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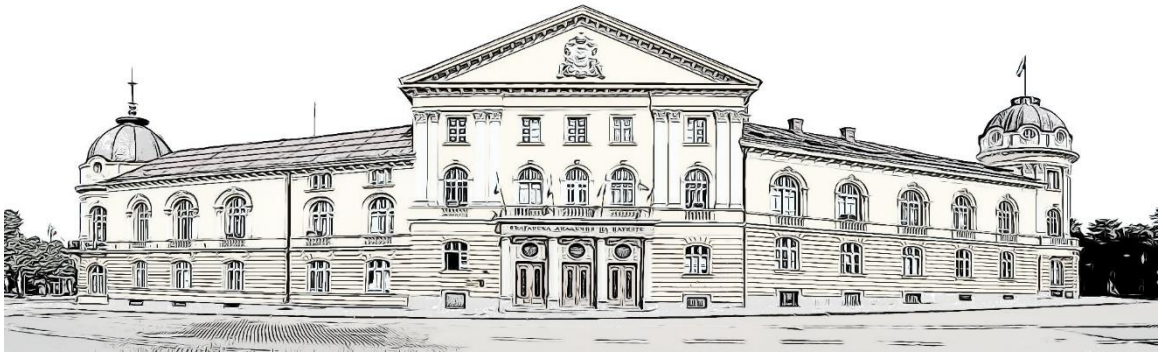
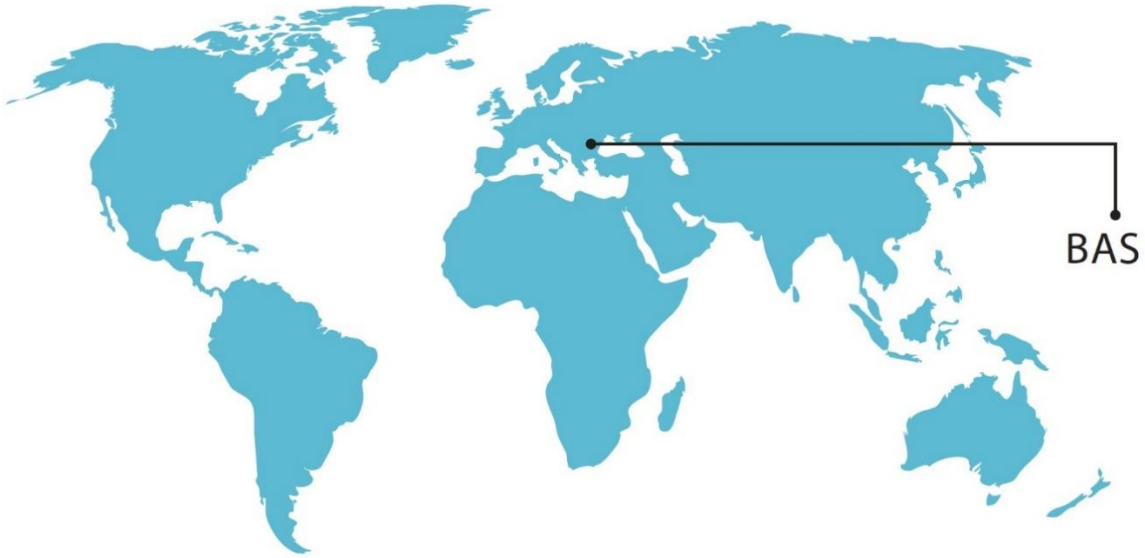
COURSE CATALOGUE IN ENGLISH

2024–2025



BULGARIAN ACADEMY OF SCIENCES

1869



Bulgarian Academy of Sciences

The Bulgarian Academy of Sciences was founded in 1869, more than 150 years ago, and was the first institution of modern Bulgaria. At present it is a scientific research centre with **42 units** - institutes, laboratories and specialised ones - in all fields of natural, mathematical, engineering, social sciences and humanities. The units of the Academy correspond to faculties/departments of universities. BAS employs approx. 3,000 scientists and approx. 2,000 administrative and technical staff or a total of over 5,000 people.

BAS has been participating in the Erasmus programme since the academic year 2009-2010. The Academy teaches only PhD students (third cycle) and hosts internships for Bachelor, Master and PhD students (first, second and third cycle). The teaching is not organised in semesters and there are no application deadlines. **Courses** are held in attendance form when there are 5 or more people willing to participate and in consultative form under the guidance of a lecturer when there are less than 5 people. They are conducted in Bulgarian or English and only in occasional cases in other languages. Level B1 is required, no language certificate is needed. The courses are free of charge for Erasmus students. Attending a **Bulgarian language course,** is free of charge for Erasmus students and brings 20 ECTS.

The **grading system** is based on numerals, where 6 is the highest and 2 is the lowest grade a student can get. The grades are divided into 100 points and any mark over .50 is considered part of the upper bracket. For example, 5.50 is excellent, 5.75 is also excellent but 5.25 is very good. Generally, anything under 3.00 is considered a fail. Grades like “Very Good” (5-) and “Average” (3+) are also possible – these are ignored in calculations of Grade Point Average (GPA).

Numeric Value *	Numeric Value **	English	Bulgarian	Percentage	ECTS	Description
6	5.50–6.00	Excellent	Отличен	92–100%	A	Best possible grade
5	4.50–5.49	Very Good	Много добър	75–91%	B	Next highest
4	3.50–4.49	Good	Добър	59–74%	C	Average performance
3	3.00–3.49	Satisfactory	Среден	50–58%	D	Lowest passing
2	2.00–2.99	Fail	Слаб	0–49%	F	Failing grade
–	–	Pass	Зачита се	50-100%	P	Successful

*: grading scale
**: grading scale used for examinations and tests

There are currently about 100 Erasmus agreements signed with universities abroad; 50 more are in the process of being signed. Erasmus agreements between host and sending institutions are the basis for mobility of PhD students for studying. For mobility of bachelor, master or doctoral students for traineeships, no prior agreement is necessary. The **application procedure** is for the sending university to send an email to the Erasmus Office of BAS (erasmus@cu.bas.bg) with a proposal for the specific student to undertake mobility for studies. It should include: names, study cycle, area of studies (subject area code according to ISCED-F 2013), e-mail of the student, duration and planned period of mobility, preliminary contacts (if any). The PhD student sends a CV with a photo. For mobility for traineeship, the Erasmus Office can provide an invitation for the student to apply for funding at the relevant university. A Learning/Traineeship Agreement is signed between the three parties - the University, the Academy and the student - which defines the programme, tasks and obligations of each party. Students have the right to change their study programme within two weeks after the start of the mobility period.

All incoming students are covered against accidents (health insurance) for the period of their mobility by the Bulgarian Academy of Sciences. That is why, they should send a copy of their identity document in advance.

The telephone number for emergency medical assistance, in case of fire or to call the police is **112.**

BAS does not have dormitories, but the Erasmus office assists with information on suitable hotels and AirBNB **accommodation.** Under a contract with another HEI in Sofia, Erasmus students of the Academy may use a dormitory at a minimum cost of around 200 BGN per month for a private room, but the conditions are absolutely basic.

The monthly card for **public transport** is 50 BGN or approx. 25 EUR. The lev (BGN) is fixed to the euro as follows: 1 EUR is 1.95583 leva.

ERASMUS OFFICE

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COMPLETE LIST OF THE UNITS OF BAS

(not all of them are teaching in English) within 9 divisions

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 for 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 of 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 with National Astronomical Observatory
7.2. Space Research and Technologies Institute

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 the State and the Law
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 constants; 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

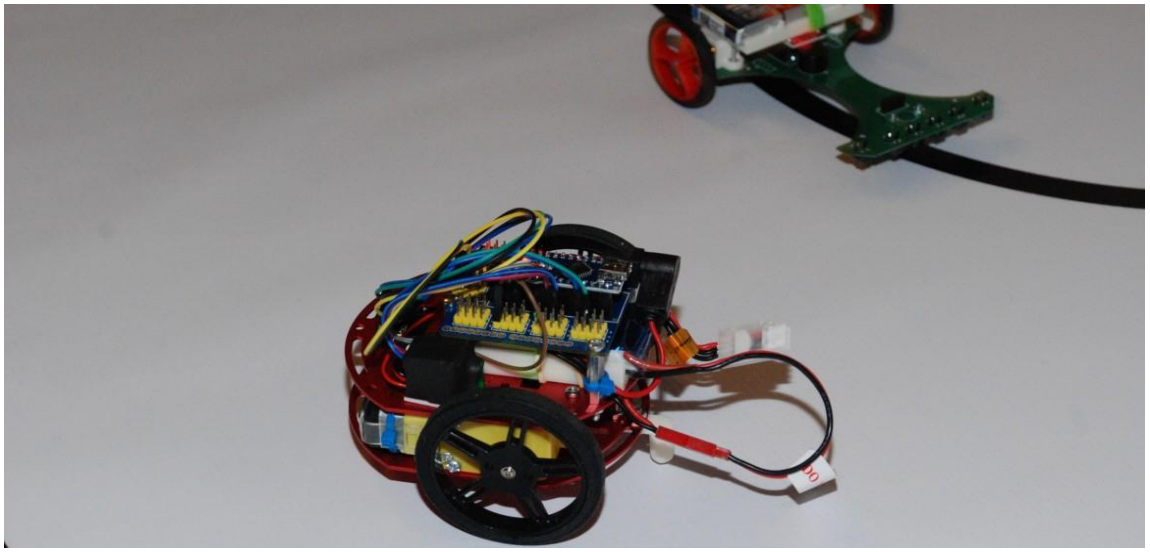
The course aims to provide the subject, fundamentals, major problems and tasks of the modern development of Bio- and Hemorheology and Hemodynamics, theoretical and experimental, physical and mathematical methods, concepts models and analysis tasks for deformation under load and shear flow of biological 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 discoveries 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 disturbances 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

1.3. Institute of Robotics



1.3.1. 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. 1 he 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 trom lecturers and staff of the Innovation Center Annotation: 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 ol the psychological attitude and assumptions giving rise to innovation hypothesis, its maturation, the ability to apply the principles ol 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: Siya Lozanova, PhD. Prof.
Phone: +359 2 873 78 22
E-mail: lozanovasi@abv.bg
Academic hours: 20 lecture hours
ECTS credits: 20 ECTS

1.3.2. 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

1.3.3. 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

1.3.4. 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

1.3.5 Modelling Of Human-Robot Systems

Modern robotics enters widely the daily life of people, which makes the task for design of a human-robot system more under-defined. Robots possess much higher degree of autonomy than before, which requires behavioral approach for interpretation of the human-robot interaction. The proposed course presents a palette of cognitive and behavioral models applicable to the design of autonomous robots for different purposes and for the future development of "personalized" robotics. Robot "agency" is being related to other autonomous agents in the information systems such as the autobiographical web agents and the personalized interfaces. Robot anthropomorphism is analyzed from a functional perspective - whether it has cognitive functions, or solely executive. Special attention is devoted to the role and potential of social robotics now and in the future. The practical seminars are devoted to interpretation of the behavior of existing robots implementing different cognitive and behavioral models. The program is designed to train graduate and PhD students in robotics, information and communication technologies, computer and cognitive sciences.

Lecturer: Maya Dimitrova, Ph.D., Assoc. Prof.
Tel.: 359 882*866 270
E-mail: maya.dimitrova.ir@gmail.com
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

1.3.6 Fundamentals Of The Brain-Computer Interface

The course provides an opportunity to understand what an electro-encephalography (EEG)-based brain-computer interface (BC1) is, and its mission to connect directly the person's brain activity with the digital world around us to control by cognitive intentions and emotional reactions. The course covers the basic concepts in the field, as well as the main methods and algorithms for registering, processing, classifying and translating F.EG signals into machine commands. The course will cover the BCI design and development, BC1 programming platforms and key application areas. The most commonly used wireless and non-invasive mobile EEG-based devices will be addressed, as well as the ethical challenges and legal aspects of implementing BCI and processing EEG data. Brain-robot interfaces as well as BCI s operating in the "Internet of Things" to control "things" in "smart" homes will be discussed in detail.

Lecturer: Anna Lekova, Ph.D., Prof.
E-mail: a.lekova@ir.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

1.4. Institute of Information and Communication Technologies

1.4.1. 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

1.4.2. 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

1.4.3. 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
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Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

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

1.4.5. 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: Vassil Guliashki, Ph.D., Prof.
Phone: +359 898 537 431
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Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

1.4.6. Reinforcement learning

The course is an introduction to the theoretical basics of punish/reward training, also known as reinforcement training. Its purpose is to acquaint doctoral students both with the origin and biological foundations of the method, as well as with its mathematical interpretation and its applications for solving optimization problems. The topics provided in the course are: biological foundations of reinforcement learning, dynamic programming and Markov processes, Monte Carlo methods, temporal difference method, approximation, tabular and gradient algorithms and applications of reinforcement learning for optimization and in adaptive control systems. Hands-on activities include implementing the learned algorithms in the open source environment Gym in the Python language.

Lecturer: Petia Koprinkova-Hristova, PhD, Prof.
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E-mail: pkoprinkova@yahoo.com, petia.koprinkova@iict.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

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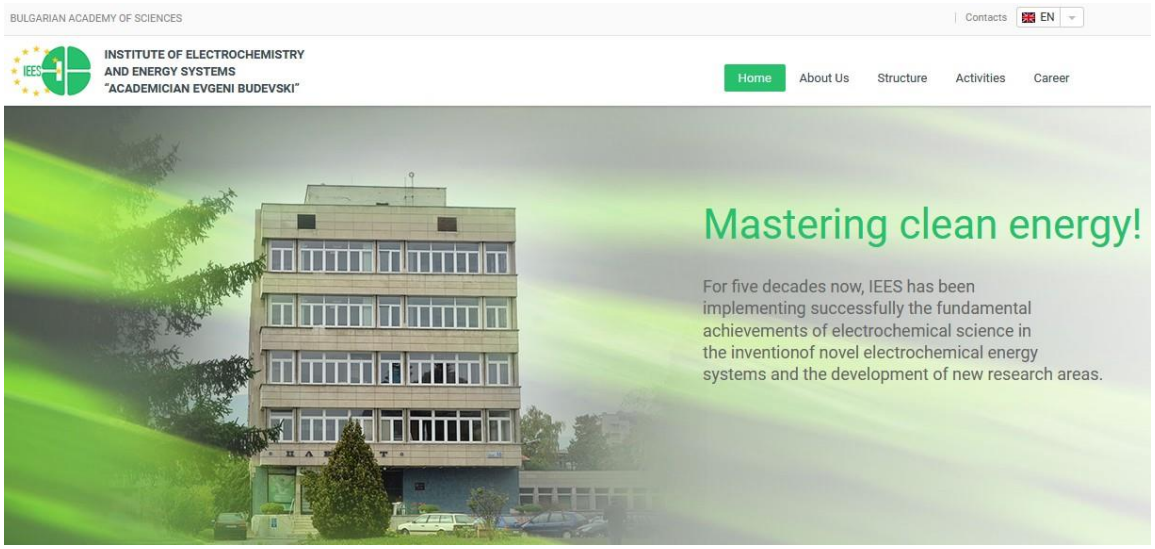
2. Energy Resources and Energy Efficiency

2.2. Institute of Electrochemistry and Energy Systems



2.2.1. HYDROGEN ENERGY SYSTEMS

The course is organized on a modulus principle and covers a wide range of topics dedicated to hydrogen as an energy vector of the future. It includes the theoretical foundations of the reversible electrochemical conversion of the hydrogen chemical energy into electricity and vice versa - the so-called green hydrogen energy cycle "water to water". The operational principles of various types of hydrogen electrochemical systems - electrolyzers, fuel cells, compressors and their application in the economy and everyday life are presented. Analysis on the role of hydrogen in achieving carbon-neutral energy and a clean environment is made. Practical tasks and laboratory exercises are provided for the lectures in the individual modules. The course is suitable for Masters and PhD students with a background in natural sciences and engineering.

***Lecturer**:* Prof. Evelina Slavcheva, D.Sc.
Phone: +359879110720
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Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

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2.2.2. THEORETICAL ELECTROCHEMISTRY

The purpose of the course is to present a fundamental view on the theory of electrochemical processes in liquids, solid-state electrolytes and nanoscale electrochemical systems, and relate it to concrete applications. The first part will explain in accessible manner the electrochemical thermodynamics as an origin of the driving forces in physicochemical systems and the kinetics as the way for using these systems for applications such as energy conversion and storage. In the second part of the course, it will be demonstrated how the learned fundamentals can be used to applications: designing properties of batteries, fuel cells, sensors, artificial neurons and synapses, and others. The course is ideally suited for Ph.D. students and as well for experts in the broad field of materials electrochemistry.

Lecturer: Prof. Ilia Valov, PhD
Phone: +359 2 872 25 43
E-mail: i.valov@fz-juelich.de
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

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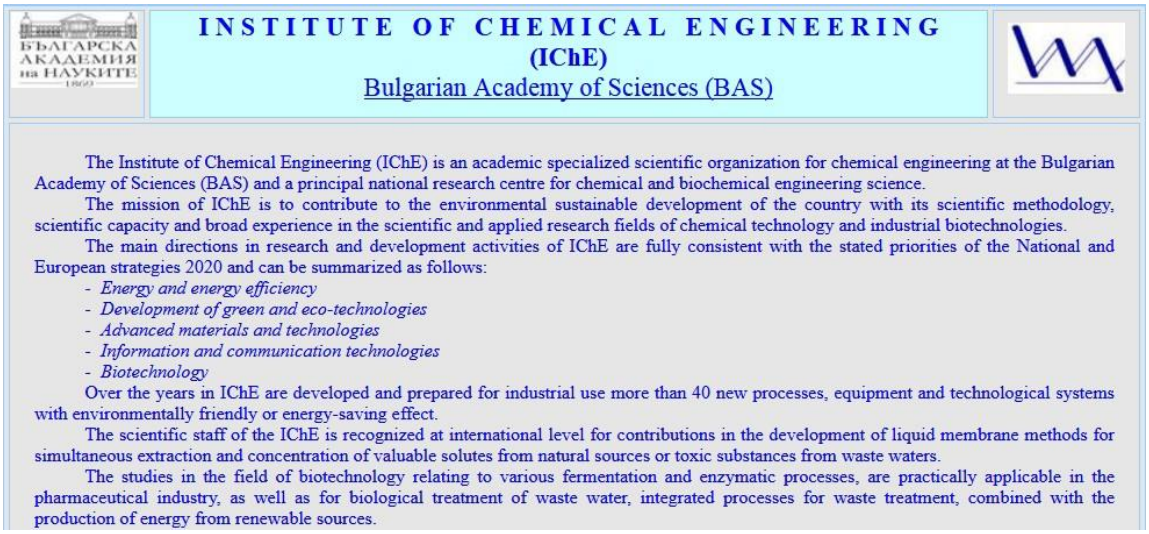
2.3. Institute of Chemical Engineering



2.3.1. 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. The training includes experimental practice on the available pilot plant installation with a packed column for absorption and distillation processes.

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
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Academic hours: 10 lecture hours, 8 lab hours, 12 self-study hours
ECTS credits: 20 ECTS

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2.3.2. 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 problems 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 freedom, 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 generation, 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 lifetimes 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 ECTS

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 superconductivity, phenomenological Ginsburg-Landau theory and microscopic theory of conventional superconductors. 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 Heritage

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 materials (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 researchers 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 dielectric polarization, reflection and light transmittance and optical constants. During the course will be considered polarization parameters and matrices required for displaying the basic equation 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 nanophotonic 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 transformation), 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 systems 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. Presented 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
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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 variables 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 doctoral 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. Holography and Holographic Interferometry. Light Sensitive Materials for Holographic Recording

The lecture course comprises basic methods and principles of holography, types of holograms and their basic holographic characteristics. Scalar diffraction theory and coupled wave theory are used for description of processes of recording and formation of interference patterns as well as for derivation of the main parameters of the holographic process - diffraction efficiency, sensitivity, dynamic range, signal to noise ratio and information capacity. Modulation for different types of holograms is analyzed in parallel with discussion of light sensitive materials for permanent and reversible holographic recording. They include amplitude and phase materials, discrete and continuous materials and others. The second part of the course includes different branches and applications of holography - display, including multicolor holography, holographic interferometry, holographic metrology and parallel processing of interference patterns, as well as modern approaches for their implementation in research, industry and non destructive testing.

Lecturer: Ventseslav Sainov, D.Sc., Prof.
Phone: +359 2 872 00 73, +359 885 392 900
E-mail: ventseslavsainov@gmail.com
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

3.3.2. 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 (interference and diffraction of light), electromagnetic optics (electromagnetic waves, absorption and dispersion of light; slow and fast light in resonant media, optics in magnetic and metamaterials); polarization optics (reflection and refraction of light, evanescent waves, dispersion); optics of anisotropic media (crystal optics, optics of liquid crystals, polarization devices); semiconductor 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 development 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

3.3.3. 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 linear 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 considered. 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

3.3.4. 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 crystallography 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

3.3.5. 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 digital holograms (Fresnel approach, convolution approach and phase-shifting algorithm). Main approaches for computer generation of holograms are also considered. Holographic interferometry, 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

3.3.6. 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

3.3.7. 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 azopolymers 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 materials 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.

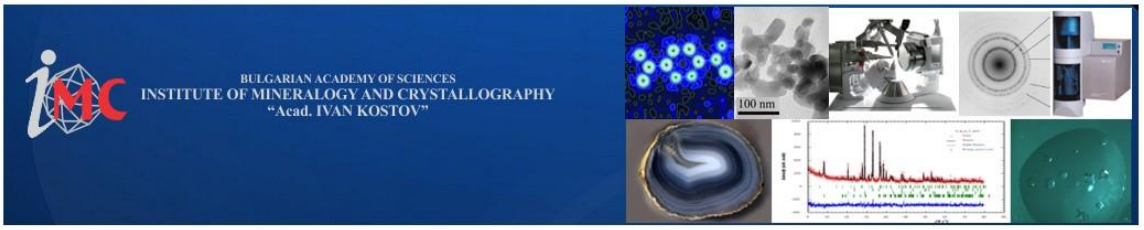
Lecturer: Lian Nedelchev, Ph.D., Assoc. Prof.
Phone: +359 2 979 35 31, +359 896 587 254
E-mail: lian@iomt.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

3.3.8. 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 specialists, 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 conditions 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 optical 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 reactions 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. Simultaneous 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, Geochemistry 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, formation 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 deposits; Representatives of epithermal, low-sulfidation deposits: textures, mineralogy, indicative trace-elements and indicative elemental ratios in some minerals.

Laboratory work

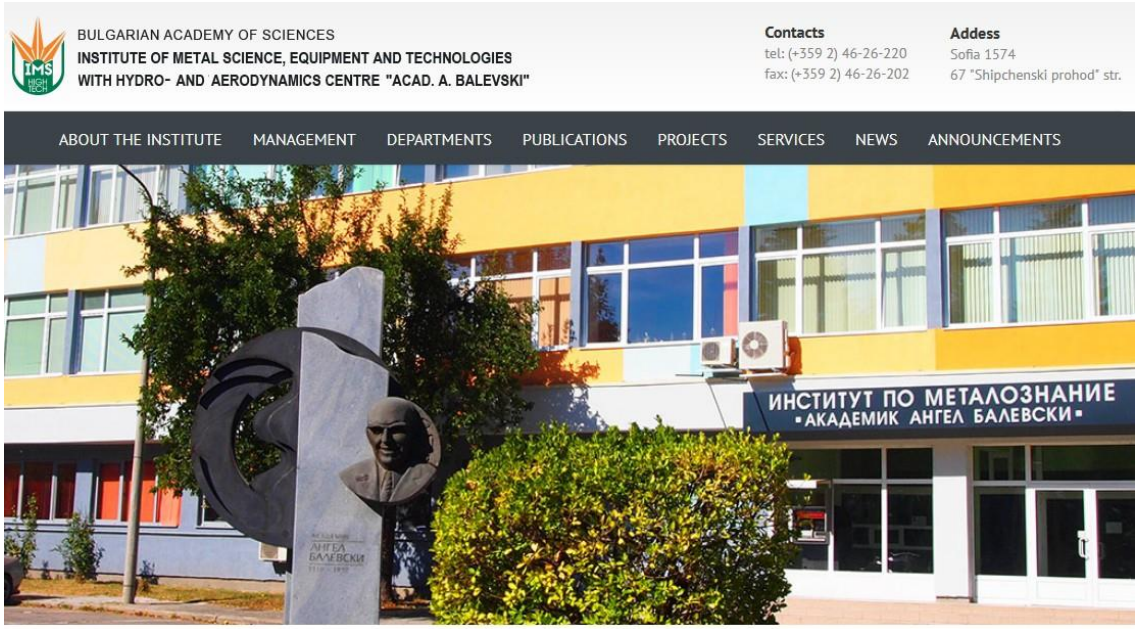
All classes are conducted under guidance of lecturer and aim at strengthening and practical application of the lectures: Mineral macro-textures; Mineral composition; Mineral micro-textures; Wall-rock alterations.

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. Metal Science – 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 student to the basic principles for obtaining steel and iron, methods for testing the strength and plastic characteristics and standards for conducting these tests. The program provide practical exercises to introduce to the structure of gray, modified and ductile cast iron. There are also practical exercises for calculation of stock materials for obtaining molten steel and cast iron.

Lecturer: Manol Dimitrov Manchev, Ph.D., Assoc. Prof.
Phone: +359 2 46 26 476
E-mail: m.manchev@ims.bas.bg
Academic hours: 28 lecture hours
ECTS credits: 20 ECTS

3.5.6. 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.

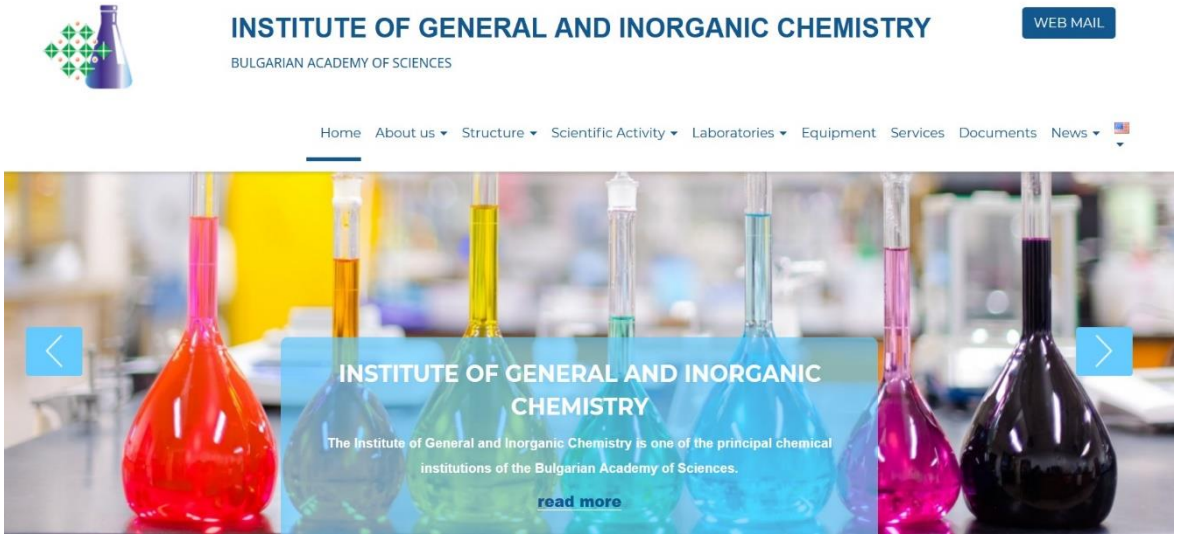
Lecturer: Nikolay Litchkov Georgiev, D.Sc., Prof.
Phone: +359 2 46 26 250
E-mail: niki0611@abv.bg
Academic hours: 34 lecture hours
ECTS credits: 20 ECTS

3.5.7. 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: Kiril Petrov Stoichev, Ph.D., Assoc. Prof.
Phone: +359 2 46 26 220
E-mail: kstoichev@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 perceive 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 characterization 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 familiar 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 nuclear 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. Theoretical Spectroscopy of Inorganic Materials

The aim of the course is to present to the PhD students the theoretical background of the vibrational, electronical and photo electronical spectroscopy and to illustrate their applications for investigation of inorganic systems and materials on the basis of specific examples. The spectroscopy methods are very informative and therefore they are widely used for elucidation of the structure and physicochemical properties of inorganic compounds. The course envisages upgrade of the knowledge of the PhD students in these spectroscopies with the aim to use them for interpretation and analysis of experimental data. Based on the knowledge they will be able to solve practical tasks, to explain and predict materials properties.

Lecturer: Natasha Trendafilova, Ph.D., Prof.
Phone: +359 2 979 25 92
E-mail: ntrend@svr.igic.bas.bg
Academic hours: 20 lecture hours
ECTS credits: 20 ECTS

3.6.4. 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

3.6.5. 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

3.6.6. 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 understanding of chemical structures, properties and reactions. First-principles methods treat the electrons in the model explicitly (quantum-mechanically) and therefore they provide for accurate 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 materials investigation, describes and predicts properties that are not experimentally accessible and directs the design of materials with novel or improved properties. Therefore, the computational 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 systems; (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

3.6.7. 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

3.6.8. 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

3.8. Institute of Physical Chemistry

3.8.1. Applied Electrochemistry

The objective of the course is to support doctoral students during their training, while also familiarizing them with some of the major cases of practical application of electrochemical individual objects. These are mainly Plating (including alloy) for a specific purpose (better decorative appearance, corrosion protection, for generating and storing hydrogen for electro-catalytic materials for fuel cells, for treatment of contaminated water and air, etc.) methods for their preparation, the main methods for the study of their properties and phase structure, and preliminary preparation of samples themselves and electrochemical / chemical compositions and baths. The course will be of interest for postgraduate students in materials science and electrochemistry.

The course is useful for PhD students, professionals working in the field of electrochemistry, electroanalytical methods, physical chemistry and materials 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

3.8.2. 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

3.8.3. 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 phenomena, 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 phenomena, epitaxial interfaces, surface design and atomic templates, modeling of quantum atomic ensembles, catalysis the lectures demonstrate the exotic ability to manipulate crystalline structures 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., Prof.
Phone: +359 2 979 25 33
E-mail: rangelov@ipc.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

3.8.4. 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 lectures 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 various 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 thermodynamic 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 fundamental physicochemical knowledge with various innovative applications (e.g. in biomedicine, biotechnologies, life sciences and environmental protection).

Lecturer: Plamen Tchoukov, Ph.D., Assoc. Prof.
Phone: +359 2 979 39 24
E-mail: tchoukov@ipc.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

3.8.5. 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: Plamen Tchoukov, Ph.D., Assoc. Prof.
Phone: +359 2 979 39 24
E-mail: tchoukov@ipc.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

3.8.6. 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

3.8.7. 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

3.9 Institute of Polymers

3.9.1. Intelligent polymer systems and their application in medicine, biotechnology and membrane technologies.

The aim of the course is to introduce smart polymer systems that respond reversibly to external stimuli such as temperature, pH of the medium, magnetic and electric field, etc. The lectures are focused on the synthesis, characterization and specific properties of different classes of smart polymers. Selected examples of biomedical as well as technological application of such systems are also discussed. The course is suitable for doctoral and post-doctoral students in the field of polymer chemistry and material science.

Lecturer: Prof. Darinka Christova, PhD
Phone: +359 2 979 2285
E-mail: dchristo@polymer.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

3.9.2. - Polymer and polymer-hybrid nanoparticles – synthetic strategies, self-assembly and potential biomedical applications

The course is intended for PhD students and postgraduates in the field of polymers and materials science. Given its interdisciplinary nature and the numerous biomedical applications of polymer and hybrid nanosized particles, it may also be of interest to PhD students and postgraduates working in the fields of biology, medicine and pharmacy. The course consists of two modules. The first module covers modern methods for the synthesis of polymers with a desired composition, architecture and functionality. The classical methods for controlled polymer synthesis - "living" anionic and cationic polymerizations are briefly presented. Particular attention is paid to the latest achievements in the field of controlled radical polymerization and the so-called "click" reactions and their application for the preparation of complex macromolecular architectures. The second module discusses the basic principles of polymer self-association in selective solvents (particularly in water), the formation of micellar and non-micellar structures, ways to control their size, morphology, functionality and sensitivity to changes in environmental parameters. The same module

also covers discrete polymer and polymer-hybrid nanostructures, as well as potential biomedical applications such as the delivery and controlled release of drugs, genetic material and proteins, their use as diagnostic agents etc.

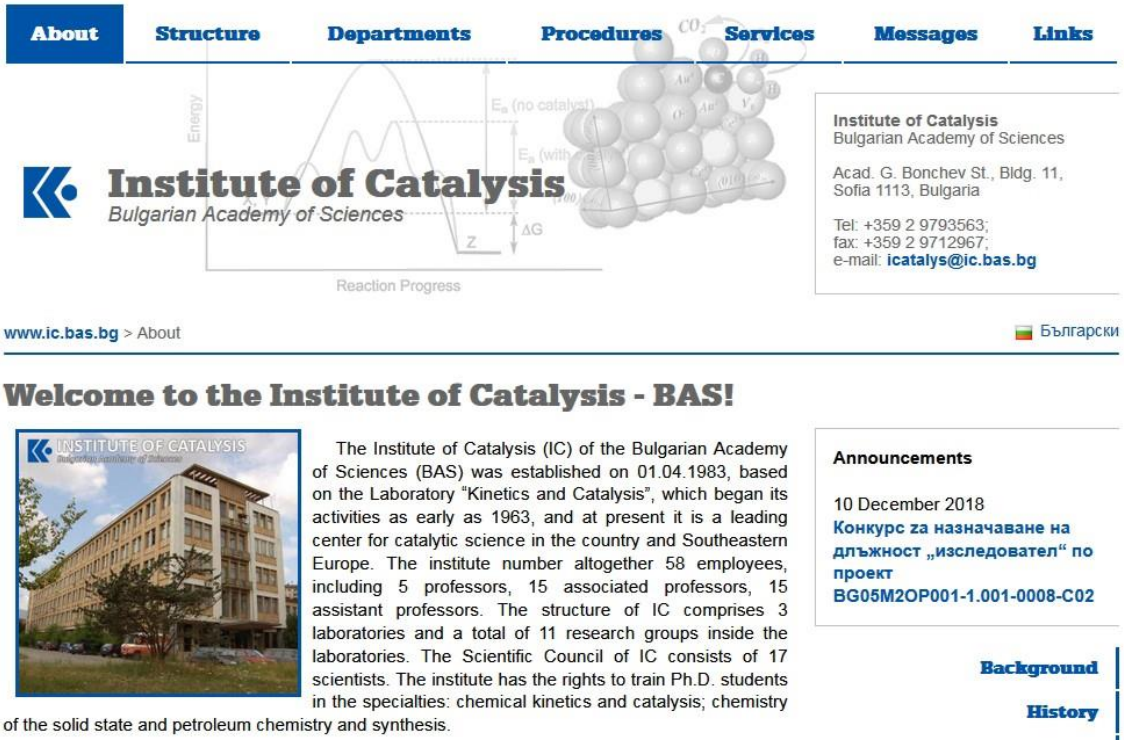
Lecturer: Prof. DSc Stanislav Rangelov
Phone: +359 2 979 2293
E-mail: rangelov@polymer.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

3.9.3. Polymers in modern medicine

The present course provide a comprehensive overview of all different types of polymers used in medical device applications. Particular attention is paid to those materials with actual commercial applications, along with supporting data from preclinical and clinical trials. The synthesis, properties and performance of each polymer or family of polymers are described in some detail as well. The focus is on those properties that are important and relevant to medical device applications, such as chemical resistance, sterilization capability, and biocompatibility. The relevant methods for processing of different plastics for medical device applications are reviewed. This course is intended for PhD students and researchers who work in the area of polymers and biomedical materials.

Lecturer: Prof. DSc Petar Dimitrov Petrov
Phone: +359 2 979 6335
E-mail: ppetrov@polymer.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

3.10. Institute of Catalysis



3.10.1. 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

3.10.2. 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

3.10.3. 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 specific scientific 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

3.10.4. 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

3.10.5. 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

3.10.6. 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

3.10.7. 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

3.10.8. 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

3.10.9. 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

3.10.10. 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

3.10.11. 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

4.2 Institute of Neurobiology

4.2.1. 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 3709
Email: d.pechlivanova@inb.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

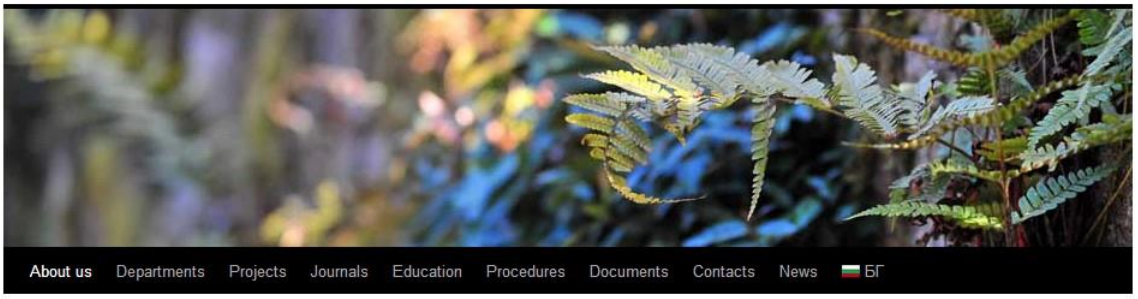
4.2.2. THEORETICAL BASIS AND METHODS FOR IN VITRO INVESTIGATION OF THE BIOMECHANICAL CHARACTERISTICS OF BIOLOGICAL TISSUES

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 wellgrounded 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: m.antonova@inb.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

4.4. Institute of Biophysics and Biomedical Engineering

Institute of Biophysics and Biomedical Engineering,
Bulgarian Academy of Sciences



4.4.1. 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 quan- titative 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 ther- apeutic, 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 prac- tical 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

4.4.2. 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 phys- iology 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 ECT

4.4.3. 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

4.4.4. 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

4.4.5. 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

4.4.6. 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

4.4.7 Intercriteria Analysis – Theory and Applications

The main goal of the lecture course is to familiarize students with the InterCriteria Analysis (ICA) – a mathematical tool which helps detecting dependencies within a set of evaluating criteria in a given problem of multiobjective multicriteria decision making in a novel and principally different way from the existing types of correlation analysis. Typically, multicriteria problems do not exhibit one best solution but a whole range of solutions and contain levels of uncertainty and imprecision. Solving such a problem requires the use of a mathematical formalism that to a largest extent renders account of the presence and impact of uncertainty onto the decision making process, namely such a tool are the intuitionistic fuzzy sets proposed in 1983 by Acad. Krassimir Atanassov, as an extension of the concept of “fuzzy sets” by Zadeh. As a result of the application of ICA over datasets of multiple objects evaluated against multiple criteria, ICA allows for the determining the intuitionistic fuzzy interpretations of the correlation between any pair of criteria in the form of ordered pairs of numbers in the unitary interval. This gives the opportunity to outline the existing relations between the criteria, to conduct comparison between criteria, as well as justified reduction of the problem’s dimensionality, i.e. reduction of the large number of criteria against which the large number of objects have to be evaluated, which can be specifically useful in “expensive”, “slow”, or in any other way “cost unfavourable” evaluation criteria. Having occurred in 2014 in search of a solution for a computationally complex and economically expensive industrial problem, ICA represents a method with a broad applicability to real-life problems, which is still the object of ongoing theoretical study, extension and improvement.

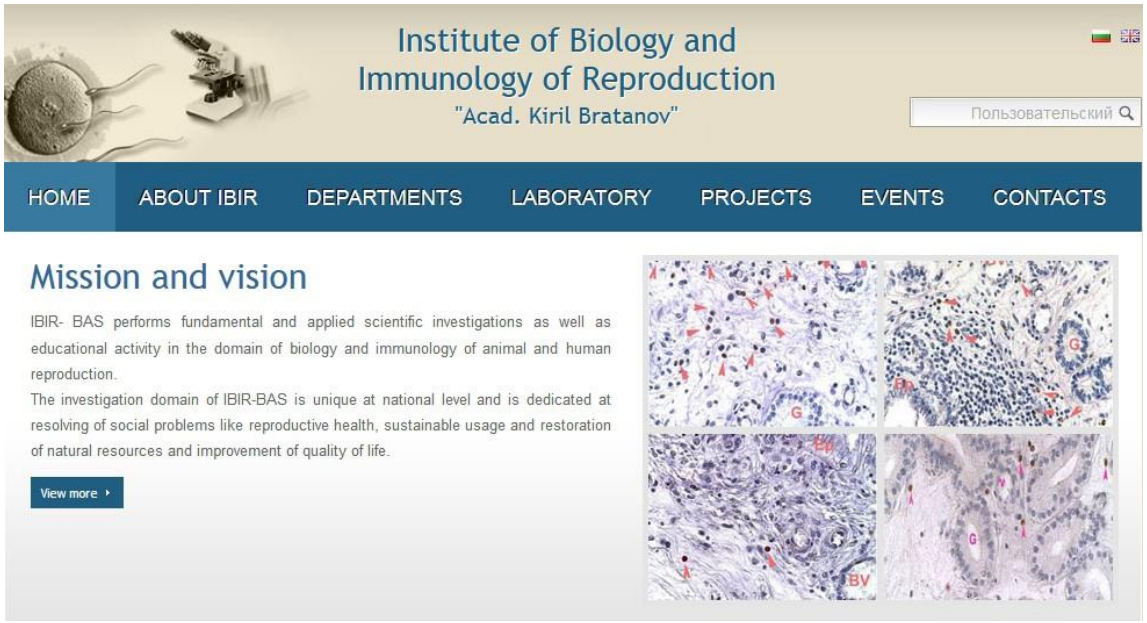
Lecturer: Acad. Krassimir Atanassov
Phone: +359 2 979 36 02
E-mail: krat@bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

4.4.8. FUNDAMENTALS OF TISSUE ENGINEERING AND REGENERATIVE MEDICINE

Both concepts (tissue engineering and regenerative medicine) of regeneration and reconstruction of cells, tissues or organs are based on a multidisciplinary approach bringing together different scientific fields such as biochemistry, pharmacology, materials science, cell biology and engineering and clinical disciplines. Within this lecture course, students are introduced to the basic principles of tissue engineering and regenerative medicine, which are the fastest growing fields among the biological sciences in recent years and are increasingly established as the vanguard of modern biomedical and biotechnological development. Students will become familiar with the principles of modern applied medicine and research methods enabling changes in cell lifespan, regeneration and aging processes. Since regenerative therapy requires biomaterials with properties and functions corresponding to the specific application for which they are intended, the course will focus on the role of biomaterials in the process of building new tissues and organs. In order to select a suitable material for a specific application, its influence on the viability, growth and functionality of the cells attached will be introduced.

Lecturer: Rumiana Tzoneva, PhD. Prof.
Phone: +359 2 979 32 42
E-mail: tzoneva@bio21.bas.bg
Academic hours: 20 lecture hours
ECTS credits: 20 ECTS

4.5. Institute of Biology and Immunology of Reproduction



4.5.1. 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 development 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 reproductive 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 function 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

4.5.2. 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 manipulation 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

4.5.3. 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

4.5.4. Methods in the Human Embryology Lab

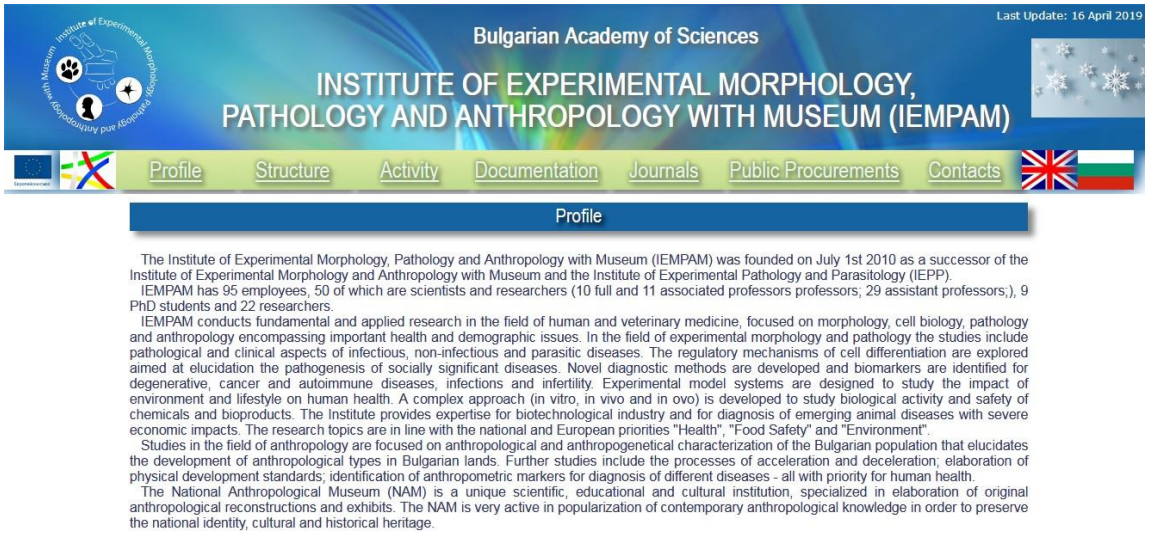
The aim of the present course is to provide a comprehensive review of the methods used in laboratory for assisted reproductive technologies. It is recommended for professionals in the field of reproductive science, clinical embryologists and students. The topics covered will include:

- 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

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



4.6.1. 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 Morphology, 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 various 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 of BAS*
Phone: +359 2 979 23 36
E-mail: ninaatanassova@yahoo.com
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

4.6.2. 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
Phone: +359 2 979 2362
E-mail: taparsky@abv.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

4.6.3. 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

4.6.4. 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

4.6.5. 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 spontaneous regression, metastases. In vitro and in vivo model systems, principles and methods in experimental oncology and oncopharmacology will be presented. Challenges in current cancer 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 cancer 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

4.6.6. DNA-Replication, RNA-Transcription, Protein Translation and Cell Division – Morphological Aspect

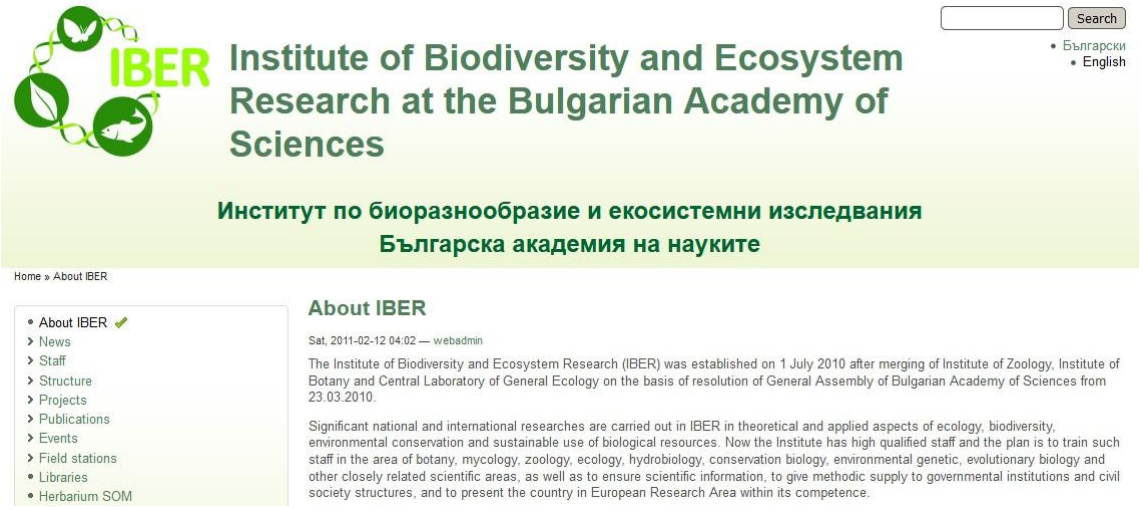
The course aims to expand knowledge of the PhD students /biologists, doctors, veterinarians and others/ about the possibilities of electronic microscopy and molecular morphology as a tool for visualization of the fundamental biological processes in the cell as DNA replication, RNA transcription, translation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

5.1. Institute of Biodiversity and Ecosystem Research



5.1.1. PLANT BIOTECHNOLOGIES FOR PRESERVATION OF RARE AND MEDICINAL PLANTS

The course is primarily intended for biotechnologists and botanists, but may also be of use to specialists working in the frontier areas of phytochemistry and biomedical sciences.
Biodiversity loss is a problem on a planetary scale. Medicinal plants are particularly vulnerable because of their gathering from nature due to the increasing market demand for phytopreparations. Plant biotechnologies are considered as alternative and complementary means of preservation of rare, endangered and medicinal plant species alongside the application of *in situ* measures. The course includes different *in vitro* techniques: rapid clonal micropropagation, *ex vitro* adaptation and acclimatization, somatic embryogenesis, cultivation in temporary immersion systems, hydroponic technologies, etc. The influence of various factors on the cultures growth and development and *in vitro* biosynthesis of bioactive substances is considered: biological characteristics of the species, genotype, type of the *in vitro* culture, composition of the nutrient medium, elicitation, and cultivation conditions. The advantages and challenges of *in vitro* biosynthesis of secondary metabolites are outlined, and examples of successful industrial production are given.
Beside the theoretical course, PhD students will benefit from the opportunity to gain hands-on experience in the Biotechnology Laboratory for Medicinal Plants. The course will help PhD students to plan their own experiments correctly, with a view to the statistical processing of the obtained data and their interpretation.

Lecturer: Prof. Marina Stanilova, PhD
Phone: (+359 2) 979 2198
E-mail: marina.stanilova@gmail.com
Academic hours: 30 lecture hours
ECTS: 20 ECTS credits

5.1.2. INTRODUCTION TO SYSTEMS ECOLOGY AND ECOSYSTEM CONSERVATION

The course aims to give doctoral students knowledge of the nature of complex ecological and social systems and their management. In ecology, and not only there, the understanding is progressively growing, that the presence of a single trajectory of development of ecological systems (to some stable and optimal climax) is static and unrealistic. The development of natural ecosystems (of which man is an integral part) is not a linear and smooth process. This realization of this leads to the formation of the understanding that the development of ecosystems stages of growth, stability, chaos and reorganization alternate, which are controlled by a small set of variables, each of which operates within different temporal and spatial scale. The course presents advanced understanding of the ecosystem and the spatial and temporal scales of ecosystem functioning, integrity and ecosystem services. Modern environmental concepts for the organization of nature and the complex self-organizing ecological and social systems are introduced. The second part presents principles of management of complex systems and logical analytical framework as a tool for analysis and decision making. Ecosystem concepts are introduced, that provide the foundation for the formulation of environmental principles, which in turn are based on the concepts of ecosystem management. The concept of sustainable development is introduced from the viewpoint of the preservation of ecosystem integrity and functions.
The course is suitable for graduate students of the specialties 2:22:01 Ecology and conservation of ecosystems, 01:06:02 Zoology, Botany 1:06:03, 1:06:11 Hydrobiology, 01:06:14 Entomology, Parasitology and Helminthology 1:06:19 and 1:06:24 Mycology. It may also be of interest to graduate students who are working on the problems of nature conservation and biodiversity within other scientific disciplines (microbiology, molecular biology, genetics, forestry, geography, etc.).

Lecturer: Prof. Nesho H. Chipev
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Academic hours: 30 lecture hours
ECTS: 20 ECTS credits

5.1.3. ECOLOGICAL FOUNDATIONS FOR FOREST ECOSYSTEMS MANAGEMENT

The course is designated for PHD students interested in studying forest ecosystems, including their conservation and use. Its main objective is to help students develop a balanced understanding of forest ecosystem management. The course comprises a varied mixture of lectures, fieldwork, and group workshops for real problem solving. The theoretical part of the program (the lectures) is made up of two parts: (i) Environmental issues in forestry; and (ii) Silviculture as science, art and practice in changing environmental and socio-economic conditions. During the field work students will get insights of how to measure/evaluate the main spatial and functional characteristics of forest stands. The real problem solving workshops will let the students discus varies environmental issues in forestry.

The course is particularly suitable for PhD students from specialties 02.22.01 "Ecology and ecosystem protection" and 04.04.03 "Forestry (including Dendrology)". It

may also be of interest to PhD students working on the issues of nature protection and biodiversity within other fields of study.

Lecturer: Prof. Tzvetan Zlatanov, PhD
Phone: (+359) 886 334954
E-mail: tmzlatanov@gmail.com
Academic hours: 30 lecture hours
ECTS: 20 ECTS credits

5.1.4. BIOLOGICAL MONITORING AND/OR MONITORING OF BIOLOGICAL DIVERSITY

The position and role of the monitoring as a substantial element within the management process, including of the environment, is discussed in this lecture course. The basic steps/activities include: forecasting and planning; regulating; provisioning (financial, material, technical, staffing); controlling, monitoring and reporting. The importance of the monitoring as an independent and objective activity which provides feedback in managerial process is defined. Differences between "control" and "monitoring" are under discussion in comparison with other assessment activities such as study, investigation, survey, surveillance, observation and other specific measurements (evaluations, assessments) designed for operational purposes. Biological monitoring represents the systematic registration of the biotic responses of living systems to external impacts. The purpose of the biomonitoring is to provide regular data with the intent to use this information in quality control programs when comparing the results obtained with reference and/or standard values, for instance, biological assessment, of the state of the environment and its components as represented at all levels of organization of the life. As each monitoring system, this one of the bio-monitoring is built up also on several common fundaments.

Three main groups of methods are commonly used for biomonitoring and bio-assessments; these are species-related methods; community-related methods; and habitat-related methods. Besides two main groups of evaluations represented as an integral (result) of differential (rate) of bio-/ecological processes, there is a third group of methods/evaluations which don’t deal with numerical values but have importance for registration and reporting for processes and phenomena in the living nature. In terms of monitoring the biodiversity, the relation is likely between an object and a subject: it depends on the aims of monitoring - assessing the state of the environment by means of biological responses or the state/health of the species/populations and/or habitats. For this purpose, application of several types of biotic responses (bio-indicators, bio-monitors, biosensors, bioaccumulators) is also under discussion.

The lecture course could be suitable for upgrading knowledge of PhD students of the specialties such as 2:22:01 Ecology and conservation of ecosystems, 01:06:02 Zoology, 1:06:03 Botany, 1:06:11 Hydrobiology, 01:06:14 Entomology, 1:06:19 Parasitology & Helminthology. It may also be of interest to graduate students who are working on the problems of nature conservation and biodiversity within other scientific disciplines (mycology, microbiology, molecular biology, genetics, forestry, geography, agronomy, etc.).

Lecturer: Prof. Yordan Uzunov, PhD
Phone: (+359) 878 896205 or (+359) 882 263218 (mobiles)
E-mails: uzunesku@abv.bg, yordanuzunov1110@gmail.com
Academic hours: 30 lecture hours
ECTS: 20 ECTS credits

5.1.5. 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, differential 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: Assoc. Prof. Boyan Zlatkov, PhD
Phone: (+359) 899 284596
E-mail: bzlatkov@gmail.com
Academic hours: 15 lecture hours, 15 training
ECTS: 20 ECTS credits

5.1.6. CONSERVATION AND SUSTAINABLE USE OF MEDICINAL PLANTS IN BULGARIA

The course aims to provide PhD students with an opportunity to apply a comprehensive approach to the study of plants, addressing the challenges in their conservation and the principles of sustainable use. At the beginning of the course, PhD students will be introduced to the floristic diversity of Bulgaria and the ways of implementing the regulatory framework for its conservation. From a theoretical standpoint, the course offers extensive knowledge on the biology, ecology, and chemical composition of medicinal plants. PhD students will explore traditional and contemporary methods for the use of medicinal plants in the prevention and treatment of various diseases. Special attention will be given to bioactive substances present in plant extracts with different polarities (primary and secondary metabolites) and their impact on human health. Additionally, methods for cultivation of rare plant species will be presented as a tool for their conservation and sustainable use.

Lecturer: Assoc. Prof. Ina Aneva, PhD
Phone: (+359) 988 983506
E-mail: ina.aneva@abv.bg
Academic hours: 30 lecture hours
ECTS: 20 ECTS credits

5.3. Institute of Plant Physiology and Genetics

5.3.1. 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 organism/environment in the geologic past: living conditions in past geological periods; interrelations between organisms and their environment (biotic and abiotic factors); variation in the organisms 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 different 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

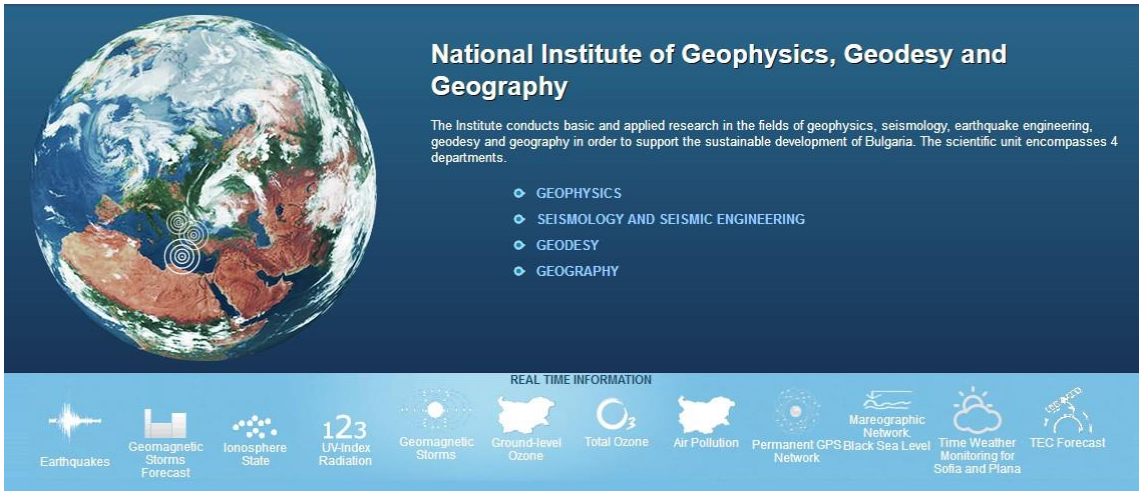
The course is intended for hydrogeologists but could be also useful for hydrologists and geologists.

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 problems like continental drift; investigation of the evolution and consecutive phases in different tectonic processes and movements at regional scale. Archaeomagnetic investigations use different 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 palaeomagnetism; 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 palaeoclimate 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 characteristics of the studied materials; characterization of the magnetic fraction in waste products of various anthropogenic products; theories about the link between palaeoclimate and the magnetism 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.

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

6.2.3. 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 belonged 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 remote 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 assessment. 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.

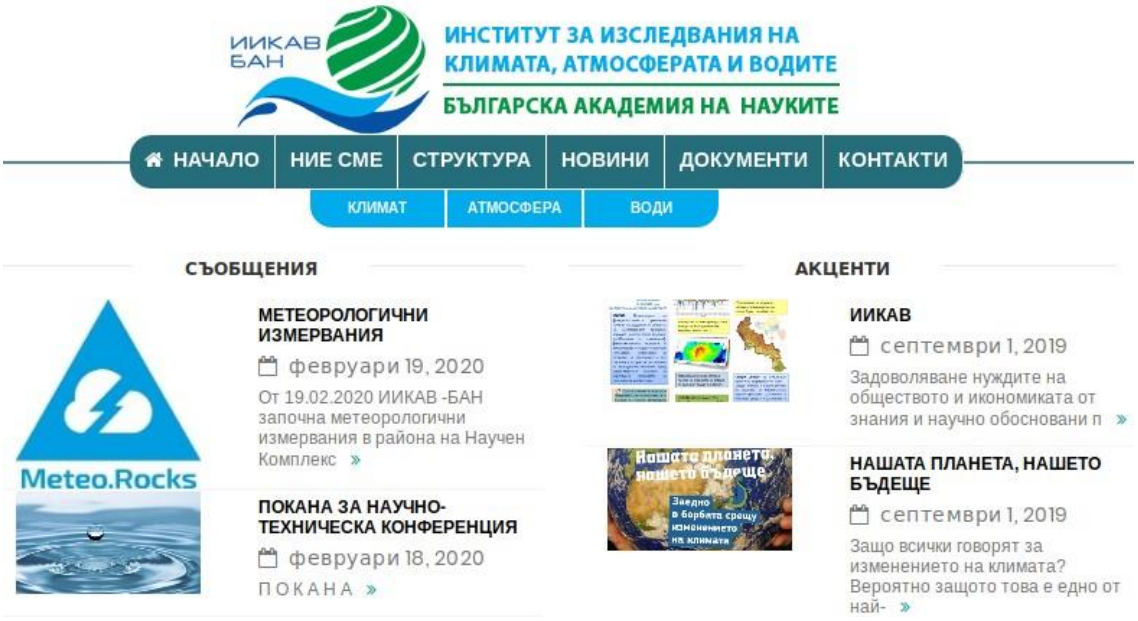
Lecturer: Stoyan Nedkov, Ph.D., Assoc. Prof.
Phone: +359 2 979 33 60
E-mail: snedkov@abv.bg
Academic hours: 15 lecture hours, 15 practical hours
ECTS credits: 20 ECTS

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 information 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

6.3.4. 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

6.3.5 Black Sea Geopolitics in the 21 century

The EU and Russia, as well as many other states in the Black Sea region are currently in search of "adequate" geo-strategy and foreign policy. This course introduces the fundamental concepts and major theories of geopolitical science as they relate to the 21st century realities. It discusses the geographic and historical context of the foreign policies and international relations in the Black Sea region. Discussions of current issues and events, e.g., Ukraine between EU and Russia, are an important part of most class sessions.

Students will become familiar with international geopolitical analysis and be able to understand and discuss in an informed way current issues and developments in the Black Sea region. Course participants will be able to conduct their own "hands-on" research and work with maps to develop deeper specialization in a particular state or issue from this area.

Lecturer: Boian Koulov, Ph.D., Prof.
Phone: +359-882-497-985
E-mail: bkoulov@gmail.com
Academic hours: 6 lecture & discussion hours, 12 practical hours
ECTS credits: 20 ECTS

7. Astronomy, Space Research and Technologies

7.2. Space Research and Technologies Institute

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7.2.1. Fusion of multisource data from remote sensing multilevel experiments

The main focus of the proposed course is to acquaint the participants with basics of data acquisitions from passive and active instruments and their thematic interpretation in the following areas – air quality, watersheds management, imaging spectroscopy of soils and minerals, and forest monitoring. The overall aim is to elaborate representative spectral and polarimetric information for different types of natural and anthropogenic objects that allows their trustworthy characterization. In this course the produced information is using solely multispectral/hyperspectral data and software tools for their processing being free and open source which ensures compliance with FAIR principles. In order to increase the quality of the output results in the course presented are the basics of data acquisition by means of satellite, aero and in-situ (laboratory) remote sensing. Special attention will be given to different online data repositories of data such as Copernicus Data Space Ecosystem, NASA's Distributed Active Archive Centers and others. In the framework of this course presented will be tools for fusing data from variety of sources (optical, infrared, thermal and radars) thus increasing the dimensionality of the features' space. The swelling volume of data inevitably demands the implementation of novel data processing methods. Therefore, we will delve into the potential of non-linear approaches, specifically highlighting the capabilities of deep convolutional neural networks. The utilization of desktop software will be complemented by a significant focus on harnessing online processing tools, such as Google Earth Engine or Copernicus TEPs.

Prerequisites for this course: Basic Remote Sensing and GIS-knowledge as well as high level of computer proficiency

Lecturer: Prof. Hristo Nikolov, PhD
Phone: +359 979 2458
E-mail: hristo@stil.bas.bg
Academic hours: 20 lecture hours, 20 practical hours, 4 hours uworkshop for the presentations of results
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 language 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.
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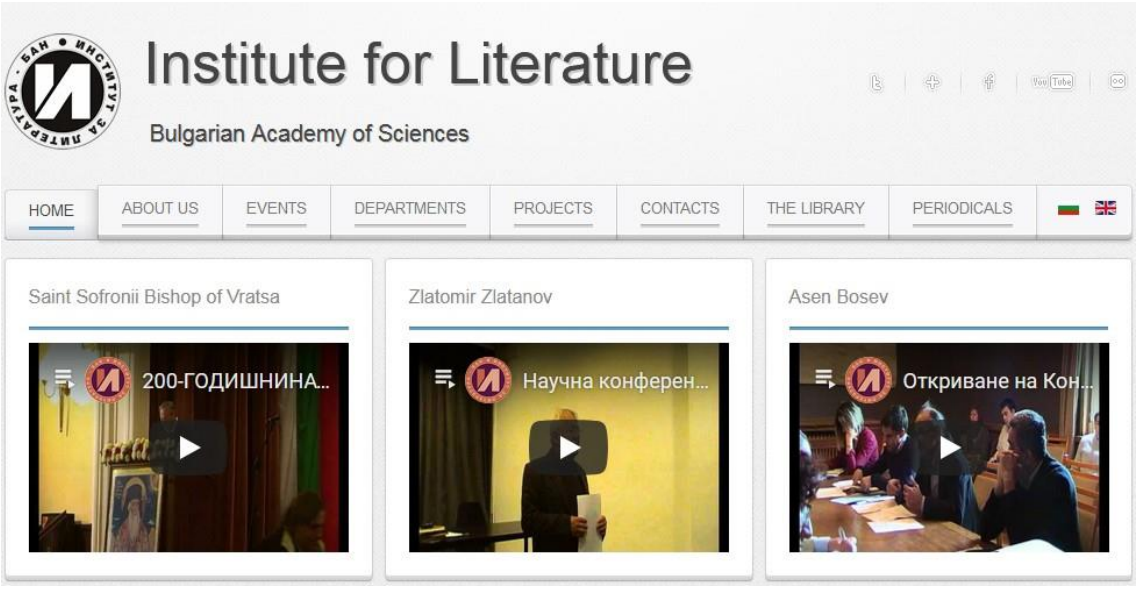
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

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.
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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.

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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.

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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.
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E-mail: naretov@yahoo.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@yahoo.com
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

8.2.7. The Concepts of Time and Identity in Bulgarian Literary Modernism

The course will examine the problem of time and identity through the prism of the literary tradition. The focus of the course will be Bulgarian literary modernism, which will be investigated through a comparative analysis using several concepts important for identity, namely: the native, the feminine, the foreign, socialist realism, and postmodernism. Bulgarian literary modernism will be analyzed not only in its static state, as a specific literary period that covers the time from the end of the 19th century to the Second World War, but as a dynamic phenomenon. This course will attempt to interpret it not only within the context of its initial appearance, but also in the context of its transformation into a tradition. The course will apply an inductive method to the phenomenon of Bulgarian literary modernism; this method will aim not to check the validity of already-existing models, but to create a new theory of its own. Various research methods will be employed, including reception studies, comparative approaches, sociological methods and psychoanalysis. A wide range of texts will be analyzed, including literary works, critical articles, archival notes and publications. The path which will be followed will be from the bottom up, from the text to the generalization, from the margins to the center, while the final conclusions will be presented at the end. A diachronic and synchronic cross-section of Bulgarian literary modernism will be made, while many of the questions the course discusses will be raised for the first time and will be examined in a new light.

Lecturer: Assoc. Prof. Ivan Hristov. PhD
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Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

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 institutions. Nation building under the auspices of the nation state: the role of education, military conscription, media and communications, etc. Political elites and political culture.
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 modernisation: 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.
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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.

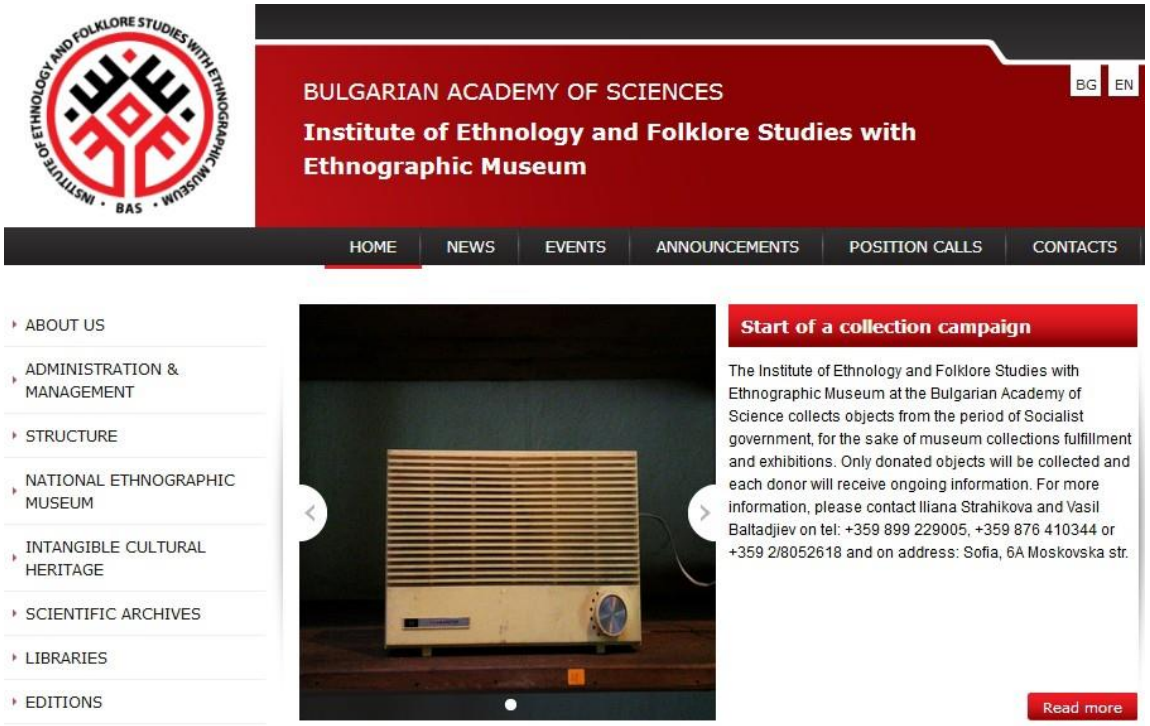
Topics:

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 communities 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.

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E-mail: mila.maeva@iefem.bas.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

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

This training course for doctoral students presents the history and contemporary way of life of Gypsies/Roma worldwide with a special focus on Bulgaria. The origin and early history of the Gypsies are discussed; their migrations around the world and their settlement in the Balkans and in Western Europe; their destiny during the Ottoman Empire; new Romani migrations and labour mobility nowadays in Europe (XIX-XX centuries). Also, the general structure of the heterogeneous Romani community/communities and the existence of various groups such as Turkish Gypsies (Xoraxane Roma, Millet); Bulgarian Gypsies (Dasikane Roma), settled (Erlii), and others, each with its own ethnocultural specifics are presented. The existing different patterns of state policies regarding the Roma in the past and nowadays are analyzed. Special attention is paid to the policy of the Bulgarian socialist state in relation to the Gypsies. Different manifestations of emancipation and civil activity among the Roma is presented, as well as the influence of the Protestant/evangelical churches among various communities in Bulgaria and Europe. Special attention is paid to the politics of evangelism among the Roma community, as well as the participation of men and women in the structures of the churches.
The training program is designed for Ph.D. students in Ethnology, but together with that, it gives fundamental knowledge, which can be used also for Ph.D. students from a wide range of other subjects in the field of social sciences and humanities, especially for History, Folklore Studies, and Social Anthropology, Sociology, Culturology, Political Sciences, etc.

Lecturer: Assoc. Prof. Magdalena Slavkova, PhD
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E-mail: mslavkova@hotmail.com
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 discussed 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 mobility 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 mechanisms for determining potential migration.

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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. 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 ethnological 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: kinship 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., Prof.
Phone: +359 888 714 608
E-mail: analuleva@gmail.com
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

8.4.6. 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

8.4.7. 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 concepts: 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.
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Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

8.4.8. 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 contemporary 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

8.4.9. 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: Vladimir Penchev, PhD, Prof.
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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, registers, 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.
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E-mail: ppykvsk@abv.bg
Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

8.8. Cyrillo-Methodian Research Centre

8.8.1. 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

8.8.2. 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

8.8.3. THE OLD BULGARIAN LANGUAGE AND ITS DEVELOPMENT

The course is intended for people interested in Bulgarian history, language and culture. It is focused on the peculiarities of the Bulgarian language, the main stages of its formation, functioning, development as well as the cultural and historical characteristics as reflected throughout its evolution. The focus is placed on the oldest period of its documented life. The Bulgarian language system will be considered as one dynamic and curious process, in which the cultural aspirations of the Bulgarians during the Middle Ages and the literary processes that took place at that time were intended to be expressed within the language. The language system will be presented as a bridge between the norms of the Old Bulgarian language and modern language processes.

Lecturer: Iva Trifonova, Assoc. Prof. PhD
E-mail: iva.workpost@gmail.com
Phone: +359 898 716379
Academic hours: 60 lecture hours
ECTS credits: 20 ECTS

8.8.4. OUTSIDE THE „BOUNDARIES“ OF MEDIEVAL SOCIETY

Why do the rules of the Ecumenical Councils prohibit the wearing of masks, the changing into animal skins, the wearing of men's clothes by women and of women's clothes by men? Why was the greatest threat to medieval society the heretics, whose abstinence closely resembled that of the saints? Eastern despots or pious monks were the Byzantine rulers? What were the rights of women? Why are children almost absent from medieval texts? These and other questions related to the structure of medieval society will be discussed in this course. At its core is the thesis that the medieval world was a strictly ordered space corresponding to divine hierarchy. A variety of symbols and signs denote certain boundaries: artifacts, natural objects, everyday practices such as eating, dressing, and speaking. Their violation confuses the order and is dangerous for society. What we will be interested in, analyzing medieval texts and drawing on contemporary sociological and anthropological theories, is how the law functions to ensure that 'boundaries' are respected and how the social status of individuals subjected to punishment changes, falling into a marginal, intermediate, isolated position.

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ECTS credits: 20 ECTS

9. Man and Society

9.1. Economic Research Institute

9.1.3. Green and circular economy

The aim of the specialized course is for doctoral students to gain knowledge about the essence of the green and circular economy, the theories and basic terminology related to them, the policies of the leading countries in the world and the prospects for the development of this type of economy in Bulgaria.
During the course, the benefits of the transition to a green and circular economy will be analyzed, the effectiveness of various policies and practices in this direction will be discussed, with the aim of initiation a debate and scientific work to identify green and circular solutions for economic entities in Bulgaria.
Participation of guest lecturers from the country and abroad is envisaged for the purpose of sharing knowledge and good practices.
Given the pronounced interdisciplinary nature of the subject of green and circular economy, the course is targeted at both doctoral students from professional area 3.8 "Economics" as well as such from other fields.

Lecturer: Prof. Virginia Zhelyazkova, DSc, Ph. D.
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9.3. Institute for Population and Human Studies

9.3.1. 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.

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9.3.2. 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.
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ECTS credits: 20 ECTS

9.4. Institute of Philosophy and Sociology

9.4.1. 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 knowledges, 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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ECTS credits: 20 ECTS

9.4.2. 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.

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Academic hours: 30 lecture hours
ECTS credits: 20 ECTS

9.4.3. Ethics in EU Research and Innovation (R&I) Policy

The course aims to introduce students to some of the challenges of responsible governance of EU-funded scientific and technological (S&T) advancements. Currently, the question of how to steer the hectic pace of research and innovation toward more socially and ethically acceptable pathways is occupying the minds of regulatory bodies, decision-makers, and the general public. Breakthroughs in artificial intelligence, biomedicine, nanoscience, geoengineering, etc., not only raise nontrivial questions about the future of the planet, the human condition, the evolving nature of sociality and the reinvention of the political; they also beg for creativity and experimentation in elaborating the proper institutional arrangements that can open possibilities for all those concerns to be addressed in practical terms.

The ambition of this course will be to familiarize its audience with the achievements and drawbacks of the EU experience, manifested in the evolution of the EU Research and Innovation

policy, with a particular focus on ethics. The students will be introduced to the twists and turns of the process of institutionalizing ethics and the Ethics Appraisal procedure within the so-called framework programs, to essential documents outlining the parameters of research ethics and research integrity in various fields, and to central notions guiding ethics compliance procedures.

On a conceptual level, they will have the chance to delve into the question of how different governance paradigms (like "good governance" or "better regulation") accommodate ethics within their logic and what role they assign the latter in managing the risks produced by the overwhelming advancements in S&T. Practically, they will receive knowledge that will help them navigate the specific mechanisms of demonstrating ethics awareness and compliance when participating in EU-funded projects. The course is appropriate not only for learners in the social sciences and the humanities. It is open to all those in the STEM sector who are not afraid to face the broader ethical and societal implications of their work and would like to be better prepared for ethics-related procedural challenges when participating in EU-funded R&I actions.

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9.4.5. Internet Culture

The objective of this course is to discuss the evolution of Internet culture from the late 1960s to the end of the first decade of the 21st century. Its development aligns with the rise of numerous social movements and protests, many of which actively utilize the cyberspace. With the increasing penetration of the Internet, individuals and societies can voice their concerns against injustice and have a global impact. In various ways, the Internet plays a crucial role in the escalation of global social unrest. Emphasis is placed on the continuity and inheritance between the counterculture revolution and the personal computer revolution, as well as the subsequent convergence of hacker activity with political action (hacktivism). The course is based on the book "Internet Culture and how it changes the world."

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9.4.6. Introduction to Analytic Epistemology

The aim of this course is to provide basic knowledge of contemporary analytical epistemology. The topics to be presented and discussed, along with their characteristic problems and subtopics, are: the analysis of knowledge, theories of justification, the problem of skepticism, as well as various ramifications of contemporary epistemology: virtue epistemology, contextualism, naturalized epistemology, social epistemology, the ethics and pragmatics of belief, the epistemology of disagreement, and justification by imagination.

As a result, PhD students will be able to read with comprehension articles in the field of analytic epistemology and to navigate the latest discussions. Also, the course is supposed to improve individual skills to write well-structured articles according to the global standards of peer-reviewed philosophical journals.

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