanography will improvethe understanding of the principles underlying marine ecosystem organization, and the processes that govern spatial and temporal distribution, dynamics, biodiversity and evolution of auto-, hetero- and mixo-trophic organisms as well as trophic interactions. Only an interdisciplinary and (eco) system-wide approach will enable to unravel the mysteries and the unknowns of the ocean. Physical, chemical and geological processes in the oceans are fundamental to biological oceanography and vice versa, therefore a few of the initial lectures in this course will be dedicated to the different disciplines.

Subjects covered include: Marine life in the oceans, biochemical adaptations to environmental variables, reproduction, hydrography, ocean geography, water masses, seawater characteristics, current systems, thermohaline circulation, deep and bottom water formation, primary and secondary production, nutrient availability and limitation, nutrient cycling, global carbon flux, microbial loop, biological carbon pump, upwelling, seafloor and continental margins, impact of climate change, eutrophication, exploitation of the ocean, trophic interactions, plankton communities, benthic ecosystems, nekton, sediment characteristics, deep sea habitats, sampling techniques and other important topics.

Evaluation: Presentation on a specific topic (seminar discussion)

Lecturer: Kremena Blagovestova Stefanova, Ph.D., Assoc. Prof.
Phone: +359 897868561
E-mail: stefanova@io-bas.bg

Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

8. Cultural-historical Heritage and National Identity

8.1. Institute for Bulgarian Language

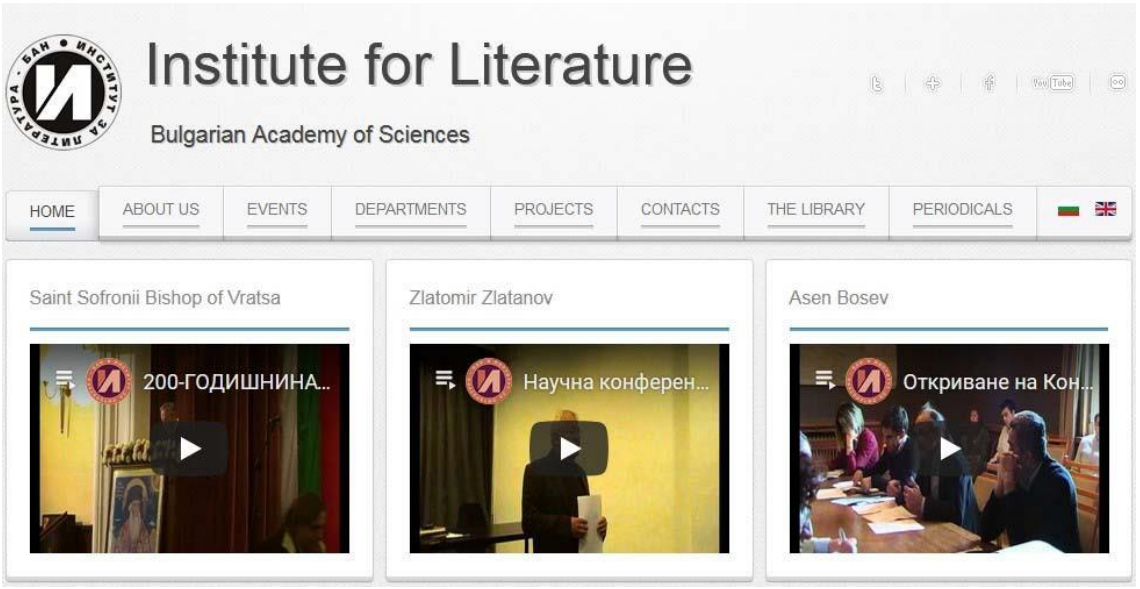
8.1.1. The Slavic Cyrillic Book in the Gutenberg Galaxy During the 15th-16th Centuries

The proposed course of lectures is addressed to PhD students who would like to enlarge their knowledge and specialize on the problems of the Medieval Bulgarian (South Slavonic) literature and language from the Ottoman times with special emphasis on the appearance of the first printed Cyrillic books for the Orthodox Slavic peoples.

Its main trend is the linguistic and cultural studies of the 15th-16th cc. Cyrillic incunabula and palaeotypes and their relationship with the Medieval Slavonic written tradition. The concrete subjects of lectures are chosen in order to complete the obligatory minimum of knowledge about the literary production (textual repertory, text study, reception, original Slavonic works) and the phonetic, graphic, grammatical and lexical peculiarities of the Bulgarian literary lan- guage from the period. The cultural significance of the Slavonic printing as form and stage of information spread is also given priority. The basic competences to be acquired or fostered are as follows: ability of work with Medieval Slavonic texts in manuscript and printed form; comparison between texts which vary in chronology, localization and linguistic norms; work with catalogues and diachronic dictionaries; ability of detecting the main linguistic features of the text prototype and the subsequent changes it is charged with according to the cultural and linguistic environment; basic knowledge for description and identification of early printed Cyrillic books.

Lecturer: Mariyana Tsibranksa, D.Sc., Prof.
Phone: +359 2 872 23 02, +359 877 791 754
E-mail: m.tsibranska@gmail.com
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

8.2. Institute for Literature



8.2.1. Textual Criticism of Slavonic Manuscripts

The course of lectures and practical exercises includes both basic and specialized knowledge in the discipline “Textual criticism”, giving practical knowledge about changes in the texts as a result of their transcription in 10th-17th centuries, analysis and comment on these changes in relation to the history of the texts. Give guidelines for dating translated texts for their authorship, and to determine their content as literary sources. Collation and comparison of manuscript evidence and their grouping into families (recensions) to explore the transmission. Conclusions are drawn about the possibility of reconstruction of the text and monitored the nature of changes occurred and recensions.

The course aims to acquaint doctoral students with the principles of text criticism and critical publications and to give a basic understanding of the terminology in medieval Slavonic tradition.

Lecturer: Anisava Miltenova, D.Sc., Prof.
Phone: +359 886 617 889
E-mail: amiltenova@gmail.com
Academic hours: 15 lecture hours
ECTS credits: 20 ECTS

8.2.2. Ideas of Knowledge

We will discuss the basic theories of knowledge from their origin to the contemporary. We start from the pre-Socratic era and proceed to the ancient legacy: Socrates, Plato, Aristotle. We continue through the Medieval Ages and try to touch upon the difference between the Byzantine philosophy, ancient Greek thinkers and their Roman successors. We will make an overview of the work of Augustine, Boethius, Aquinas, Scotus and Ockham and continue to the British empiricists: Locke, Berkeley and Hume. As is well known, the most important enquirers for these times relate to issues of religion and scholasticism. We will follow Descartes and Kant to German idealists and arrive at the "modem philosophy" of the 19'h century, focusing on the one of Charles S. Peirce. We will try to summarize the most significant contemporary theories of knowledge of today.

Lecturer: Ivan Mladenov, D.Sc., Prof.
Phone: +359 2 979 29 90
E-mail: mladenovivan13@outlook.com
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

8.2.3. Pragmatism and Semiotics

One might be confident in saying that the worthiest contribution of American philosophy is the doctrine of Pragmatism. Therefore, the focus of this course will be on Pragmatism, and the ideas of its founder, Charles S. Peirce. The American polymath and prolific scientist, considered by many as the greatest American philosopher, Peirce invented pragmatism as a concept in 1870. He is also the founder of American semiotics, which is simply a terminological portmanteau wrap for its philosophy.

The European tradition, which goes back to the work of Ferdinand de Saussure flourished in the 1960s, alongside the names of Roland Barhtes, Paul Ricoeur, Julia Kristeva. It is a more linguistically oriented branch, which originally bloomed under the banner of semiology. We will have a glimpse at this aspect as well as at some other historically well-formed schools with great achievements such as: M. M. Bakhtin and the Moscow-Tartu School with its famous notion of the "Semiosphere" and its recent exertions to widen its scope with natural sign-phenomena; Italian semiotics with Umberto Eco; some Scandinavian schools have featured too. Most of all, we will try to apply some avant-garde methods of modem semiotics for conceptualizing the world of ideas.

Lecturer: Ivan Mladenov, D.Sc., Prof.
Phone: +359 2 979 29 90
E-mail: mladenovivan13@outlook.com
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

8.2.4. Conceptualizing Symbols and Metaphors from Everyday Life

(On Charles Peirce's philosophy)

We conceptualize the world of ideas in order to orient ourselves in it. However, even at the most elementary level we do conceptualize. Any coordinated movement of our bodies means that a lightning-fast concept has been performed in our mind and we have acted according to a short scheme that we received from the mind. We conceptualize the symbols and the signs we constantly perceive, which mean that we are permanently de-coding and de-ciphering the realm of signs, which comes towards us.

Why "metaphor"! Simply, because most of our thinking flows as a permanent substituting process and we know something by comparing and relating it to something else, which is more familiar to us. Then we conceptualize the newly received knowledge, that is, we "store it" in our memory and it becomes a part of our previous experience.

If we have a clear vision of what we are going to do during the day, this makes us happier. If we can ease the general ordering and hierarchy of our tasks, we might improve our lives. Peirce believed that he had found a clue to do that, we try to explicit this clue of his philosophy.

This is a philosophy of the scientific metaphors and, how they extract the disclosed knowledge or, to express the same from the opposite direction: it develops metaphors based on philosophical concepts of Charles Peirce (1839 - 1914) but the purpose is the same. These are either some of his well-known ideas, which are elaborated according to their own implications, or abandoned notions carefully opened and applied to contemporary theories.

Lecturer: Ivan Mladenov, D.Sc., Prof.
Phone: +359 2 979 29 90
E-mail: mladenovivan13@outlook.com
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

8.2.5. Unpublished Texts of Bulgarian Writers – Readings, Adaptation, Comment and Issue

This course of lectures is based on the idea that literature is a complex and hierarchical structure. The so-called 'canon' is its core surrounded by different published texts and phenomena - popular, marginal or even unfamiliar to the public. The unpublished texts from the periphery of literature.

Unpublished texts of familiar, sometimes well-known or even canonical authors (for example Ivan Vasov himself) are in the focus of the course, together with the reasons why they were not published by their authors in their lifetime. Some problems that have to do with the history of literature, textology, censorship (and auto-censorship) or publishing business are presented. Then the problems with the way of publishing of such text are analyzed - selection, editing, notes, etc. The course is designed for students with some knowledge of Bulgarian literature from 19th and 20th centuries and especially for future scholars, translators and editors.

Lecturer: Nikolay Aretov, D.Sc., Prof.
Phone: +359 898 973 765
E-mail: naretov@gmail.com
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

8.2.6. Postcolonial Approaches: Theoretical Aspects and Balkan Dimensions

This course of lectures aims to present contemporary post-colonial studies in international context and to pose the question about the possibility to apply them to the Balkans and Bulgarian culture. The course deals with the similarities and differences from the classical metropolises and the powerful state structures (Ottoman Empire, Russia, USSR) that determined the historic and cultural development in the Balkans in 19th and 20th centuries. The course orientates the students in the debates about ne notions of 'center' and 'periphery' in Balkan's culture and in mentalities of the people here and also analyzes some manifestations of them in Bulgarian culture.

The course is orientated towards students that have some general knowledge of Balkan's and Bulgarian culture and are training for scientific research in this field.

Lecturer: Nikolay Aretov, D.Sc., Prof.
Phone: +359 898 973 765
E-mail: naretov@gmail.com
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

8.2.7. **Animals in Literature and Culture**

The course offers a critical perspective towards the relations between humans and the other living creatures. Various scientific standpoints to the study of these relations will be discussed along with various practical worldly manifestations of theirs. The lectures trace the forms of cultural constructing of nature and animals in literature and culture, as well as the social representations of those cultural constructions. Using broad interdisciplinary material the course lays emphasis on ethical problems and possibilities of choice, and stimulates the critical thinking. A great number of Bulgarian and world literary examples offer various starting points for reflection upon the relations of people towards the other living beings.

Lecturer: Kalina Zahova, Ph.D., Assoc. Prof.
Phone: +359 886 13 90 91
E-mail: kalinaz@abv.bg
Academic hours: 30 lecture hours

8.3. Institute of Balkan Studies and Centre of Thracology

8.3.1. Balkan Modernity: Pieces of a Puzlle

South East Europe, or the Balkans, has been mainly defined, on the one hand, as Western Europe's negative alter-ego (Maria Todorova) or as a historical space sui generis, on the other (Holm Sundhaussen). Methodological discussions on comparative and integrative European history pay little attention to Southeast European structures and agencies as parts of overall European phenomena. When they do include the region, scholars compare Empires (Habsburg and Ottoman), conduct inner-Southeast European comparisons, or choose case studies in Southeast, Central, and Eastern Europe.

This course aims at providing some basic knowledge about the region's history as a basis for reflection on the long-established mental maps, which although being re-designed still mostly marginalize the South East Europe. To achieve this purpose some issues crucial for the Balkan history will be discussed and compared to structures and agencies in the rest of Europe.

Major themes:

1. Empires: Ottoman Empire, Habsburg Empire, Russian Empire. National and religious identities. State building, long nineteenth century.

2. After Empires: The establishment of Balkan states: adoption of Western-type institu-

tions. Nation building under the auspices of the nation state: the role of education, military conscription, media and communications, etc. Political elites and political cul- ture.

3. After Empires: Social dynamics and economic development. Rural and urban. Everyday

life. Technology.

4. After Empires: Ideas and culture. Citizenship. Women. Minorities.

5. Post-WW II era. Socialism as a forced modernisation. Other examples of forced mod-ernisation: Kemalism in Turkey; Greece from the Civil War to the EU.

Assessment: Students will have to write two essays of different kind:

i) one historical (or historiographical) piece of writing;

ii) one critical review of a recent (and relevant) book in the field.

Lecturer: Dobrinka Parusheva, Ph.D., Assoc. Prof.
Phone: +359 085 147 377
E-mail: clio dp@yahoo.co.uk
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

8.3.2. Politics, Culture, and Caricature

The aim of this course is to follow and analyze relationship between the caricature (and cartoonists) and the objects of caricature, on the one hand, and, on the other hand, between the caricature (and cartoonists) and its (their) audience. Politics, political culture, and political caricature in Bulgaria are in the focus of attention. The chronological framework of interest covers the period from the end of the nineteenth century to nowadays. The reading of the term political culture follows the understanding of the social sciences, that is, it stays for psychological orientation or attitude of people to politics and government, which has cognitive, reactive, and assessment aspect.

Topics:

1. Caricature and political caricature.

2. Caricature and cartoonists.

3. Politics and caricature.

4. Cartoonists and politicians.

5. Caricature and audience.

6. Audience and cartoonists.

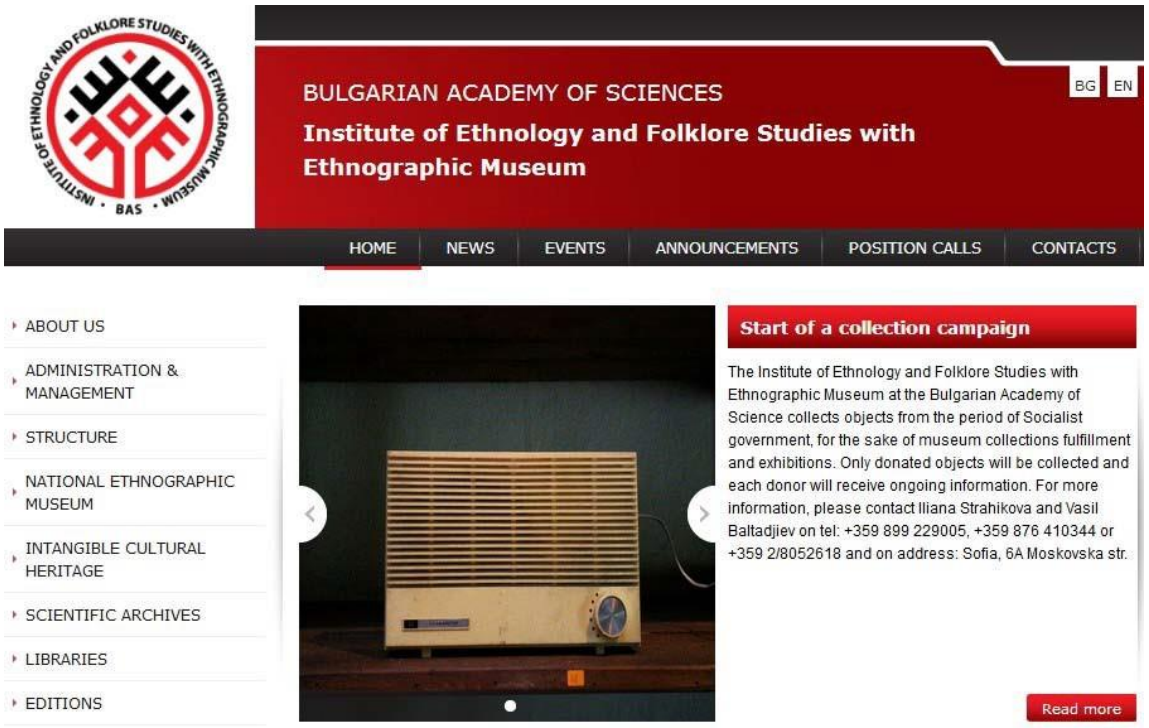
7. Politics, culture and caricature.

Assessment:

Preparation of a written text on a topic related to the general theme of the course.

Lecturer: Dobrinka Parusheva, Ph.D., Assoc. Prof.
Phone: +359 085 147 377
E-mail: clio dp@yahoo.co.uk
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

8.4. Institute of Ethnology and Folklore Studies with Ethnographic Museum



8.4.1. Ethnology of the Balkans

The PhD course presents in generalized and summarized parameters of the ethno-cultural heritage of Balkan people and its contemporary dimensions. The fundamental conceptual notions and analytic ethnologic techniques are discussed, which will lead to understanding processes flowing among the different ethno-national, ethno religious and ethno cultural com- munities on the Balkans. The training gives the possibilities to receive knowledge about the main ethnologic parameters of the Balkan people, and the different kinds of communities in the “traditional”, i.e. pre-industrial society, in the process of modernization and up till nowadays. The issues of ethnicity, national, regional and community identities, the religious dimensions of the ethno-culture, the family-relative and social networks, migrations and mobility of the Balkan people, and their transition to modernity and post-modernity are determined as main and key themes.

This training course is very significant for the establishment of new personal perspective of each PhD student, which helps for better orientation in our multicultural society in the process of globalization. The training program is oriented towards the PhD students in Ethnology, but together with that it will give fundamental knowledge, which can be used also for PhD students from wide range of other subjects in field of social sciences and humanities, and especially for History, Folklore Studies, Social Anthropology, Sociology, Culturology, Political Sciences, etc.

Lecturer: Rachko Popov, D.Sc., Prof.
Phone: +359 887 603 693
E-mail: balkan ethnobg@yahoo.co.uk
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

8.4.2. Gypsies/Roma (History, Traditions, Modern Times)

The PhD training course presents in generalized and summarized form the main parameters of the history and contemporary dimensions of the Gypsies (Roma and other communities) worldwide, with special focus on Bulgaria. The origin and early history of the Gypsies, beginning of their migrations from the country of origin, their presence on the Balkans, migration to the Western Europe, their historical fate during the Middle ages, new migrations (19th and 20th centuries) and their contemporary distribution in various countries of the world are discussed. Also, the general structure of the heterogeneous Gypsy communities will be outlined and the main ethno-social subdivisions with their main ethno-cultural characteristics are presented. Different patterns of the state politics towards the Gypsies in history and nowadays, as well as to the Romani non-governmental sector are analyzed. The contemporary attempts for construction of the "Roma Nation" will be presented as well as the processes of searching of the new identities among part of the Gypsy communities.

The training program is oriented towards the PhD students in Ethnology, but together with that it will give fundamental knowledge, which can be used also for PhD students from wide range of other subjects in field of social sciences and humanities, and especially for History, Folklore Studies, and Social Anthropology, Sociology, Culturology, Political Sciences, etc.

Lecturer: Mila Maeva, Ph.D., Assoc. Prof.
Phone: +359 878 923 083
E-mail: mila.maeva@iefem.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

8.4.3. Migrations Between Balkans and Ottoman Empire / Turkey: Models, Social Networks and Identities

The course offers a study of historical and ethnographic specifics of migrations between the Balkans and the Ottoman Empire / Turkey from the middle of the 19th century to the present day. It focuses on the characteristics and specificities of migratory patterns and forms, social networking and the development of the ethno-cultural identity of migrants (Turks, Tatars, Roma, Muslims). During the course, new and insufficiently researched questions will be dis- cussed based on different historical sources and ethnographic materials through the methods of historical ethnography, transnationalism and multiculturalism, which will contribute to a deeper and more objective historical and ethnological knowledge and will give a new holistic and multifaceted view on the subject.

The course deals with the current issues of ethno-cultural and social development of mo- bility and migration from and to the Balkans and Turkey, adaptation and integration models, political, cultural and social influences on sending and receiving countries as well as the mech- anisms for determining potential migration.

Lecturer: Mila Maeva, Ph.D., Assoc. Prof.
Phone: +359 878 923 083
E-mail: mila.maeva@iefem.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

8.4.4. Bulgarian Folklore: Traditional and Contemporary Aspects

This course of lectures is presents the specific characteristics, approaches and methods of folklore studies, as well as the main body of knowledge on Bulgarian folklore formed during the long history of the discipline in this country. It discusses the different concepts of folklore and outlines its basic features which differentiate folklore from other cultural phenomena. The introductory lectures trace the construction of folklore studies in international and Bulgarian milieu and examine its place in the field of humanities and social sciences.

The PhD students get acquainted with the Bulgarian calendar rituals and rites of passage

as an immediate context in which folklore forms emerge and function. The main focus is on the different genres of verbal folklore: songs, fairytales, legends, personal narratives, short forms; while the main folkloric characters are also introduced. Attention is paid to the connection and interweaving between Christianity and folklore. Subjects of discussion also include the peculiarities of folkloric concepts and attitudes; their reflection in different spheres of human activity and their potential to mold established attitudes, of behavioral models and identities in both traditional societies and in modern times.

The course is addressed to PhD students in the humanities and Social Sciences.

Lecturer: Vihra Baeva, Ph.D., Assoc. Prof.
Phone: +359 898 475 580
E-mail: vihra.baeva@iefem.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

8.4.5. Anthropology of Hazards and Disasters

As an innovative research subject, Anthropology of Hazards and Disasters will be introduced based on both main scholarly approaches in anthropology - as a holistic and comparative subject. The complex interrelationships between humans, culture, and their environment will be examined, from the human actions that may cause or influence the severity of the disaster, through the position of social vulnerability that defines the disaster's impact, to the range of sociocultural adaptations and responses, including the impact of aid and the infusion of help and relief.

The comparative, relativistic approach of the discipline has often given it a critical stance,

privileging local knowledge and local ways of management, while problematizing the domi- nant models of reaction at different levels. Using examples of recent various natural, bio-, technological disasters, the course will show how cultural systems (the beliefs, behaviors, and institutions characteristic of a particular society or group) figure at the center of that soci- ety the factors considered important also by the contemporary positivistic science: disaster's vulnerability, preparedness, mobilization, and prevention.

Lecturer: Elya Tzaneva, Ph.D., Assoc. Prof.
Phone: +359 887 596 664
E-mail: etzaneva@gmail.com
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

8.4.6. Models of Ritual Kinship in Bulgarian Culture

This course intends to present comparative ethnographic and historical perspectives on a major particular type of kinship by considering a broad range of practices worldwide, and in Bulgarian culture as a main example. Its inclusion in the Curriculum of ERASMUS + reflects the fact that anthropology of kinship - both blood - and nonblood, is currently gaining growing interest among the students in ethnology, sociology and linguistics. Among the different types of kinship, what was once marginalized as a residual category of fictive or artificial kinship (even defined as pseudo-kinship) is increasingly becoming a focal domain of contemporary kinship studies, including relations by adoption, fostering, brotherhood, nursing and spiritual sponsorship (godparenthood), and by other kinds of ritual or informal affiliation.

The audience will be stimulated to conceptualize the subjective and analytical status of these categories of ritual kinship in social anthropology, as well as to reconsider its structural and ideological connections with the dynamic patterns of natal and marital kinship or other partnership practices such as sponsorship and patronage, mutual help and affect, all treated from the comparative ethnographic and historical perspectives established in the literature.

Lecturer: Elya Tzaneva, Ph.D., Assoc. Prof.
Phone: +359 887 596 664
E-mail: etzaneva@gmail.com
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

8.4.7. How to Interpret and Study Ethnic Identity

The primary aim of this course is to examine major schools and respective concepts of ethnic identity, the approaches and methods for its most adequate study. The main goal is to provide the audience with a sound understanding of the important themes surrounding the subject of identity from a sociological and ethnological perspective, emphasizing and mobiliz- ing the potentials of different even controversial approaches, and seeking a way to use their analytical and conceptualizing positives. The themes to be presented are divided into three broad sections: ethno-sociological theories on ethnicity and nation - ideas, methodology, per- sons, achievements; elaboration of a model for empirical study; issues of research of ethnic identity's dynamics.

The first part is more detailed and consists of: understanding of ethnicity and ethnos, critical discussion of modernist and essentialist theories; special emphasis will be made on ethno-symbolism, placing it within a larger cross-disciplinary context. The second part em- phases ethnicity and early forms of nationalism, ethnic contacts vs ethnic conflict, and the role of ethnic stereotypes and cultural layers in their building and functioning, while the third part looks at cultural identity, national and other groups' identities, with examples within Balkan and European historical contexts.

Lecturer: Elya Tzaneva, Ph.D., Assoc. Prof.
Phone: +359 887 596 664
E-mail: etzaneva@gmail.com
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

8.4.8. Ethnology of Socialism and Postsocialism

The lecture course will present the main approaches, methods and categories, used in the ethnological research of socialism and post-socialism: the socialist and post-socialist societies as ethnological objects, basic theoretical paradigms; historiography, methodology of the ethno- logical research - qualitative and quantitative methods. Also, the basic aspects of the everyday culture of socialism and their transformation in the post-socialist period will be introduced: kin- ship and kinship relationships; family, marriage, gender construction, memory culture; labour culture; dynamic of the cultural and ethnical groups and identities: Jews, Greeks, Karakachans, Gagauzes, Bessarabian Bulgarians in Ukraine and Moldova.

The course will be appropriate for the ethnology PhD students and also for those who study history, folklore, social anthropology, sociology, political sciences, etc.

Lecturer: Ana Luleva, Ph.D., Assoc. Prof.
Phone: +359 888 714 608
E-mail: analuleva@gmail.com
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

8.4.9. Traditional Institutions and Normative Culture on the Balkans

The course of lectures is devoted to traditional folk institutions on the Balkans. Its aim is to introduce Ph.D. students to the strengthened principles of integration, forms of regulation and functional modes of those social and cultural communities in which everyday Balkan social and cultural life passes. The course is focused on the most important principles and traditional values for the relevant traditional culture such as: the principles of reproduction and inheritance, territorial and religious principle, principle of gender and age division, principles of profession and occupation for community foundation and the duplicating principle of the blood relationship: the principle of the ritual relationship for construction of alternative social structures.

Simultaneously these basic for the Balkan people social and cultural communities will be studied in their time and space dynamics: how much the traditional principles of integration and regulation of the social and cultural life are reproduced during the process of social mobility (migration) and in the conditions of modernization in the modern Balkan national states; how much they determine the modern life strategies in the conditions of globalization; do these traditional institutions define the cultural identity of the different Balkan nations.

The complex approach and the variety of research strategies will be used in the study and

interpretation of the traditional Balkan institutions and the forms of regulation. The course of lectures will help Ph. D. students not only of Ethnology, but of History, Sociology or Psychology to get a better understanding of the different ways to analyze the overall picture of Balkan social and cultural life.

Lecturer: Petko Hristov, Ph.D., Assoc. Prof.
Phone: +359 897 307 591
E-mail: hristov p@yahoo.com
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

8.4.10. Museums and Museology

The objective of this class in Museology for PhD-students is to achieve advanced qualification and skills as museologists and museum professionals in museums in Bulgaria. The lectures will present to the PhD-students Museology as a scientific discipline; the basic con- cepts: museum, museum exhibit (musealia), museum exhibition, museum design and design of exhibiting.

It will present as well the work and functions of the museum, museum activities: museum collections and depositoria; presentation of the museum treasures; museum communication; museum visitors and audience; museum pedagogical programmes; entertainment in museum; national and international law in the preservation of tangible and intangible cultural heritage; contemporary trends in museology and in the activities of Bulgarian museums. The course will present also the genesis and development of museum abroad and in Bulgaria.

Topics:

1. Genesis and historical background of Museum.
2. Museology - a new scientific discipline: history, theory, methodology.
3. Museum functions, basic and specific functions of museums.
4. Museums in Bulgaria - since the national Revival up to the present day.
5. The museum exhibit/item.
6. Museum collections, museum depositories. Museum specializations.
7. Museum exposition - types; general principles of display.
8. Museum exposition and design.
9. Museum communication. The museum and its audience. Cultural tourism.
10. Museum pedagogical programmes. Entertainment in the museum.
11. Museum and space - museum building, architecture.
12. Preservation of museum collections - international and national law.
13. Museum and High-techs - real and virtual museum.
14. Contemporary trends in the development of museums.

Lecturer: Svetla Rakshieva, Ph.D., Assoc. Prof.
Phone: +359 885 306 414
E-mail: sve rakshieva@abv.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

8.4.11. Balkan and Slavic Studies

The PhD course reflects the folklore specifics of the traditional and the contemporary culture in the Balkan and Slavic regions. It is based on approved theoretical formulations and research methodologies, current for the contemporary folklore studies. Their representation in particular national, ethnical and religious contexts, reflecting the multicultural variety on the Balkans and among the Slavic world, would allow the construction of academic and research skills, necessary for the study of the dynamical social and cultural processes observed in the specified regions. The course considers the main parameters of the so called folk culture and the processes of its development as well as among the traditional (pre-industrial), also in the modern and postmodern society.

The programme is organized around few main topics: the Slavs as a meta-ethnical community and the main slavistic debates and research methodologies; the Balkan ethno-cultural communities and the function of folklore for the formation of Balkan identities (ethnical, national, and religious); folklore and religion (Christianity and Islam); urban folklore and con- temporary folklore forms; socialist and post-socialist folklore. In this way we trace out the geography, the history and the dynamics of the folklore phenomena and the development of the Slavic and Balkan studies in relation to the sciences, which view as their main object the human and the society.

The program helps the PhD students in the process of their developments as independent scientists, who master the contemporary scientific approaches for successful empirical and theoretical research within the field of the Slavic and Balkan studies.

The course is aimed at the PhD students in the Folklore Department, but would be of interest to the PhD students, performing their research in the area of ethnology, sociology, anthropology, cultural and Balkan studies as well.

The course is available in Bulgarian, Russian, French and English.

Lecturer: Ekaterina Anastasova, Ph.D., Assoc. Prof.
Phone: +359 877 175 657
E-mail: ekaterina anastasova@yahoo.com
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

8.4.12. Anthropology of Migrations

The aim of the course is to present, research and analyze migration movements and their effects in the places sending and receiving migrants. Although ethnographic examples focus mainly on the region of Southeastern Europe, the PhD students will also have the opportunity to learn about various cases from other parts of the world – during the lectures, but also through the selected literature and supplementary materials presented to their attention by the lecturers. This will stimulates thinking about migration and accompanying processes in a comparative perspective.

The course summarizes the theories of migration in an interdisciplinary way. The students will be introduced to the terminology and methodology of studying population mobility and migration movements in a historical and contemporary perspective. Labor migrations from the pre-modern era, when the so-called “Gurbet culture” set up, which was built within the Ottoman and Austro-Hungarian empires, will be outlined. Then, whole regions became sources of seasonal male labor mobility; female labor migrations in the decades of early modernization, which also will be discussed. The contemporary economic and political cross-border migration of the Balkan population, will be emphasized on as well. The reasons for new international migration, the geography of migration flows, the link between migration and the process of socio-cultural transformation, new types of mobility, such as movements for the purpose of education, marriage, retirement or in search of new social perspectives, will be presented.

The course will present national and EU-wide policies on migrants, the movement of

refugee flows and their integration into the host societies, as well as their impact on the stability and national security of individual countries. An important focus will be the analysis of the perspectives of migration studies in order to achieve practical results of the course and to prepare specialists in migration studies.

Lecturer: Petko Hristov, Ph.D., Assoc. Prof.
Phone: +359 877 175 657
E-mail: petko.hristov@iefem.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

8.5. Institute for Historical Studies

8.5.1. International Migrations in Bulgaria, Late 19th – Mid-20th Centuries. Sources and Research Methods

The course is designed for historians, cultural anthropologists, demographers, researchers from other disciplines who are interested in the modern history of international migrations in Bulgaria.

The target of the course is to acquaint PhD students with the main sources and methods of research for reconstructing the history and patterns of the migration flows from/to Bulgaria from the Late 19th to the mid-20th centuries and for outlining the specifics of their time dynamics, spatial orientation, age and gender structure, economic integration. Special attention is devoted to the discovery, description and critique (external and internal) of written sources: official documents (institutional and organizational records, censuses and other statistics, reg- isters, correspondence, reports, mass or popular sources - documents per se that originate from everyday life situations: marital agreements, land transfers and deeds, mortgage records, birth certificates, career records, etc.) as well as documents of personal origin (diaries, travel notes, letters, memories). Methods of qualitative and quantitative analysis, case study, biographical method, etc. are studied

Lecturer: Penka Peykovska, D.Sc., Assoc. Prof.
Phone: +359 886 858 385
E-mail: ppykvsk@abv.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

8.6. Cyrillo-Methodian Research Centre

8.6.1. Clavis Temporum – The Historical Chronology in Medieval Europe

The course presents the historical chronology from Late Antiquity to the Late Middle Ages through its philosophical and cultural-historical dimensions. They are traced through the different phenomena of medieval culture - monuments of archaeology, epigraphics, palaeography, and diplomatics; the Christian services of worship and the church holy days; the works of the Church Fathers and the works on historiography.

The scale of time in Medieval Bulgaria and the monuments which determine it are the object of special attention during the parallel discussion of the Western and Eastern chronological systems and their concrete expression.

Lecturer: Slavia Barlieva, Ph.D., Prof.
Phone: +359 2 987 02 61
E-mail: barlieva@bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

8.6.2. Graphic Culture of the Middle Ages in Western Europe

The course is part of the programme of training in Latin medieval studies and traces the development of Latin graphic culture from its beginning to the epoch of the first printed books. The peculiarities of the different kinds of script are discussed as graphic-artistic phenomena, which are important elements of the cultural history of Europe. The students are made familiar with the terminology and the methods of palaeography and its connection with related subjects such as diplomatics, codicology, textual criticism, and chronology. The seminar exercises have as their aim to develop practical skills to decipher and date medieval Latin MSS. As a whole the classes provide a basis for future independent work with medieval written monuments and on archival studies.

Lecturer: Slavia Barlieva, Ph.D., Prof.
Phone: +359 2 987 02 61
E-mail: barlieva@bas.bg
Academic hours: 15 lecture hours, 15 practical hours
ECTS credits: 20 ECTS

8.6.3. History of the Bulgarian Language and Culture

The course is designed for people with an interest in Bulgarian history, language and culture. The curriculum covers the main stages of the formation and development of the Bulgarian nation, and the related customs and traditions, as well as their reflection in Bulgarian language. The Bulgarian language system will be introduced as a dynamic process, which reflects (on lexical and overall linguistic level) the cultural quests of the Bulgarian people during the Middle Ages and the historical language processes. The language system will be considered a bridge between the principles governing the language processes in the history of Bulgarian and current language developments.

Lecturer: Iva Trifonova, Assoc. Prof. PhD
E-mail: iva_3@abv.bg, iva.workpost@gmail.com
Phone: тел: +359 898 716379
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

8.6.4, Old Church Slavonic

The course deals with the emergence and formation of Slavic writing. It will introduce PhD students to the original Bulgarian graphic systems, their functioning and development over the centuries using various materials and text excerpts from the “classical” Old Bulgarian written monuments. The main “tool” throughout the course will be the direct work with literary and epigraphic monuments, dated between 9 and 11 centuries, on the basis of which the Bulgarian language system and its characteristics will be discussed.

Lecturer: Iva Trifonova, Assoc. Prof. PhD
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Phone: тел: +359 898 716379
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

8.6.5. The Medieval Biblical Tradition Of The Orthodox Slavs

The course goal is to introduce the participants into the problem field of the appearance and history of the Biblical texts among the Orthodox Slavs during the Middle Ages. In order to complete that the course includes a general introduction in the history of the Biblical texts in Antiquity, and the presented stages and texts, as well as the related issues, are oriented towards the understanding if the Slavic Biblical tradition. This segment of the course includes work with key scholarly editions of the Old and New Testament in order to illustrate the difficulties. Then the Slavic tradition itself is presented, combining chronological and thematic approaches, putting an accent on the unsolved problems, in order to stimulate the scholarly curiosity of the participants. Here the course also includes work with key editions of Slavic Biblical translations. At the end of the course will be made an overview of the contemporary state of Bulgarian Biblical studies.

Lecturer: Andrey Bobev, Asst. Prof. PhD
e-mail: andreybobev@yahoo.com
Phone: +359 885 188 911
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

9. Man and Society

9.1. Economic Research Institute

3 Aksakov str., Sofia BG-1040

9.1.1. Methodology of Scientific Research

Purpose of the specialized doctoral course is to help in the preparation and defense of the thesis by classifying the basic elements of the technology of scientific theoretical and applyed research and presentation of research results at the professional level.

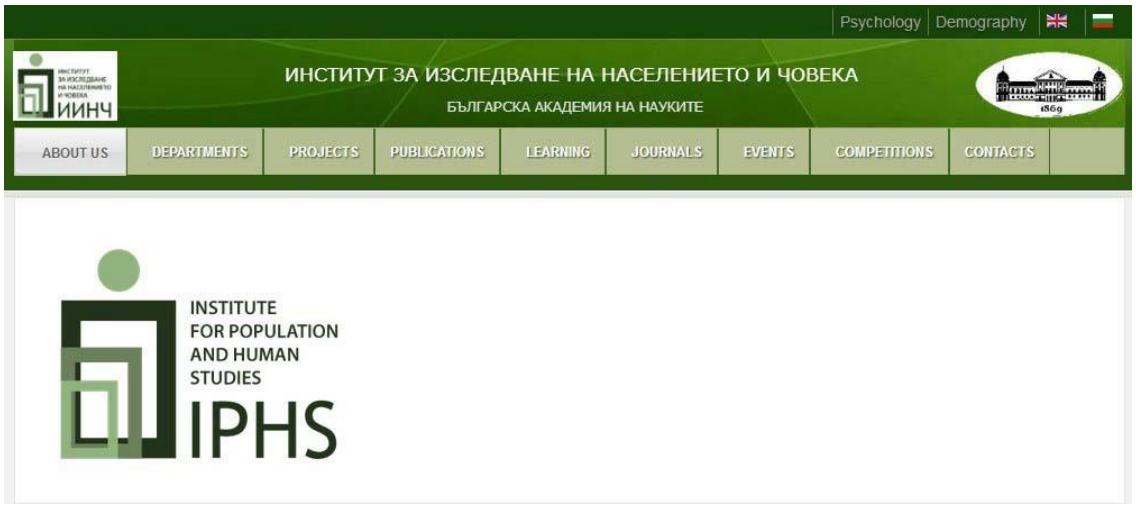
Key specialties targeted by lectures: for all majors in the social sciences.

Individual lectures invite other speakers, including from abroad, excelling in various fields.

Lecturer: Prof. Rossitsa Chobanova, D.Sc., Ph.D. (econ.)
Phone: +359-887-870-238
E-mail: R_Chobanova@iki.bas.bg

Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

9.2. Institute for Population and Human Studies



9.2.1. Psychology in the Politics or the Politics as a Function of the Psychological

The selected topics in the course "Psychology in the politics or the politics as a function of the psychological" have two basic aims: (1) to present the general theoretical frame of political psychology as interdisciplinary field of knowledge; and (2) to extend learning about some psychological mechanisms related to the interpretations on political events. Political psychology is a new, more specified knowledge in the educational system for social sciences not only in our country, but and in the countries where this knowledge is created and systematized earlier.

It involves a lot of specific theories and relations not presented in the disciplines studying politics. The knowledge of psychological points of interpretation helps to be more precise in understanding of explanation mechanisms in own practice for PhD students. The topics are ranged over a large number of problems starting from political leadership, across attitude management, to psychology of terrorism. The course is referring to PhD students in psychology, political science, philosophy, sociology and other social sciences.

Lecturer: Antoaneta Hristova, Ph.D., Prof.
Phone: +359 888 209 766
E-mail: a.hristova@iphs.eu
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

9.2.2. Ethnic and Cultural Variety in the Balkans and in Bulgaria

This course' objective is to present the ethnic, religious and linguistic variety in the Balkans (and Bulgaria) as a special region's wealth. The region's specific models of ethnic and religious co-existence and tolerance are studied, but also the role of the cultural differences for the social stratification and inequalities, conflicts and social exclusion. The course includes 10 themes to be presented in 30 teaching hours.

Lecturer: Ilona Tomova, Ph.D., Prof.
Phone: +359 2 979 30 30, +359 884 237 085
E-mail: ilonai2000@yahoo.com
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

9.3. Institute of Philosophy and Sociology

9.3.1. Theory of History

The goal of the course is to introduce students to the theory of history of the second half of the 20th century. The course will outline the basic problems of the contemporary theory of history, and their genealogy in the context of Enlightenment, speculative and analytical philosophy of history. The curriculum includes key thinkers of history like Michel de Certeau, Frank Ankersmit, Quentin Skinner, Hayden White and others. The subjects are intended to present some of the most influential contemporary approaches to historiography as discourse analysis and rhetorical analysis. A special attention is given to the institutional transformations of historical knowledge and to the professionalization of philosophy of history as an academic discipline.

Studying theory of history will give to students the opportunity to acquire working knowledge of contemporary concepts, theoretical frameworks, analytical languages and techniques necessary for their education and development as researchers. The course will stimulate their critical thinking, their self-reflexive attitude to history writing, historical narratives and knowl- edges, and it will encourage them to use the concepts and research techniques invented in the field of theory of history to wider and heterogeneous contexts.

Lecturer: Ivelina Ivanova, Ph.D., Assoc. Prof.
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E-mail: i.ivanova@gbg.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

9.3.2. Community and Society

Modern political theory was focused on individual rights. It was the individual rights that were supposed to set the boundaries beyond which power turned into tyranny. But in the present day, individual rights are not enough to justify the legitimacy of authority. On one hand, individual rights can become merely formal, manifesto rights if they are uprooted from the life-world. On the other hand, late modern societies bring together life-worlds that produce tensions, which constantly threaten to evolve into conflicts. Furthermore, the concept of individual autonomy, to which modern political theory granted a normative status, has taken root only in some life-worlds, and transplanting it in others involves the uprooting of other local, or perhaps alternative concepts. The situation is even more complicated because the limitations of individual rights can no longer be compensated by the enjoyment of seemingly unlimited popular sovereignty, because political rights are no longer coextensive with the principle of popular sovereignty or the boundaries of nation states as many political thinkers of the 20th century assumed. On the contrary, the fragmentations and fissures of the principle of popular sovereignty are internal to late modern states, they divide not the body politic from its others, but rather heterogeneous populations, which flows traverse the boundaries of the state.

The course is intended to represent the genealogy and the present state of this problem in contemporary political theory. The curriculum delineates the formation of the current concepts of community and society, the tension between the concepts from the perspective of conventional political science, the debates on the justification, the political and social effects of a potential right to community, which is irreducible to individual political or civil rights. The subjects are chosen so as to bring into focus the points of contact of the debates on communitarian rights with more general critiques of social exclusion and marginalization in contemporary critical and postcolonial theory.

Lecturer: Ivelina Ivanova, Ph.D., Assoc. Prof.
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E-mail: i.ivanova@gbg.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

9.4. Institute of Philosophy and Sociology

9.4.1. Public opinion about refugees in Bulgaria: formation, specifics, social actors, facts and interpretations

Summary: The aim of the course is to acquaint PhD students with the main specifics of forming public opinion about refugees in Bulgaria. The course highlights the role of the presence or absence of direct contact with refugees as key to the nature of the formed representations and offers a comprehensive concept and vision for the modern shared image of the refugee in Bulgarian society with relevant characteristics in the image that express fear, understanding or empathy. Another important goal of the lecture course is to identify the ways in which different images of refugees are constructed, imposed and mobilized in the public space by various social actors - media, NGOs, central and local government, religious institutions, experts, etc., with special emphasis on the role of the media in constructing publicly shared images of refugees. The lecture course also offers a typology of behavioral strategies of social actors depending on the current image of the refugee, which they share and the values they adhere to; the main social subjects, producing negative, as well as those producing positive attitude towards refugees are identified, outlining their social-group status. At the same time, one of the aims of the course is to show the way in which the respective representations of refugees resonate in the “sensitive places” in the cultural identity of Bulgarians. The social, cultural and institutional distances separating Bulgarian citizens and refugees are also derived. As a final part, the course offers identification of difficulties and obstacles to the integration of refugees in Bulgarian society in various fields, namely labor, cultural, educational, housing integration, political rights, integration into the health care system, integration of vulnerable groups of refugees, etc. Recommendations have also been formulated to state authorities and other stakeholders to help develop adequate policies regarding the integration of refugees.

The course is aimed at doctoral students in sociology, psychology, political science, ethnology, law, pedagogy and other fields of social sciences and humanities.

Lecturer: Assoc. Prof. Albena Nakova, PhD
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Phone: 0889991332
Attendance: 30 lecture hours

9.4.2. Lectures on Religious Studies and Comparative Religion

ANNOTATION:

In Part I we consider: The essence and functions of Religion – The concept and religion as a subject and interdisciplinary research problem. Social, psychological, anthro¬pological and theological aspects of the study. Spiritual essence of religion as a worldview and values. Genesis and determination of religion. Development of religions from animism and polytheism to monotheism. Content of religion as a concept of God, the world and man. Functions of religion: psychointegrative, personal-existential, epistemological; social, state, national-consolidating. Research on religion until the 21st century. Major world religious movements, directions, centers, publications, authors and schools. Phi¬losophy of religion, religious philosophy and theology of world religions.

In Part II we consider comparatively: Historical and comparative analysis by denominations, sects, new movements. These are: Religions in Antiquity; Judaism - the first consistent, Abrahamic religion and paradigm of monotheism. Christianity as a world religion: early Judeo-Christianity; state religion, apostolic churches, heresies and sects. Catholicism (Thomism, Neo-Ottomanism; Second Vatican Council). Orthodoxy (7 Ecumenical Councils; Byzantine philosophy, Hesychasm); Protestantism and Anglicanism – directions: liberal Protestantism, neo-Orthodox, existential orientation. Islam as a world religion. Contemporary Islamic Fundamentalism. Shiites and Sunnis, religious and legal schools. Eastern forms of spirituality: Hinduism and Buddhism. World religions as new religious movements; churches and denominations around the world and in our country.

Lecturer: Prof. Stefan Penov, DSc (Head of the Department of Religion& Worldview)
Email: dr.st.penov5776@gmail.com; stefan_sal@mail.bg
Phone: 0887146254
Attendance: 30 hours of lectures

9.4.3. Applied Social Research

ANNOTATION:

This is a specialized research-oriented PhD course with the objective of training highly qualified social scientists with skills in active public policy making. In this course students develop a comparative understanding of social science methods for the design of policy relevant studies. The course focuses on five social science fields such as: Public sociology (research for non-academic audience), Urgent Anthropology (rapid assessment methods), Policy Relevant Demography (population policies and impact on the demographic trends), Public criminology (community adjustment and crime prevention), and Clinical sociology (research ethics and sensitive fieldwork approaches).

This course concentrates on some specific data gathering methods such as the Randomized Controlled Trials, Participatory Active Research, Vignette techniques, as well as on Monitoring, evaluation and assessment of publicly funded projects. The transmittable learning skills of the course include the competencies on How to write a policy brief and How to make Data presentation for non-specialized audience. It is expected that students will develop an understanding of the strengths and limitations of various research methods, depending on the context and will develop advanced skills in social survey design, policy report writing, and interpretation of qualitative and quantitative data for non-professional audience.

The course does not require previous statistical or software knowledge. The final exam is based on current performance portfolio, which will be tailored to the actual research PhD thesis of the enrolled student.

Lecturer: Assoc. Prof. Alexey Pamporov, PhD
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Email: apamporov@gmail.com
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

Erasmus+ Programme at the Bulgarian Academy of Sciences

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