National Technical University of Ukraine
"Kyiv Polytechnic Institute"
August 3–16, 2012



VII SUMMER SCHOOL

Achievements and Applications of Contemporary Informatics, Mathematics and Physics

http://summerschool.ssa.org.ua



Summer School "Achievements and Applications of Contemporary Informatics, Mathematics and Physics"(AACIMP-2012) is a unique scientific and educational project, which is held for the seventh time by Student Science Association of National Technical University of Ukraine "Kyiv Polytechnic Institute".

AACIMP succeeds the traditions of world summer schools and preserves its uniqueness at the same time. It is one of the first and the biggest university summer schools in Eastern Europe.

This year courses are taught in form of lectures, seminars, workshops, discussions within four streams: "Operational Research", "Neuroscience", "Advanced Energy" and "Mobile Software Development".

Participation in Summer School AACIMP-2012 is a wonderful chance to expand one's horizons, find out more about the latest achievements in science, modern high technologies, urgent questions of scientific and technical progress of society.

This year our slogan is "New ideas start here!". And we extremely believe that this summer school will really become a startpoint for lots of new accomplishments and achievements, as well as it will push old projects forward with newly arised ideas.

Organizing Team of AACIMP-2012

AACIMP-2012 Organizing Team

Organizing Committee of Summer School AACIMP is more than just a project stuff. It is a creative volunteer team of enthusiastic young people who spread fresh progressive ideas among youth.



Alexis
Pasichny

AACIMP
Strategic Development



Kate
Pereverza

AACIMP
Program Coordinator



Iryna
Sagaidak

Infrastructure and
Logistics Coordinator



Dmytro
Fishman

Information Campaign
Coordinator



Irina
Smolina

Secretary



Liudmila
Pavlenko

Work with partners



Sandra
Yaremchuk

Work with participants



Oksana
Dziuba

Logistics



Inna
Borshch

Work with tutors



Jane
Kuhuk

Work with tutors



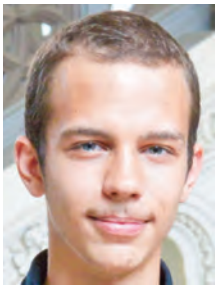
Bohdan
Pukalskyi

Work with tutors



Maksym
Shepel

Logistical support



Igor
Stepanyan

Logistical support



Oksana
Kutova

Work with participants



National Technical University of Ukraine “Kyiv Polytechnic Institute”

NTUU ”KPI” is one of the largest universities in the world, powerful scientific, educational, cultural and youth center of Ukraine.

Centenary history of KPI

The university was founded in 1898 as Kyiv Polytechnic Institute in honour of Russian emperor Alexander II. The first departments of KPI were Mechanical, Engineering, Agricultural and Chemical.

History of the university is closely connected with the names of great research scientists, who studied and worked here: D. Mendeleev, E. Paton, S. Koroliov, I. Sikorsky, S. Lebedev, M. Kravchuk, S. Timoshenko and other researchers.

Kyiv Polytechnic Institute has become the basis for net expansion of Ukrainian higher educational establishments: at different times 11 separate institutes and universities were founded on the basis of KPI.

KPI today

Nowadays more than 30 000 students study at KPI, approximately 8 000 academicians and scientists work here.

From the moment of foundation the university has been developing as a campus: today different facilities for studying, going in for sports, cultural, scientific, intellectual development and rest are joined organically on the undivided territory of 160 hectares.

It is traditional for NTUU ”KPI” to take first place in the rating of Ukrainian higher educational establishments and to be titled as the best university of the country.

The rector of NTUU ”KPI” is academician of National Academy of Sciences of Ukraine, doctor of technical sciences, professor Michael Z. Zgurovsky.



Areas of training

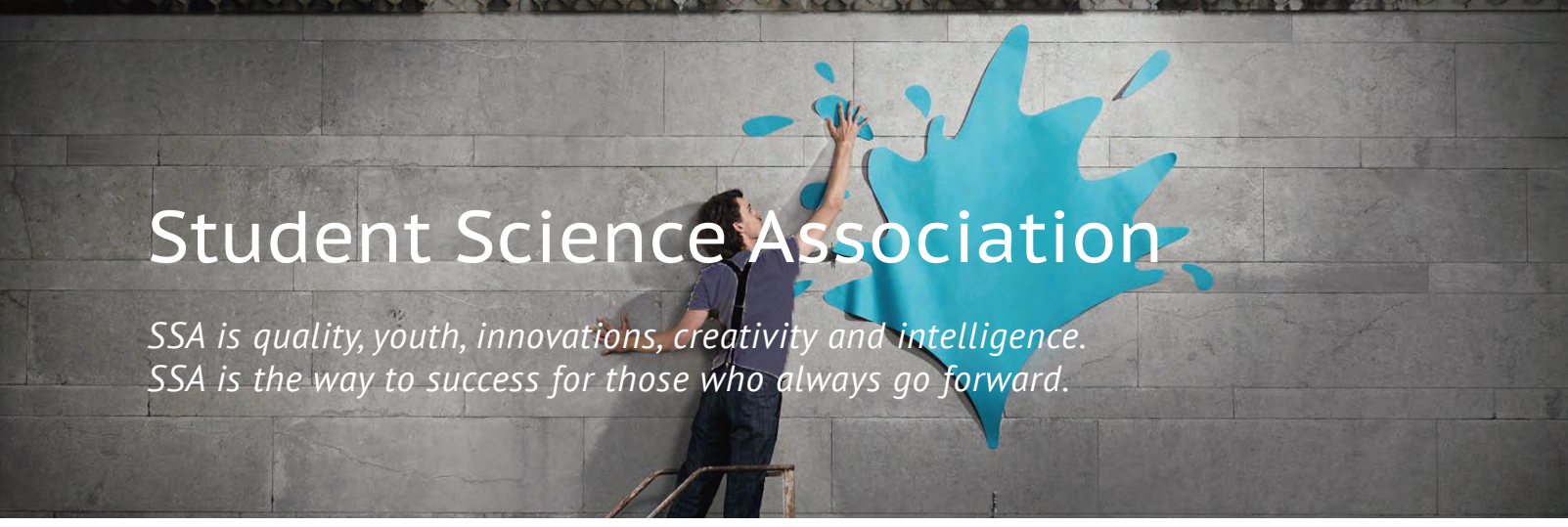
There are 18 departments and 8 institutes in KPI that train specialists in the following areas: information technology, mechanical engineering, chemistry, material science, energy saving, monitoring and environmental protection, elimination of results of man-made disasters, space and aviation technologies, research and usage of human resources, medical engineering, applied systems analysis and decision-making, etc.

Furthermore, humanitarian departments function successfully in KPI as well and it creates an opportunity for student to get second higher education, to become an experienced manager, marketer, sociologist, technical translator.

Research university

The conception of research university has been put on the basis of its development, it organically unites educational process and science. The priority research spheres in the university are sustainable development, technologies of information society, new materials, special communication technologies.

Due to applied character of most of researches, KPI is closely connected to industry and business. The university cooperates with large world companies, which are interested in innovative designs (Microsoft, Siemens, Samsung, Intel, Bosch, Cisco, NetCracker, Epam and others). In order to support and adopt the ideas of young researchers Science Park “Kyivska Polytechnica” was created and is successfully developing now.



Student Science Association

SSA is quality, youth, innovations, creativity and intelligence.
SSA is the way to success for those who always go forward.

About SSA

Student Science Association of NTUU"KPI" (SSA) is a public students' organisation, which was founded in 1998. Nowadays it is one of the most successful youth organisations in Kyiv. Student Science Association gives opportunity to every student and postgraduate to take part in international scientific projects, get experience, gain new knowledge and broaden their outlook.

SSA successfully cooperates with such international scientific and educational organisations as EuroScience, EUROPT, SD Promo, CODATA. Partner support is given by large Ukrainian and international companies such as P&G, Microsoft, Siemens, NetCracker, Samsung, Activ Solar, Ernst & Young, Kraft Foods and others.

Projects

Student Science Association plays an important role in education of intellectual elite of the new generation. It offers perspectives and possibilities, connected with scientific research activity, innovative technologies and advanced ideas.

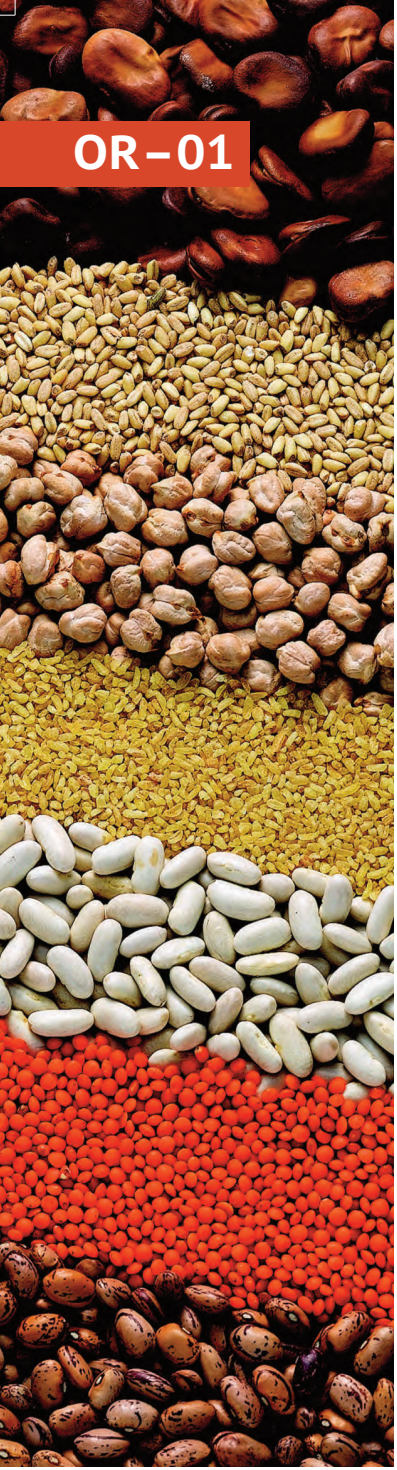
To achieve this goal SSA conducts a great number of educational projects. Scientific conferences, courses held by invited tutors, thematic seminars, round tables, intellectual games, open lectures of famous world scientists and leading companies are among them. Certainly Summer School "AACIMP" is the largest project of Student Science Association. It unites students, researchers and specialsits from all over the world.



Operational Research

Operational Research is a mathematical science that applies advanced analytical methods to help making better decisions. It is successfully used by business, military and government structures since its foundation in the middle of 20th century. OR provides decision-makers with more complete data, helps focus on optimal solutions, measure risk and use modeling to forecast results of decisions.

This year we would like to focus our participants' attention on such important subject of OR as data mining which provides techniques to find useful information in large sets of data to improve decision making.



OR–01

Introduction to data mining

Data mining (which is often referred to the machine learning, pattern analysis and frequently defined by many other names) is one of central disciplines of modern-day computational science. Data mining deals with the problem of extracting (or "learning") "knowledge", "models", "algorithms" or other types of useful information from raw data. In our age of terabyte-sized pocket drives and high-speed data acquisition the need to get necessary knowledge from data is ubiquitous. Natural sciences such as physics or biology have “addressed” computerized data analysis and regard stable patterns extracted from experimental data to make them a central research target. Engineering disciplines such as robotics and AI are based on the obtained knowledge on how to devise sophisticated automated behaviours, ranging from business decision support and movie recommendations to autonomous warfare.

The course aims to give an overview of basic data mining and machine learning techniques. Lecturer discusses both theoretical basis and practical implementation as well as application issues of data mining. Participants are expected to have no significant prior knowledge.



Konstantin Tretyakov

M.Sc. in Computer Science

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Areas of scientific researches: bioinformatics and computational biology, analysis of gene expression regulation, web usage mining, social network analysis, music information retrieval, robotics.

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Financial mathematics and related aspects of environment, education and development



Financial mathematics is a young applied mathematical discipline which uses mathematical methods and models for financial calculations, market growth prediction and risk analysis. This discipline unites a large number of separate areas that use different tools and have various fields of application. In terms of practice, financial mathematics also overlaps heavily with the field of computational finance (also known as financial engineering).

In frame of this course students approach, view and investigate the Financial Sector from its environment, to which nature sciences, education, infrastructure and industry belong. In fact, prospective of the study is a one that takes into account living conditions of people in the countries and in the world. The course suits those requirements both quantitatively and qualitatively. The course will prove it in all its parts: in motivation, analysis, optimization and outlook. Overall, the course encourages participants to study together and go towards the further advance in scientific reasoning and creative thinking.



Wilhelm-Gerhard Weber

D. Sc.

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Introduction to time series analysis and forecasting

Time series is defined as an ordered sequence of observations repeatedly obtained over time. In other words, it concerns any data with time variable. Obviously, there is a tremendous number of applications for time series (finance, physics, business monitoring, to name a few) and thus, high demand for the 'right' use of it. Usually, there are two main research areas: time series analysis and time series forecasting. The first one deals with an existing signal and encompasses methods for extracting valuable information. The goal of the latter is to build a statistical model to predict feature values of the same data.

The main goal of this workshop is to give some insights how to make use of this kind of data. Firstly, short introduction and basic definitions are discussed. After that, two practical sessions are given in order to apply some techniques on real datasets. No prior knowledge on time series is required. However, basics of statistics is recommended. Students will use statistical language R.



Anna Leontjeva

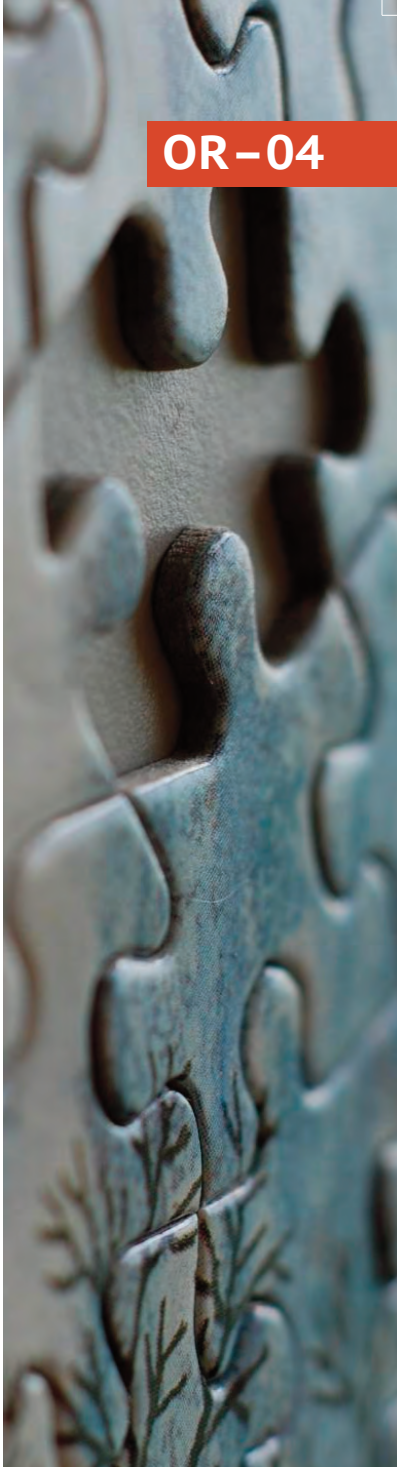
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Humanitarian or – decision support for crisis & disaster operations



Recent natural and man-made disasters have affected many parts of the world and have resulted in an extensive loss of life, disruption of infrastructure and significant economic impacts to regional and national economies. The randomness of impacts and the urgency of response efforts challenge the operational analyst and demand a dynamic decision-making in an uncertain and complex environment. Major disasters require a cross-organizational coordination of relief activities that are usually concerned with the limited availability of resources and infrastructure to address the needs of the affected population. Integrated Operational Research tools enable an efficient coordination of rescue and facilitate further disaster relief activities.

In this course the lecturer discusses how modern Operational Research can support an operational analyst in the pre-disaster planning phase as well as the post-disaster response phase. In particular, selected problems in the fields of city evacuation planning, vehicle routing, facility location problems, humanitarian supply chains, early warning systems are addressed.



Erik Kropat

Ph.D., Doctor of mathematics

Institute for Theoretical Computer Science, Mathematics and Operations Research (Munich, Germany)

Areas of scientific researches: operations research, identification and optimization of complex networks under uncertainty in technology, finance and computational biology, gene-environment networks, eco-finance-networks, homogenization theory of differential equations on networks, spatial data mining, web mining, fuzzy data mining and fuzzy DSS.

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Introduction to integer programming

Linear programs even with a very large number of variables and constraints can be solved efficiently. Unfortunately, it is no longer true that variables are required to take integer values. Integer programming is a class of problems that can be expressed as the optimization of a linear function subject to a set of linear constraints over integer variables. Many practical problems in a variety of application domains (e.g., economics, transportation, logistics, bioinformatics, and health care) may be modeled as linear or nonlinear integer programs.

The course covers standard approaches used for formulating and solving linear as well as some classes of nonlinear integer programs. It also overviews several well-known applications of integer and combinatorial optimization and known integer programming problems: Set covering, Warehouse location, Capital budgeting, the Lockbox problem, the Knapsack problem.



Oleg Prokopyev

PhD in Industrial and Systems Engineering

Assistant Professot at Department of Industrial Engineering, University of Pittsburgh (Pittsburgh, USA)

Areas of scientific researches: combinatorial optimization, integer programming, stochastic programming, computational complexity, applications of operational research in health care and bioinformatics.

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Concepts and mathematical models of consciousness

OR – 06

Consciousness research is one of the main directions of modern science. The rapidity of development and new knowledge exploration in this field may even cause the next scientific revolution, as some scientists believe. Just as opposite to the last century trend of avoiding consciousness as a subjective term which is out of objective science consideration, there are actually a lot of neuroscientists, physicians and mathematicians associating themselves with Consciousness Studies.

The existing models and concepts of Consciousness are reviewed in the lecture as well as some prospective ideas including new concept of Anticipating Neural Networks and their relations to understanding of Consciousness are represented. Lecturer discusses some other subjects of Operational Research which are connected in practice: Neuroscience and Modeling of socio-economic systems which include usage of Consciousness study.



Alexander Makarenko

Doctor of physics and mathematics

Professor, Head of Applied Nonlinear Analysis Department, Institute for applied Systems Analysis, NTUU “KPI” (Kyiv, Ukraine)

Areas of scientific researches: hyperbolic equation of heat conduction, differential equations of mathematical physics, measures of complexity and informational content of individual objects, mathematical modeling and prognostication of global processes, artificial neural networks, cellular automaton, sustainable development, electronic control.

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Principle of symmetry and decision making problem

In many practical management problems associated with decision-making we deal with a number of selection criteria. The belonging of problem solutions to the Pareto set is taken as the condition of choice in this case. But the Pareto principle is only one of the rational decision choice principles. What other ideas can be the basis of decisions-making? One of them is to use symmetry properties, namely, invariance with respect to a particular group of transformations in choosing the "best" solution. Sometimes this principle provides a rational solution which is almost unique. The second question to be considered in context of mathematical understanding of symmetry phenomena is the concept of "beauty" of the solution. Can such an emotional thing as “beauty” be described by strict mathematical relationships? The concept of symmetry and antisymmetry might give an answer to this question.

During the course students gain insight into the symmetry and antisymmetry concepts, get acquainted with its applications in decision making problems with focus on the questions stated above.



Igor Kozin

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Areas of scientific researches: multi-criteria optimization, decision making theory, principles of symmetry in decision making theory, discrete optimization and economic applications, graph theory, scheduling theory, packaging, placement, evolutionary modeling, large information systems in the management of economic entities.

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Combinatorial optimization

Lately, network theory has been applied to analyze various large sets of data that can be represented as a graph. For instance, financial networks can be used for getting insight into market dynamics and investigating globalization tendencies. The results of network optimization approaches for analysis of the Chinese, Russian, US and Swedish stock markets are the main focus of this mini-course.



Boris Goldengorin
PhD in Economics, professor at Higher School of Economics (Nizhny Novgorod, Russia)
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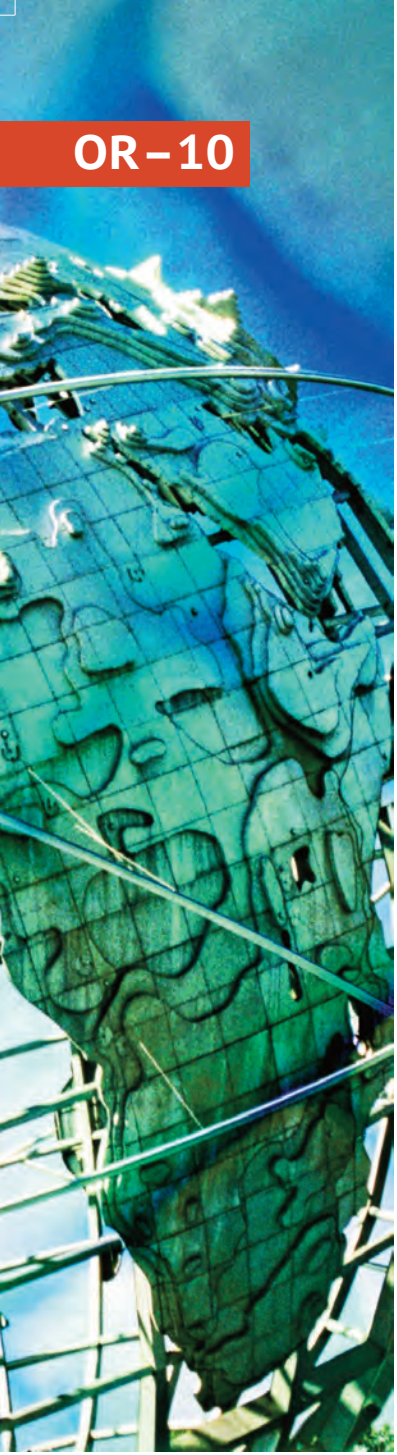
Operational research in context: pages from a consultant's book

The first part of this talk examines recent trends in OR. Then, the talk outlines some examples of problems initiated through consultancy activities. Lecturer also describes an attempt to improve the efficiency of sewage disposal in UK using network methods. Other problems arising in the criminal or civil courts illustrate strong links between OR and statistics.



Michael Tso
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EURO
OPPORTUNITIES

International organizations (EURO, IFORS etc.) exist to provide support for the researchers and practitioners involved in Operational Research field. EURO (Association of European Operational Research Societies) is the main organization that unites the European community of OR and provides services for it. Scientific components of EURO have different formats and purposes, proposing plenty of opportunities of participation, including working groups, journals and conferences. Permanent active EURO Working Groups are forums for exchanging ideas and research results and for finding new partners. EURO Journals are the best ways to share with the wider circles of OR society results of your work. Conferences are regular events that gather the whole community at a single place, providing extraordinary opportunities for communication and cooperation.

In this talk the students of OR stream get acquainted with the international organizations that unite the researchers and practitioners of Operational Research discipline and also find out how to participate in activities that are so essential for the modern development of Operational Research.

EURO – Association of European Research Societies

EURO is the "Association of European Operational Research Societies" within IFORS, the "International Federation of Operational Research Societies". It is a non profit association domiciled in Switzerland. Its aim is to promote Operational Research throughout Europe, developing operational research as a unified science and its advancement. EURO was officially launched on 8 March 1976. Considerable progress has been made since then. Actually among the main EURO activities are carrying out conferences on topics of Operational Research, providing support for EURO working groups, coordination of local Operational Research communities.

Neuroscience

The stream "Neuroscience" introduces students, PhD students and young scientists to general Neuroscience and particular Computational Neuroscience fields from synaptic transmission up to neuro- & brain- computer interface, including single neuron level, small neural circuits, network and neural populations as well as an overview of different structures and various functions of a brain.

The stream is positioned as an 'introduction to' and is oriented to ordinary audience with the background in natural sciences.



NS–01

The neurotransmitter systems of the brain and their function

These lectures deal with neurotransmitters (endogenous chemicals that transmit signals from a neuron to a target cell across a synapse) and the way their activity is involved into brain function. After discussing of which substances can be classified as neurotransmitter and neuromodulator, the release, effects on neuronal excitability and receptor interaction, as well as location, pathways and possible brain function of each neurotransmitter are covered in detail during this course. Special attention is given to acetylcholine, glutamate, GABA, noradrenaline, dopamine, 5-hydroxytryptamine and neuroactive peptides.

Separate part of lecture concentrates on seeing how different neurotransmitters may be involved into the initiation and maintenance of some brain disorders, such as Parkinson's disease, epilepsy, schizophrenia, depression, anxiety, dementia, as well as into the sensation of pain and how drugs which are used in these conditions produce their effects by modifying appropriate neurotransmitter function.



Evgenia Belova

Ph.D. in biological sciences

Snr. researcher at A. Kogan Research Institute for Neurocibernetics, Southern Federal University (Rostov-On-Don, Russia)

Areas of scientific researches: neurophysiology, neuropharmacology, electrophysiology, clinical electrophysiology, the problem of the functional state of the brain, neurodynamic organization of information processes in the brain, neural networks, signal processing neurons of the cerebral visual cortex.

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Brain-computer interface. Technology and its applications

A brain-computer interface (BCI) provides a direct functional interaction between human brain activity and external device. It is, undoubtedly, one of the most perspective research in modern neurosciences. The areas of application of these systems are very diverse; this innovative technology, in fact, allows operating any technical or computational process only by brain impulses. Besides, computer-to-brain interface allows recording messages or orders right to the brain without using its usual input channels; bilateral interfaces allow brain and external technical devices to exchange information in both directions.

Principal BCI scheme and brain signals relevant to its performance as well as two types of BCI – gradual and discrete ones are elucidated on the lectures. The review of the performance of BCIs based on two types of mental tasks is given. Motor imagination known nowadays as an efficient rehabilitation procedure to restore movement in paralysis is also considered on the lectures. The application of BCI based on motor imagination to perform a rehabilitation of neurological patients is especially discussed.



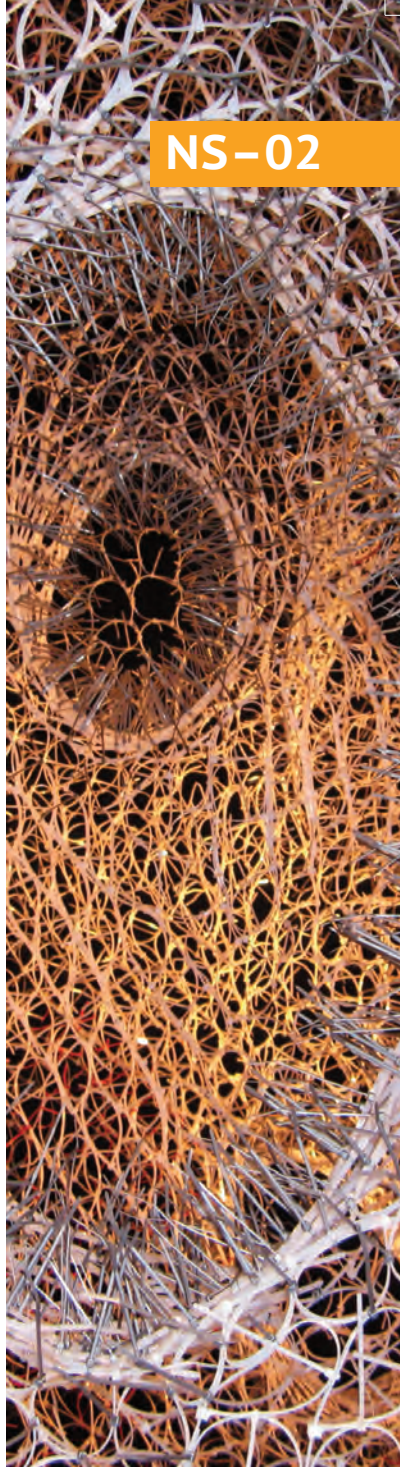
Alexander Frolov

Ph.D., Doctor of Science

Chief of the Mathematical Neurobiology of Learning Lab, Institute For Higher Nervous Activity Of RAS (Moscow, Russia)

Areas of scientific researches: Brain-Computer Interface, Recurrent-neural-network-based boolean factor analysis and its application to word clustering, the electrode for selective nociceptive stimulation: use experience and prospect for application in nociception studies in a human and many others.

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Circadian clock in mammals: electrical activity and its synchronization

Circadian clocks are molecular time-keeping mechanisms that reside in a diverse range of cell types in a variety of organisms. The primary role of these cell-autonomous clocks is to maintain their own 24-hour molecular rhythm and to drive the rhythmic expression of genes involved into physiology, metabolism and behavior. The ability of the clock to persist in the absence of environmental cues provides internal temporal organization so that rhythmic activities can occur at characteristic times during the circadian cycle. The mammalian circadian system is really critical for the proper regulation of behavioral and physiological rhythms.

The lectures of the course are devoted to the problems of cellular and molecular mechanisms of circadian clock implementation in mammalian organisms and are based on the experimental data obtained from longterm electrophysiological recordings in multielectrode dishes. The primary biological clock regulating circadian rhythms in mammals is discussed in the course.



Nikolai Kononenko

Doctor of Biological Science

Leading sceintific researcher at the Department of General Physiology of Nervous System, Bogomoletz Institute of Physiology, NASU (Kyiv, Ukraine)

Areas of scientific researches: biological rhythms of mammals, electrophysiology of neuron, relationship between biochemical reaction in cytoplasm and electrical processes in outer cytoplasmic membrane, plasticity of neuron, oscillations of electrical activity in neuronal networks.

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From cellular neurophysiology to nonlinear neural network and oscillations



This course consists of three parts which highlight main ideas of mathematical modeling of biophysical and electrophysiological properties of individual neurons and neural networks.

Part 1. Cellular Neurophysiology and Modeling. The lecture starts with well-known model of Action Potential. There will be also demonstrated how to analyze a model dynamics. Such analysis allows distinguishing neuron activity into different types.

Part 2. The Cable Properties of Neurons. The lecture introduces an area of spatial representation of dendrite tree in neuron modeling. The focus of this lecture is given to how geometry of dendrite influences somatic activity of neurons and why neurons have active membrane.

Part 3. Nonlinear Dynamics of Network Excitability and Oscillations. This part of the course is devoted to formulation of the mean field models for firing rate dynamics, and applications of this theory to description of the phenomena of real neuronal activities.



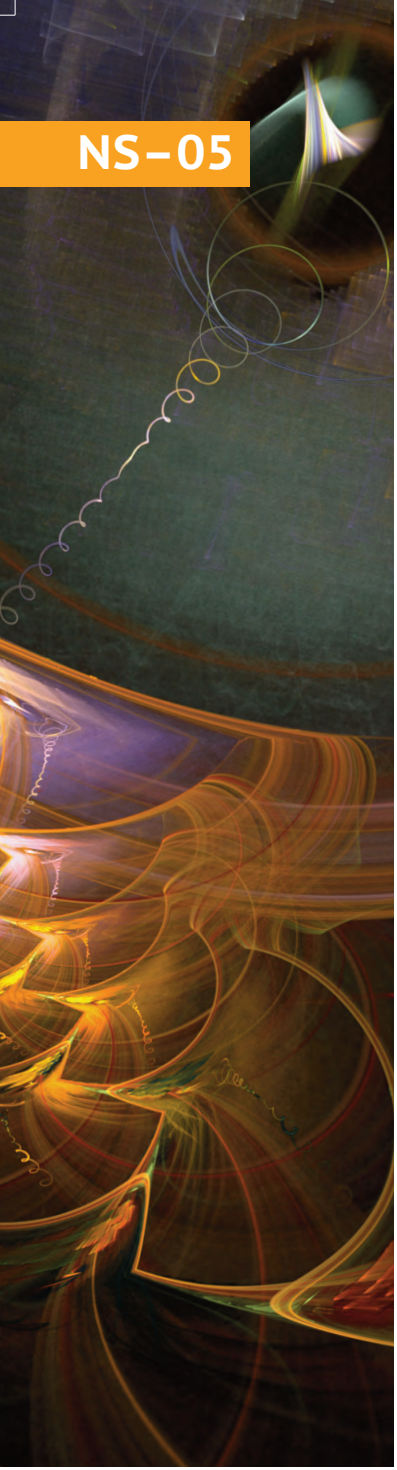
John Rinzel

Ph.D.

Professor at New York University (New York, USA).

Areas of scientific researches: dynamic neural computation, effects of active properties in dendritic membrane; intrinsic mechanisms for repetitive firing and bursting oscillations of individual cells; collective rhythms of neurons in networks; neuronal oscillations studies; spontaneous rhythmogenesis in developing neural systems; dynamics of auditory processing.

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Amazing auditory system

The auditory sensory system might be the most intriguing sensitivity to perceive the surrounding space for animals and humans. From the beginning of evolution, the nerve system was faced to an acoustic environment, where sound waves oscillate very fast and have a huge range of pressures. It was a challenge, because processing auditory signals require both temporal and amplitude precision which lay far beyond the ability of live systems. To solve these problems, the nerve system invented Fourier transformation, coherent analysis and many other useful tools which were later re-discovered by humans. However, animals and humans have developed exquisite auditory system, which is widely used both by preys and predators.

This course briefly introduces structure and function of auditory system to students. Lecturer mainly focuses on the problem of sound source localization (ability to identify the location or origin of a detected sound in direction and distance), one of the phenomena of auditory sensory systems.



Ruben Tikidji-Hamburyan

Ph.D. in Computer Science

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Areas of scientific researches: biologically adequate neuromodelling, information processing and perception in the nervous system; cellular and subcellular training machinery; neuronal networks of brain; types of cells in cerebral cortex.

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Elements of theory for multi-neuronal systems

Part 1. Representation of continuous values in neuronal systems. Inputs and outputs of neural systems, as well as sometimes structures, which are located deep inside them, use the neural impulses frequency code for continuous variables. In models, this code is often substituted by continuous variables, stripped off the impulses. A systematic approach, correct at both extremes — just impulses and just continuous entities, as well as anywhere between them, is given. Two cases of multi-neuronal representation of continuous variables — the parallel and the sequential ones are examined in this part. Qualitative and quantitative properties of the multi-neuronal coding of continuous variables are considered in detail.

Part 2. Informational evaluations of neural systems. The theory for evaluation of informational efficiency and informational capacity of neuronal systems in theoretical models and physiological experiments are presented. Finally, the plausible roadmap to complete the understanding of principles of neural operations in human brain is shortly discussed.



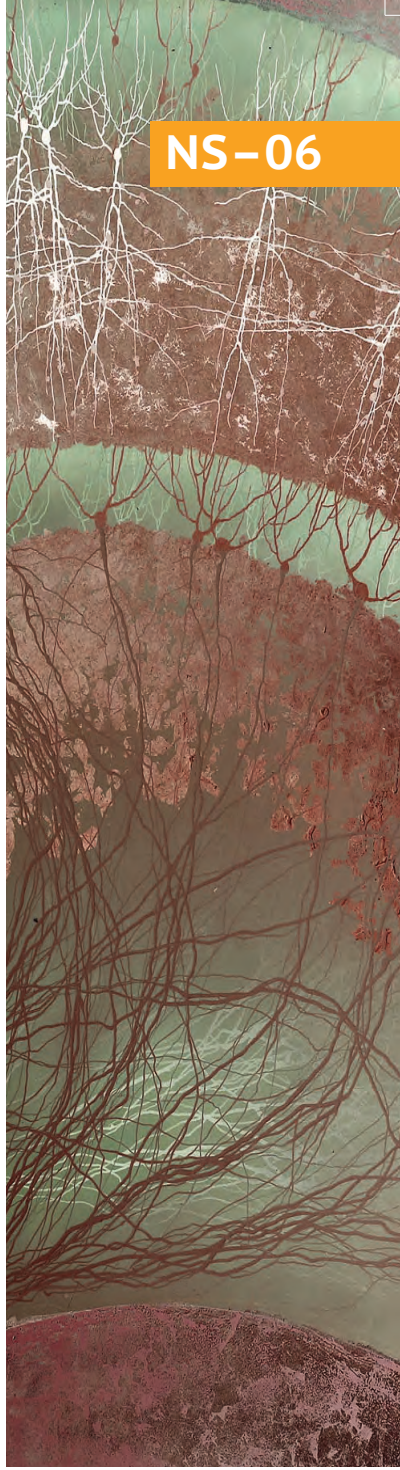
Witali Dunin-Barkowski

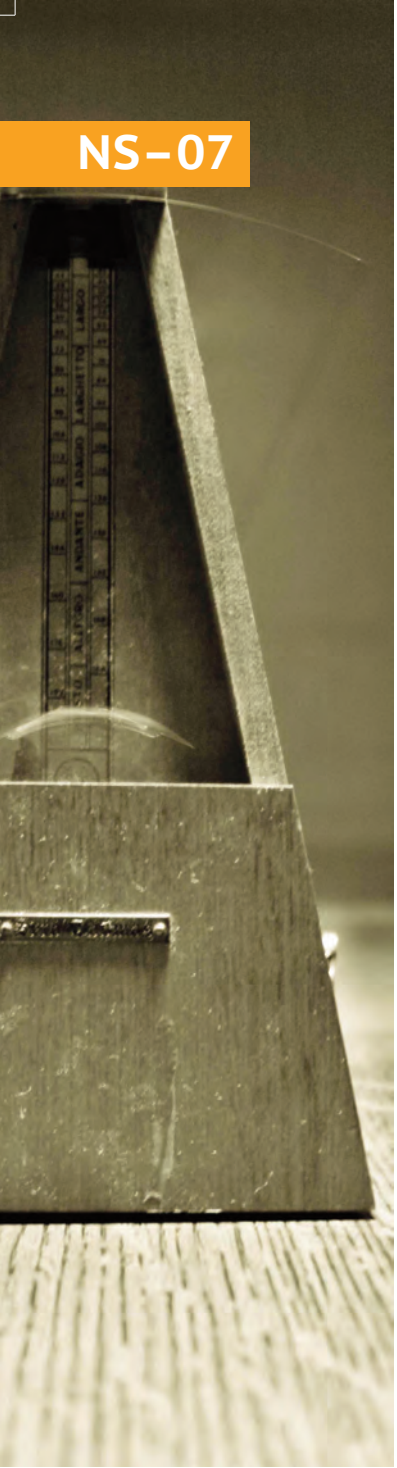
Doctor of physics and mathematics

Chair of Department for Neuroinfomatics, Center for Optical Neural Technologies, Scientific Research Institute for System Analysis of Russian Academy of Sciences (Moscow, Russia); president, founder of Russian Association for Neuroinformatics

Areas of scientific researches: neuroinformatics, experimental and theoretical biophysics of different parts of nervous system, biophysics of cells, natural and artificial neural systems, general artificial intelligence.

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NS–07

Dynamical principles of rhythm generation

The dynamics of single neurons and oscillatory neuronal networks controlling rhythmic movements, Central Pattern Generators (neural networks that produce rhythmic patterned outputs without sensory feedback) are described within this course. The course consists of two parts.

Part 1. Neurons at rest and in action. The first lecture introduces basic regimes of activity of neurons: rest states, sub-threshold oscillations, tonic spiking and bursting, and describes dynamical mechanisms supporting multistability of these regimes.

Part 2. Dynamics of Central Pattern Generators. The second lecture discusses basic dynamical principles underlying control of rhythmic activity in oscillatory neuronal networks. Tutor introduces mechanisms supporting bursting activity and laws of dynamics describing temporal characteristics of neuronal activity in the proximity of the bifurcations.



Gennady Cymbalyuk

Ph.D.

Associate professor at Dynamical Neuroscience Laboratory, Neuroscience Institute, Georgia State University (Atlanta, USA)

Areas of scientific researches: Central Pattern Generators, genesis and regulation of bursting activity, control of rhythmic movements, leech heart beat, hybrid systems composed of living neurons and mathematical model integrated in real-time, dynamic clamp.

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From multicompartment models to computational psychiatry

NS–08

Part 1. Multicompartment and Stochastic Models. Lecturer provides participants with basic mathematical models used in the field. Multicompartmental models (focusing on transmissions among the compartments of the system) as well as stochastic ones are discussed.

Part 2. Cybernetics, AI, Cognitive Science and Computational Neuroscience: Historical Aspects. This part of the course is an overview of scientific issues on the edge of Cybernetics and Neurobiology.

Part 3. Computational Psychiatry & Computational Neuropharmacology. These emerging new disciplines have grown up from computational neuroscience. The lecture addresses the topics like neurological and psychiatric disorders as dynamical diseases, schizophrenia as a disconnection syndrome, pathological brain rhythms, etc.

Part 4. Computational Social Science. This part of the course discusses sociodynamic models, common simulation approaches and focuses on the network models which are common from cybernetic point of view.



Péter Érdi

PhD, Doctor of Science.

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Areas of scientific researches: multiple modeling strategies to describe neurodynamic phenomena; computational psychiatry, computational neuropharmacology; dynamic modeling of associative learning in schizophrenia; computational social science: social dynamics, scope and limits of predictability.

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NS–09

Nervous system from oscillatory point of view

Actually it is a generally known fact, that the human brain is a complex dynamic system capable of generating a multitude of oscillatory waves in support of brain function. Oscillatory activity can be observed in many brain regions. Specific waves propagate through the cortex and hippocampus during sleep and main cognitive function. The significance of brain oscillations is a complex and somewhat controversial subject; brain oscillations reveal that our senses do not experience the world continuously.

In this course lecturer and participants of the stream consider how to apply phase resetting theory to describe and predict an interaction of periodical processes in human brain. To reach the goal, neuron's behavior is simplified up to one dimension function, so-called phase resetting curve (PRC). Through the concrete example of cross-frequency entrainment in feed-forward network we examine how to employ phase resetting curve approach to explain various phenomena of synchronization, phase-locking and modulation, which are characterstic for nervous system.



Ruben Tikidji-Hamburyan

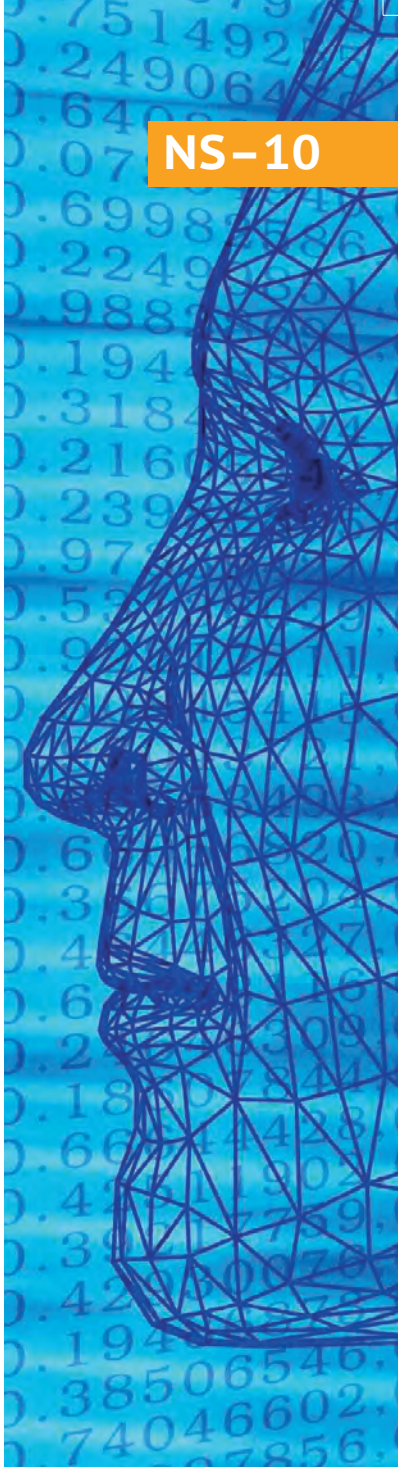
Ph.D. in Computer Science

Senior researcher at A.B. Kogan Research Institute for Neurocybernetics, Southern Federal University (Rostov-on-Don, Russia); visiting researcher at the Health Sciences Center, Louisiana State University (New Orlean, USA)

Areas of scientific researches: biologically adequate neuromodeling, information processing and perception in the nervous system; cellular and subcellular training machinery; neuronal networks of brain; types of cells in cerebral cortex.

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Neuron-computer interface in dynamic clamp experiments



The course consists of four parts. The first one describes biophysically detailed, Hodgkin-Huxley-like models of neurons, their properties and reductions. These properties are essential to control a neuron in a real time during experimental intracellular registrations by dynamic-clamp technique. The technique is an electrophysiological method that on a real-time basis uses the interaction between one or several living cells and the computer for dynamic processes modeling (so, it is an example of brain-computer interface). The following part gives an introduction into the models of synaptic plasticity. Then, discussion turns to the consideration of a statistical ensemble of neurons and its different models, starting from the detailed ones, belonging to the probability density approach, and reducing to the simplest, firing-rate type models.

In the last part of the course a hierarchy of models of interacting populations in the visual cortex is described, revealing roles of different simplifying assumptions. The detailed comparison of the full model with experiments is given.



Anton Chizhov

Ph.D.

Senior Researcher at Ioffe Physical Technical Institute of the Russian Academy of Sciences (Saint-Petersburg, Russia)

Areas of scientific researches: neurophysics and gas dynamics, biophysical models of separate neurons; development of records for intracellular measurements held in a Dynamic-Clamp experiments; statistical theory of neuron population models; biophysically-detailed model of cortical neural tissue, a model of visual cortex.

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Models of associative memory: consolidation, reconsolidation and synaptic plasticity

Reconsolidation is a phenomenon where memory is liable and can be updated during retrieval. In this course lecturer presents various memory reconsolidation models based on attractor networks of associative memory. Computational models of spike-time dependent synaptic plasticity which is closely related to reconsolidation are discussed on lectures. The lecturer also considers Kernel Associative Memory model.

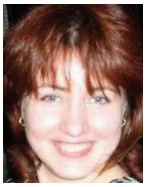


Dmitry Nowicki
Associate professor at Institute of Cybernetics of NASU (Kyiv, Ukraine);
Dept. of Computer Science, University of Massachusetts (Boston, USA)
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Molecular mechanisms of pain

The importance of understanding the ways how the central nervous system can alter incoming signals that relate to pain stimulated a lot of investigations. It is found that molecular mechanisms lead to changes in patterns of action potential generation in primary neurones, modification of synaptic transmission between primary central afferents. These mechanisms of pain are the subject of this lecture.



Nana Voitenko
Head of Research Group at the Dept. of General Physiology of the Nervous System, Bogomoletz Institute of Physiology (Kyiv, Ukraine)
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Fluorescent proteins in current biology

Within this lecture participants get wise to a breakthrough in current biology, which is based on the combination of genetic and optical methods to record and control specific events in targeted living cells. A brief introduction to ideas and current approaches to fluorescent proteins, optical super-resolution techniques, quantum dots and optogenetics is given.



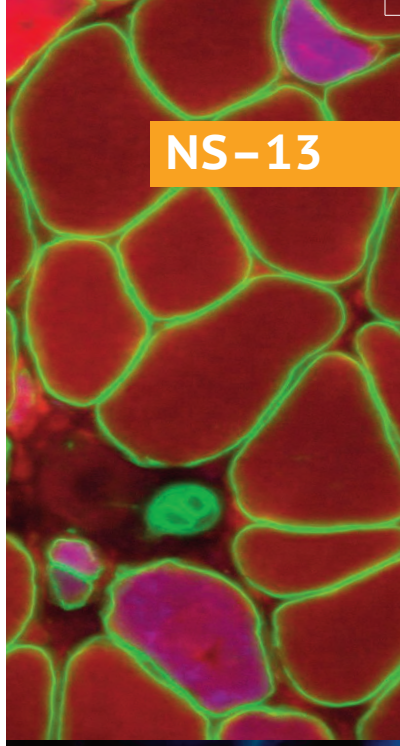
Pavel Belan
Head of Research Group at the Dept. of General Physiology of the Nervous System, Bogomoletz Institute of Physiology (Kyiv, Ukraine)
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Analysis of calcium regulatory networks in neurons

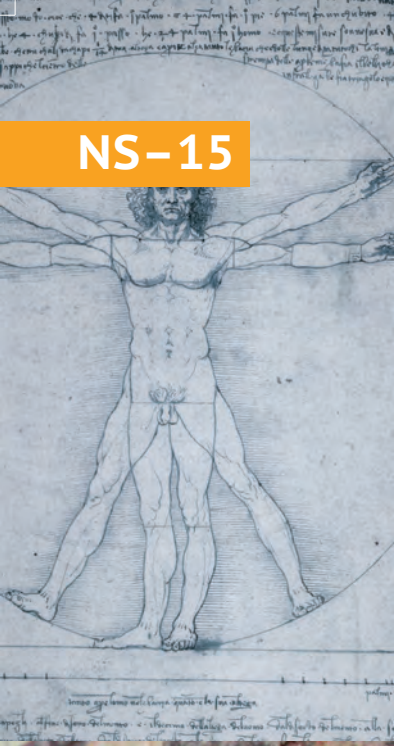
In the lecture tutor highlights Importance of Ca2+ in cellular function. Ca2+ dynamics, fluxes and regulatory networks are represented, general features of Ca2+ signaling in neurons and non-neuronal cells are described too. Classification of neuronal Ca2+ models is given as well. Finally, distinction between phenomenological and experimentally determined description of transport and buffering is depicted.



Elena Saftenku
Researcher at the Department of General Physiology of Nervous System, Bogomoletz Institute of Physiology of the NASU (Kyiv, Ukraine)
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NS–15

Visit to O. Bohomoletz Institute of Physiology

The O.O. Bogomoletz Institute of Physiology is the leading organization in Ukraine on problems of human and animal physiology, pathological physiology. The Institute was among the pioneers in usage of the technique of microelectrode studies of excitable cells. During the visit students see laboratories of the Institute, get an insight into the ongoing researches, and discuss them with scientists of the Institute.



The O.O. Bogomoletz Institute of Physiology of the National Academy of Sciences of Ukraine

The Institute was founded in 1953. It is one of the greatest Ukrainian research centers. Known scientists (such as O. Bogomoletz, P. Kostyuk, P. Serkov, O. Krishtal) conducted researches at various times there.



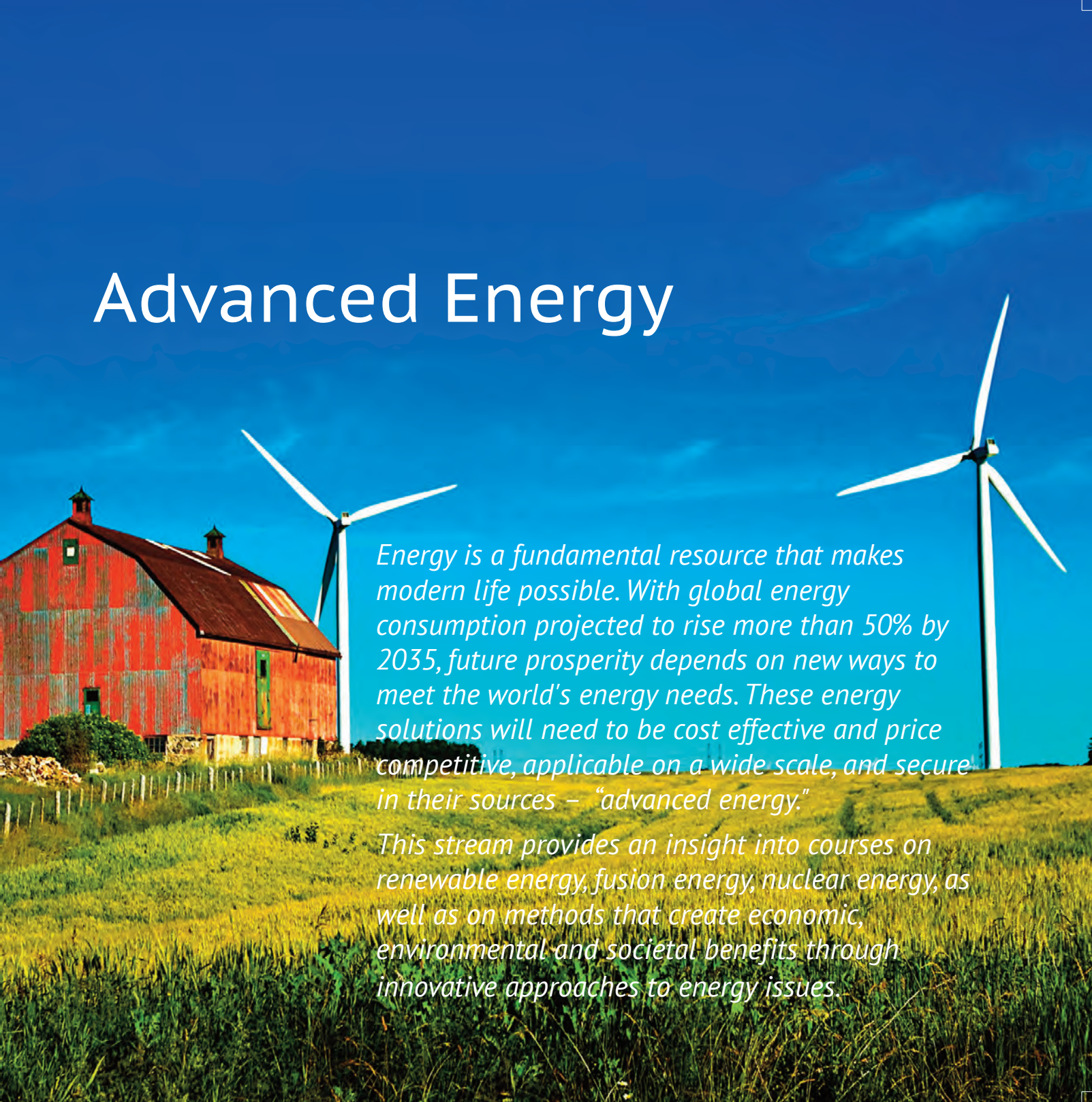
NS–16

Round table "Open questions in neuroscience"

The discussion on the open questions in Neuroscience is devoted to outstanding, recurring issues, problems and visions of contemporary neuromodeling and computational neuroscience, neurophysiology, cellular and molecular neuroscience, behavioral neuroscience, neuron-computer and brain-computer interfaces, and other topics introduced in lectures and courses of the stream.

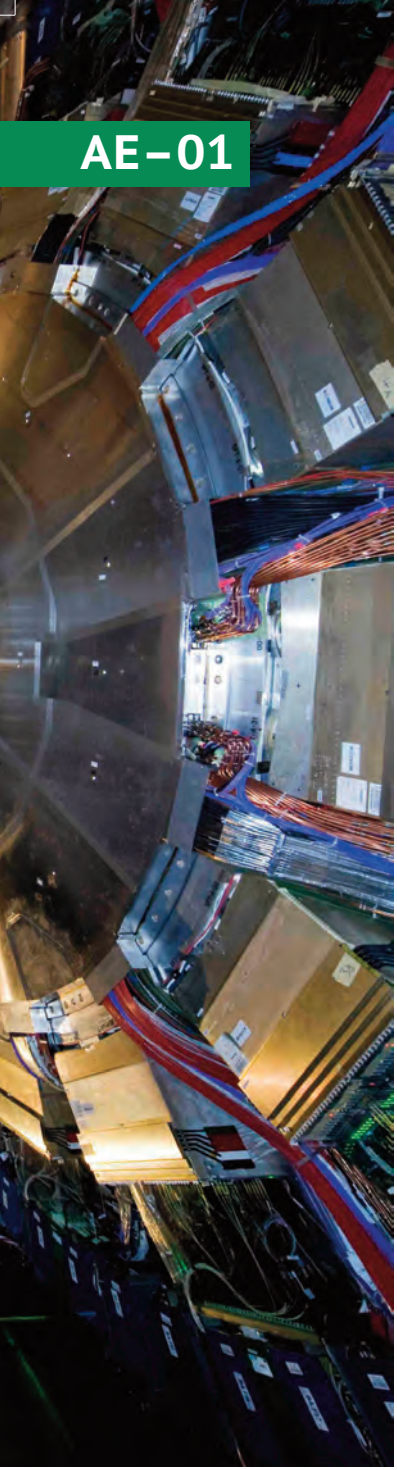
Most of the tutors of this stream take part in the discussion. A round table format provides fruitful scientific communication and networking, and allows participants to ask their questions directly to any of Summer School lecturers. It is an open event and all participants and tutors from all streams are invited to join the discussion.

Advanced Energy



Energy is a fundamental resource that makes modern life possible. With global energy consumption projected to rise more than 50% by 2035, future prosperity depends on new ways to meet the world's energy needs. These energy solutions will need to be cost effective and price competitive, applicable on a wide scale, and secure in their sources – "advanced energy."

This stream provides an insight into courses on renewable energy, fusion energy, nuclear energy, as well as on methods that create economic, environmental and societal benefits through innovative approaches to energy issues.



AE–01

Large hadron collider opens new horizons in atom-world

Large Hadron Collider (LHC) is the most expensive experimental setup ever built for the fundamental research. Physicists hope that the LHC will help answer some of fundamental open questions in physics, concerning basic laws governing interactions and forces among elementary objects, deep structure of space and time, and, in particular, interrelation between quantum mechanics and general relativity, where current theories and knowledge are unclear or break down altogether. Data are also needed from high energy particle experiments to suggest which versions of current scientific models are more likely to be correct.

In this talk a brief overview of the discovery tools at the LHC experiments (ATLAS, CMS, LHCb ALICE) is presented. In particular, recent achievements in micro-detectors and read-out electronics explored for creating unprecedendent tracking and vertexing systems as well as for high accuracy measurements of paricles energies ranging the TeV scale are discussed. Finally, the latest results of all four experiments are presented including a discovery of the Higgs boson announced by ATLAS and CMS experiments at CERN on July, 4th this year.



Valery Pugatch

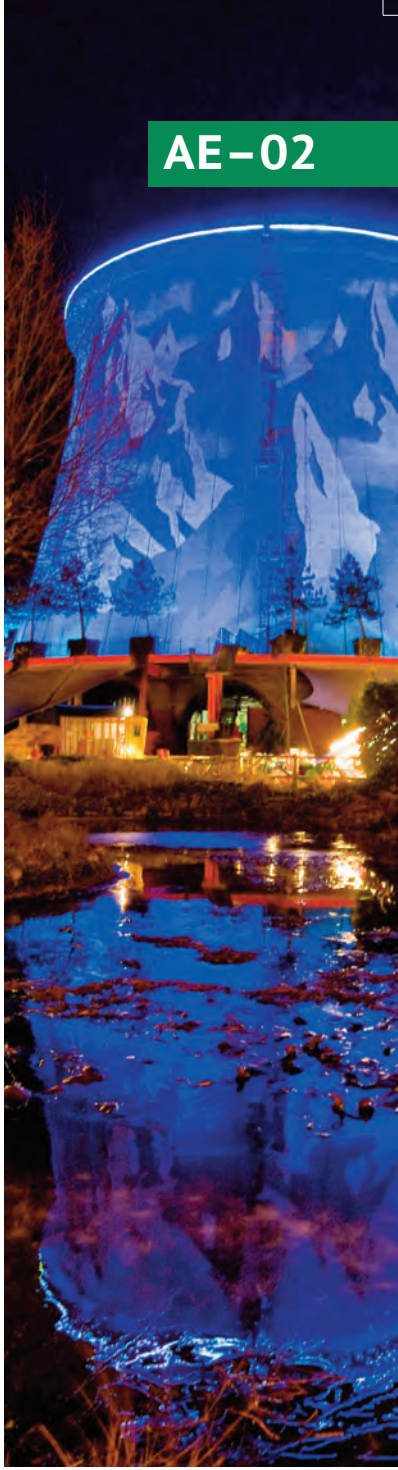
Doctor of physics and mathematics

Researcher at High Energy Physics department of the Institute for Nuclear Research NASU (Kyiv, Ukraine)

Areas of scientific researches: Many-particle nuclear reactions; giant, deeply-bound and un-bound nuclear resonances; nuclear dependence of mesons production cross-sections at high energies; CP-violation phenomena; high density nuclear states at relativistic heavy ion collisions; applications of micro-sensors and micro-electronics.

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The Germany nuclear phase-out decision



The German government announced in May, 2011 its plans to shut all of the nation's nuclear power plants within the next 11 years, up to 2022. The plan calls for phasing out all of Germany's 17 nuclear reactors and expanding the use of renewable resources. The decision was based on recommendations of an expert commission appointed after the Japanese disaster to study an industry that generates 23 percent of Germany's electricity.

This two day workshop addresses the backgrounds of the German decision to move towards an economy based on efficient use of renewable energy sources and the consequences for the global energy debate. The workshop is based on short introductions and video documentaries with interactive and participative working sessions. The course consists of two parts: first the participants get to know about energy transition based on comparison of energy policy scenarios and then about nuclear energy and its qualitative issues of concern – safety risks, security risks, radioactive waste – risks in the German energy transition.



Jan Haverkamp

Ir., M.Sc. in Environmental Engineering

Lecturer at Masaryk University of Brno (Brno, Czech Republic), Expert consultant on energy policy and nuclear energy at International environmental organisation Greenpeace.

Areas of scientific researches: nuclear energy and energy policy; facilitation of communication processes; public participation.

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Heat pump technologies

A heat pump is able to extract heat from the air, ground or water and provide it for using in different applications of human activity (heating, cooling etc). It is used to provide heating because less high-grade (i.e., low-entropy) energy is required for their operation, than appears in the released heat. In general, most of the energy for heating in such systems comes from the external environment, and only a fraction comes from the high-grade energy source. Some heat pumps are able to accomplish either conditioned-space cooling or warming, depending on operational setting. Reversible-cycle heat pumps are devices designed to work in either thermal direction, in order to provide heating or cooling of the same conditioned environment.

The course includes description of the principles of heat pump technologies; refrigerant working fluids; applications, installation and service of heat pumps; calculation of pay-off times for an investment in a heat pump system; analyzing the potential for heat pumps on the national level.



Volodymyr Voloschchuk

Ph.D. in Hydraulics

Associate Professor at the Department of Thermal and Mechanical Engineering, National University of Water Management and Nature Resources Use (Rivne, Ukraine).

Areas of scientific researches: thermal engineering, energy saving technologies, information technologies in thermal engineering; optimization and energy efficiency improvement in heating systems and buildings.

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Introduction to solar energy

AE–04



Solar energy can be defined rather simply as the conversion of sunlight into usable energy. Currently, solar energy is used to provide electricity to dwellings, businesses, schools, universities, space vehicles, etc. As traditional energy prices rise, solar energy use tends to grow at a rate of about 25 percent a year. The need of education for solar energy engineers is rising proportionally to the increasing interest in solar energy technology.

This course provides an overview of solar energy technologies, their role in a sustainable energy production and consumption, and explains the demand for solar energy in the global economy. Students get acquainted with various kinds of solar energy technology, their basic principles, advantages, disadvantages and limitations. Different kinds of solar energy are considered: solar thermal systems, solar photovoltaic, concentrating solar systems (solar tower, solar parabolic trough, solar Dish/Stirling), solar cooling. Additionally, students get optional assignments throughout the course to enhance the obtained knowledge.



Sergii Khairnasov

PhD. in Thermal Physics

Senior Researcher at Thermal Power Department, NTUU “Kyiv Polytechnic Institute” (Kyiv, Ukraine)

Areas of scientific researches: thermal and hybrid (PV-T) collectors; solar building integrated thermal and photovoltaic systems; heat pipes application to concentrated solar systems; heat exchangers based on heat pipes for energy saving equipments; systems of ensuring thermal modes of space and ground electronic equipments.

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Nuclear energy and medicine

Medical radiation physics is one of fascinating and intensively developing fields, which gives us possibility to use our knowledge on nuclear and radiation energy for health-related purposes. Medical radiation advances rapidly as a healthcare discipline today; it embraces huge advancements in information technology, digital imaging and instrumentation, making it one of the most advanced and dynamic areas of clinical medicine. Nuclear and radiation techniques are commonly applied in the diagnosis and treatment of a large numbers of infectious, cardio-vascular disorders and cancer.

This course allows understanding from the physical point of view – how ionizing radiation interact with the matter, what are the main principles of dosimetry, and how it is applied in medicine. Students get acquainted with modern radiation and nuclear technologies of diagnostics and medical treatment, such as x-ray radiography, radiotherapy, computed tomography (CT), nuclear medicine and positron emission tomography (PET).



Vira Bondar

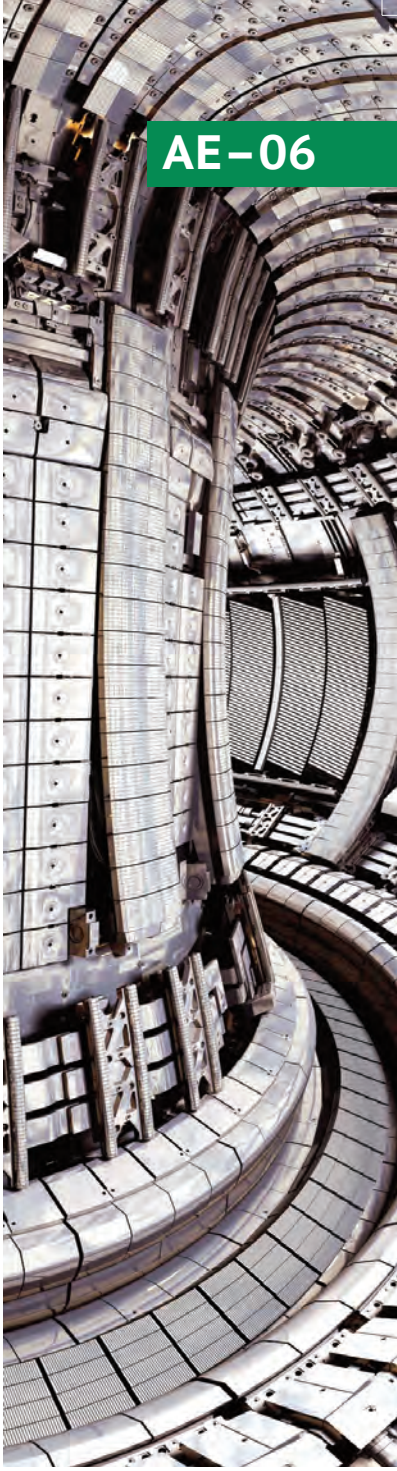
Ph.D. in Physics and Mathematics

Nuclear Physics Department, Taras Shevchenko National University of Kyiv (Kyiv, Ukraine)

Areas of scientific researches: nuclear data for science and technology; time-of-flight measurements of nuclear reaction cross sections; nuclear structure; characteristics of nuclear excited states and their decay; violin, joga, salsa, belly dances.

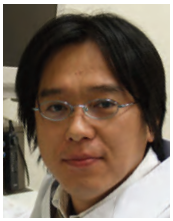
E-mail: vira_bondar@ukr.net

Fusion enegry



Fusion power is the power generated by nuclear fusion processes. The name comes from the nature of fusion reactions when two light atomic nuclei fuse together to form a heavier nucleus (in contrast with fission power). This energy is also environmentally safe: there is no possibility of a catastrophic accident in a fusion reactor resulting in major release of radioactivity to the environment or injury to non-staff, unlike modern fission reactors.

Fusion energy is in fact the energy of the future. The “big science” involves long-term, wide, complex and costly projects in the world. This course gives a systematic overview of the latest research and development on fusion reactors based on the technology readiness levels (TRL). The TRL is used for a complex measure of the engineering maturity of fusion reactor concepts in Japan. The course also emphasizes the role of materials innovation for the realization of fusion reactor power generation compared to currently-available fission reactors. Experimental simulation methods on fusion reactor materials are shown with the basis of material science and technology.



Ryuta Kasada

Ph.D.

Associate professor at Advanced Atomic Energy Research Section, Advanced Energy Generation Division, Institute of Advanced Energy, Kyoto University (Kyoto, Japan)

Areas of scientific researches: fission and fusion reactor materials; nanoindentation; radiation effects on solids.

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AE–07

Nuclear energy challenges in the 21ST century

The Fukushima accident in March 2011 has called into question the enthusiasm of the last decade towards large development of nuclear energy that was often described as "renaissance" of nuclear energy (meaning recovery from the fall observed after Chernobyl accident). However, despite the concern raised after this accident at the international level, nuclear energy is expected to continue playing major role in the energy production balance in number of countries all over the world for at least several decades more. The proponents of nuclear energy also note that the safety record of nuclear power is high when compared with many other energy technologies.

The lecture provides an insight into the operation and the control of nuclear reactors. The audience gets acquainted with the main parts of a nuclear power plant, the main characteristics of the core of the reactor, the process of power generation, the operation and the means used to control the nuclear processes in the core of the reactor and to ensure safe operation of the plant.



Michel Chouha

Doctor of Science

Scientist at Institute for Radioprotection and Nuclear Safety (Paris, France); Representative of IRSN in Eastern and Central Europe.

Areas of scientific researches: reactor physics; core design; nuclear fuel design; safety studies; accident analysis; residual power (decay heat).

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Comparative economic assessment of various energy systems

AE–08

The comparative economic assessments of various energy systems were conducted in many countries since the early 1990s, and were led by the international organizations such as the International Energy Agency and the International Atomic Energy Agency. Those studies compared different energy systems, including coal, natural gas, oil, nuclear, hydro and renewable energies such as wind, solar and biomass, in terms of various costs and influences to the regional economy, society, health and environment.

This lecture aims to give the overview of the results of those major studies and the basis for the decision making on the energy selection and planning in near future. The lecturer covers costs of various energy options assessed by different organizations, factors taken into account in these cost comparisons, international programs to assess and compare various energy sources, external costs of securing energy supply (energy import price shock and economic impacts), and both costs and risks of new technologies, technology development and sustainability.



Yoshio Matsuki

Doctor of Energy Science

Professor at the Department for Mathematical Methods of System Analysis, Institute for Applied System Analysis, NTUU "KPI" (Kyiv, Ukraine).

Areas of scientific researches: health and environmental assessments of nuclear and other energy systems; mathematical modeling; environmental monitoring; energy system analysis; nuclear plant monitoring; environmental impact assessment.

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AE–09

Energy and mass

Part 1. Electric energy production and consumption in Switzerland. In the introduction, the principal of electricity production is explained. The next part deals with the geography of Switzerland which is a country consisted by 2/3 of mountains up to above 4600 m. Many valleys are uninhabited and ideally suit for narrow and high barrages to collect water from rain, melting snow and glaciers.

Part 2. Energy and Mass: $E = mc^2$. In the preceding lecture, transformation of mass into energy is discussed. The forces, holding matter together, are examined as well.

Part 3. About energy and physics in football. Firstly, the important physical facts in striking penalties are explained. Then, everlasting discussions about goal or not goal are investigated coming up with the truth about the fifth goal (Wembley goal) in the world cup final 1966, England vs. Germany 4:2 and others. Furthermore, the physics of banana kicks is illustrated. The last part of the lecture deals with vector addition in football.



Manfred Daum

Dr. rer. nat.

Project consultant at Paul-Scherrer-Institute (Villigen, Switzerland)

Areas of scientific researches: physics with pions; muons; neutrinos; ultracold neutrons.

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Review of energy sector

While global energy consumption grows every year, structural diversification of energy supply becomes the top important challenge for global community. Forecast assessments of the world energy supply and demand structure of nowadays are given within this lecture, and its resource security is investigated. The expected global consequences of the impact of energy facilities on the environment are analyzed.

Volodymyr Voloshchuk
Associate Professor at National University of Water Management and Nature Resources Use (Rivne, Ukraine)

E-mail: vl.volodya@gmail.com



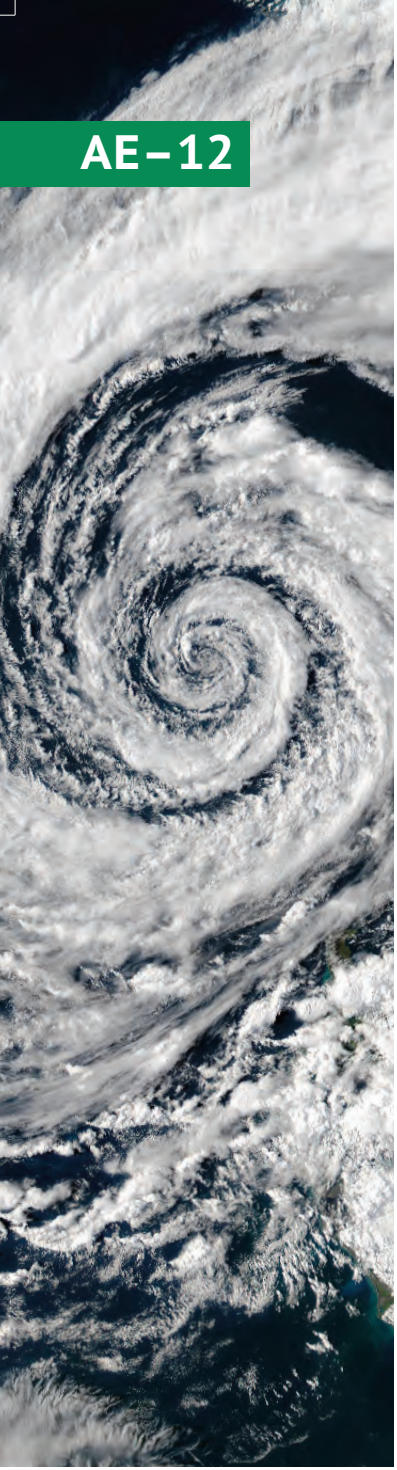
Review of thermal engineering

The course provides knowledge on theoretical fundamentals of heat engineering, and non-traditional heat sources, gives an overview of relationships among heat, work and other forms of energy to the participants of the stream. Knowledge and practical experience of possible technologies and techniques in thermal engineering for designing energy-efficient systems and managing energy in an effective way are presented.

Volodymyr Voloshchuk
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AE–12

Photovoltaics – a solution to slow down global warming

Global Warming is a phenomenon that has been headlining major media publications since the 1960's. Students get acquainted with the topic of Global warming as well as the way photovoltaics could become a solution to solve this critical problem. Topics to be discussed are the solar value chain, the production of photovoltaic technology and various case studies of successful Solar PV projects in Ukraine. The course is provided by Activ Solar, partner of AACIMP-2012.

Activ Solar, headquartered in Vienna (Austria), is a global company focused on the development and manufacture of solarbased technology. The company's main business areas include production of silicon products and development of large-scale photovoltaic installations. PJSC Semiconductor Plant, based in Zaporozhye, Ukraine, is a subsidiary of Activ Solarwith Polysilicon production history dating back to 1964. Activ Solar develops finances and realizes large-scale solar energy projects combining world-class expertise, strategic partnerships with cutting edge technology. The company's unique vision, industry know-how and technological excellence unite to deliver high quality and sustainable solar energy



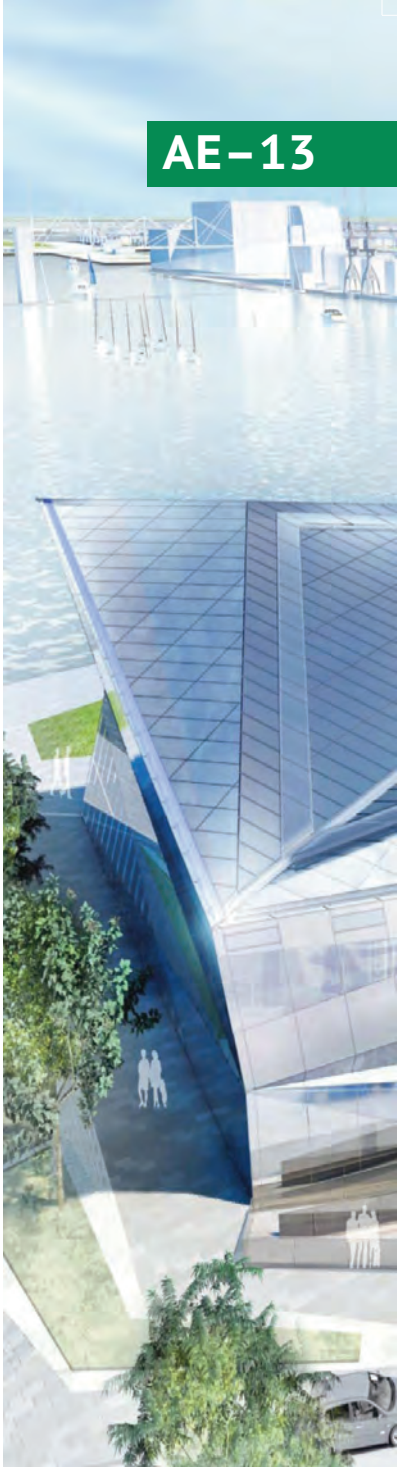
Johann Harter

Physicist with a PhD in Semiconductor Electrolyte Contacts

COO at Activ Solar (Vienna, Austria)

Areas of professional activity: Dr. Johann Harter joined Activ Solar in May 2010 bringing over 28 years of experience leading multinational teams across Europe, the United States and Asia in the field of technology development, semiconductor manufacturing, business management, operation ramp-up and restructuring. Dr. Harter is a physicist with a doctoral degree in semiconductor electrolyte contacts from Karlsruhe University, Germany.

Sustainability at Siemens



This lecture addresses the performance of Siemens in sustainability area from the viewpoint of global social and economic trends. It explain show these factors are shaping Siemens business as well as how they harbor significant risks. The lecture also demonstrates how a sustainability-driven company can minimize the risks and master the challenges to leverage emerging opportunities for its stakeholders.

Sustainability these days is a buzzword used in many different contexts with many different connotations. Everybody agrees that the world development should be sustainable. But what does it mean for a multinational company? Siemens doesn't just talk about sustainability: it made the three areas of sustainable development – environment, business and society – the cornerstone of all its activities. It is an integrated technology company aiming to sustain profitable growth and create long-term value for all stakeholders. To help achieve this, One Siemens, a new framework for sustainable value creation and capital-efficient growth, was rolled out worldwide.



Olena Mykal

Ph.D. in International Relations

Head of Strategy and Business Development Department at Siemens Ukraine (Kyiv, Ukraine)

Areas of professional activity: before joining Siemens she worked in Mergers and Acquisitions Area as a Coordinator of the Projects and also at the National Institute of Strategic Studies of Ukraine on the position of Deputy Head of the Foreign Policy Department. Dr. Mykal holds PhD in International Relations from WasedaUniversity (Japan).

AE–14

Excursion
to the instute of hydromechanics

The Institute of Hydromechanics of National Academy of Sciences of Ukraine is the leading organization in the country on problems of hydrodynamics, acoustics, hydraulics and hydraulic engineering. Recently, the technology of sustainable energy has gained an important role for the Institute, particularly, hydro energy technology and technology of low-potential heat usage, that is realized in numerous heat pumps. In collaboration with Royal Institute of Technology (KTH, Stockholm, Sweden) and NTUU "KPI" joint educational and research laboratory of heat pumps was opened at the Institute.

The excursion to the laboratory provides participants with an insight into the heat pump technology. During the visit they can see the functioning heat pump and have possibility to discuss the principles of technology operation with scientists of the Institute. Besides, participants can visit new wind tunnel laboratory. Wind tunnel laboratory is home for a low-speed, closed-return wind tunnel used to support fundamental and applied research in fluid mechanics, aerodynamics, and convective heat transfer.



Institute of Hydromechanics

The Institute of Hydromechanics was founded in 1926 as Ukrainian Scientific Research Institute for Water Management under the initiative of an outstanding hydrologist, academician, Eugen Vladimirovich Oppokov. Since 1938, the Institute was known as the Institute of Hydrology and Hydraulic Engineering. Finally, in 1964, after founding of new laboratories it was reorganized to the Institute of Hydromechanics that belongs to structure of the National Academy of Sciences of Ukraine.



Mobile Software Development

The world is getting flatter and more mobile. Desktops are being replaced increasingly by laptops, tablets and smartphones. The stream provides an exceptional opportunity to get familiar with tools and techniques that will be in high demand in the nearest future.

Participants of the stream become part of an international team that will be working for two weeks to create a cross-platform game that can be played both on iOS or Android devices, smartphones and tablets alike.



Agile project management

Agile methods are commonly used to manage smaller cross-functional teams and deliver product in small increments, nimbly responding to rapidly changing business needs. In this lecture participants are introduced to the theory of SCRUM project management methodology, while they have an opportunity to practice it during the whole period of the Summer School.



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IT consultant at Netlight Consulting AB (Stockholm, Sweden)
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Tools for development

A professional can work with any tools and deliver results. But good tools make life much easier and teams more productive. In this workshop, participants of the “Mobile Software Development” stream learn how to use version control system and neat tips and trick how to use WebStorm more effectively. Additionally, students try their hand deploying simple applications to Github.

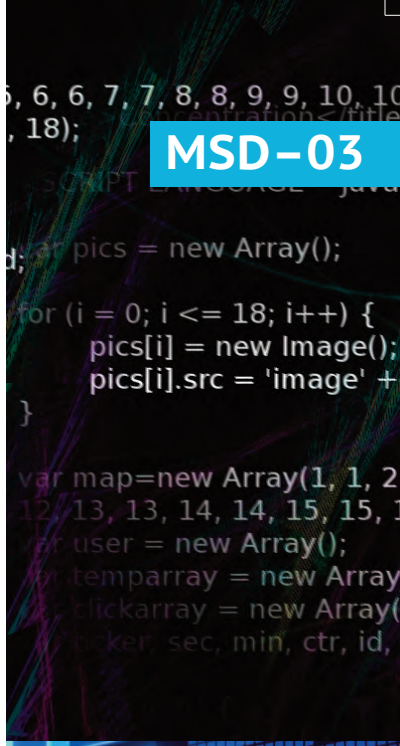
Vasilij Savin
IT consultant at Netlight Consulting AB (Stockholm, Sweden)
E-mail: vasilij.savin@netlight.se

Jasmine, javascript unit test

Unit testing allows developers to test automatically separate units of code and enforces more modular and encapsulated design, which provides a safety net and some peace of mind when making significant changes in already existing code. Jasmine framework is a Javascript behavior-driven development framework, not dependent on any other libraries or frameworks and even do not require DOM.



Ivan Milles
IT consultant at Netlight Consulting AB (Stockholm, Sweden)
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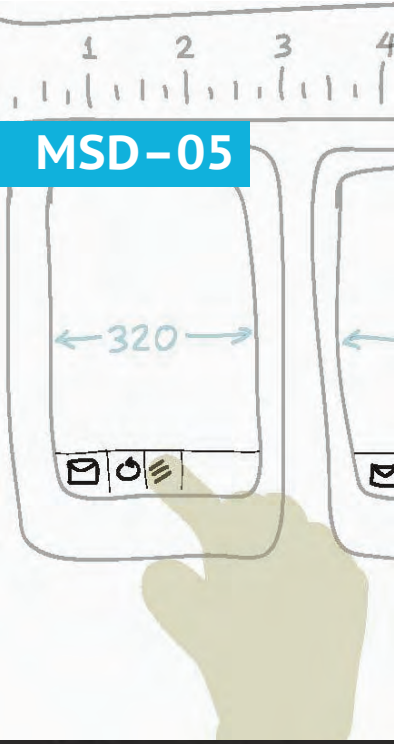


Mobile
web development

More and more people access web resources via mobile devices, so it is essential for developers to provide pleasant user experience in that media. This can be achieved either via native mobile applications or building a mobile web application. Currently there are many competing mobile platforms; maintaining all of them is getting rather difficult. HTML5/CSS 3/JS combo allows web developers to deploy an application across different platforms and devices with the same code base. These technologies are the main focus of the lecture.

Vasilij Savin (Stockholm, Sweden)

Ivan Milles (Stockholm, Sweden)

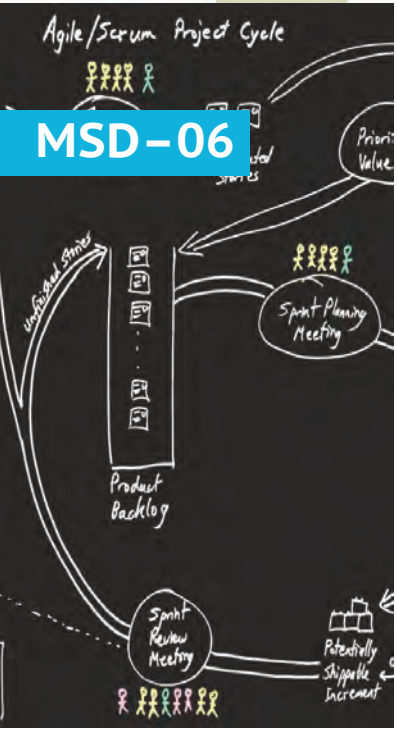


User interface design and prototyping

This workshop examines basic aspects of UI Design and teaches how to create a sound user interface. Students gain an understanding of the user interface design process, learn how to develop personas and create prototypes, how to order disorder with grids and many other techniques and approaches. Participants are taught as well how to create lo-fi (low fidelity) interface mockups for web applications.



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Development process

Practical part of the stream is basically the software development which goes in small teams according to the agile software process and covers planning, prototyping, development, testing and deployment phases. Stream development coordinator, who plays the role of product owner, works next to the teams, keeps track of their progress, helps coordinate and plan within a team.



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Intermediate release presentation

Nowadays, an iterative approach has been widely adopted, where customer gets to see work-in-progress and make adjustments to requirements based on better understanding of problem domain. During this activity participants present what they have managed to create so far and get feedback from other teams and stakeholders. Pre-release coordinator reviews progress and provides usefull feedback as well.



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Presentation workshop

More often than not, systems are developed to meet needs of non-technical users. However, there is usually an acknowledged communication gap between engineers and non-technical people. In this workshop teams prepare presentations of their work to the rest of AACIMP participants. Each team have an opportunity to get feedback from tutor and improve their presentation skills prior to the grand day.



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MSD–09



Samsung Electronics – main technical partner of the stream

One of the most important parts of the mobile software development process is a testing operation on real technical devices. For this purpose Samsung Electronics Co. kindly provides participants of Mobile Software Development stream with their brand new phones and tablets on basis of Android operational system. Thus students of the course have an opportunity to estimate such important characteristics of software as portability and compatibility.

Besides that, participants get to know about mobile applications online store – Samsung Apps. Available from September 2009 in some European (including the United Kingdom, France, and Italy) and Asian countries, Samsung Apps has expanded its availability following the launch of the Samsung Wave smartphone. The store is currently offered in 121 countries.

Samsung Electronics

Samsung Electronics Co., Ltd. is a global leader in semiconductor, telecommunication, digital media and digital convergence technologies. The company operates two separate organizations to coordinate its nine independent business units: Digital Media & Communications, comprising Visual Display, Mobile Communications, Telecommunication Systems, Digital Appliances, IT Solutions, and Digital Imaging; and Device Solutions, consisting of Memory, System LSI and LED.

Recognized for its industry-leading performance, Samsung Electronics was named the world's most sustainable technology company in the 2011 Dow Jones Sustainability Index.

Social Program



Summer School is two weeks of unforgettable impressions. Each day after classes participants are invited to join excursions to famous and mysterious sites of Kyiv, walking tours, cruise on the Dnipro River, contests and games, cinema club, quest, and many other activities.

Summer School is a fantastic possibility for guests of Ukraine to discover Ukrainian culture and traditions.



Lectures on Computational Neuroscience History

How this discipline appeared on the Earth? How has it been developing from the very beginning up to nowadays? How was it on either side of the zero meridian?

Two branches of Computational Neuroscience

Two Neuroscience stream tutors discover the whole way of nowadays Computational Neuroscience development.

The specialist widely known in the Computational Neuroscience field all over the world, the sceintist who worked at ground zero of Computational Neuroscience, Prof. John Rinzel from New - York University narrate about Computational Neuroscience history growth in USA in his lecture “Step by Step into Computational Neuroscience History”. The listeners of the lecture will be wined and dined in the open air enjoying picturesque view of the KPI campus. The founder and the president of Russian Neural Networks Society, Prof. Witali Dunin-Barkowski from Scientific Research Institute for System Analysis, Russian Academy of Sciences discovers the way of Computational Neuroscience in the USSR and then in Russia for AACIMP students. The participants of the lecture are treated with tasty food and beverage.

Flashbacks, first-hand reports, history through the eyes of the two specialists contributing to the evolution of the Computational Neuroscience field, unity and companionship, historical photos and unforgettable possibility to speak to the history alive.

Two branches of Computational Neuroscience history meet on the Summer School AACIMP-2012 in August.



Excursion to Pereyaslav-Khmelnytskyi

The Museum of Folk Architecture and Rural Lifestyle

Ancient city from Kievan Rus

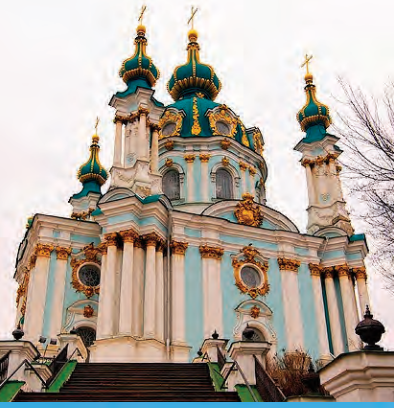
Visitors to the town of Pereyaslav-Khmelnytskyi, located at the confluence of the Alta River and Trubizh River about 100 km southward from Kyiv, discover a plenty of interesting attractions to visit. In fact, the entire town has been proclaimed to be a historical sanctuary, with its history dating back to the year of 911 when it was first referred in the text of the treaty between the Byzantine Empire and Kyivan Rus. In 992, under the direction of the Prince of Kyiv, Vladimir I, a large fortress was built in the town.

The fate of Pereiaslav-Khmelnytskyi leaded the town through numerous challenges and difficult times. However, today it appears to be a nice and cozy place for citizens and tourists, although it has not become a capital city or megalopolis.

City of museums

The attractions of Pereyaslav-Khmelnytskyi include the Museum of Folk Architecture, displaying a rich collection of historical items relating to the architecture and traditions of Ukrainians. Other museums to see are the Museum of Space Exploration, Museum of Beekeeping, Museum of the Cossack Glory, Museum of Rushnyk, Museum of Ukrainian Traditional Dress, and the Museum of Bread. The St Michael's church, built in the mid-1600s, was the Ascension monastery with its cathedral added at the end of the 17th century. Excavated ruins of 10th and 11th century buildings also offer some fascinating insight into the history of this beautiful Ukrainian region.







Discovering Kyiv City

Along the Streets of Old Rus City

This is the first part of Kyiv City Tour — “Discovering sights of the Old Kyiv City”. During the excursion participants see the Opera house — one of the largest theaters, the ancient Golden Gate, the dazzling domes of St. Sophia and St. Michael cathedrals, Andrew's Descent — the street which preserved the spirit of Kiev of the previous centuries. The tour finishes at the Podil — a trade center of medieval Kyiv.

Between the Upper City and Pechersk

This tour acquaints participants with architectural masterpieces of old Kyiv. While drowning in the shadow of chestnut streets, one can admire the ancient and the modern — solemn and mysterious monuments of Kyiv architecture. Participants see St. Volodymyr’s Cathedral, Taras Shevchenko University, the Presidential Administration, House with Chimeras, and the main street of the city — Khreshchatyk.

Cruise along the Dnipro River

The participants are invited to the exciting evening river tour. From the deck of a comfortable river bus, floating on the waters of the Dnipro River, everyone is going to see amazingly beautiful view of Kyiv. First — quiet Podil, then — golden domes of Kyiv-Pechersk Lavra sinking in the greenery, Volodymyr’s Hill, the majestic monument to “Mother Motherland”, bridges from simple ones to the most beautiful.

Fun and leisure

KPI Quest

Participants are invited to the dynamic and exciting quest, which is intended to acquaint AACIMP students with one of the biggest technical universities in Europe. Quest tasks should be completed step-by-step on the way to the final point. Participants are divided into several teams and each team has to cooperate as one whole crew. This is a perfect opportunity to try one's best and feel a real team spirit.



Board games evening

Board games evening is a nice opportunity to spend time together in pleasant and warm atmosphere. Playing board games helps participants to relax and have fun, to break the ice and to broaden one`s horizons in a funny way. The event should strengthen team player skills as well as give a chance to discover new cultures and learn languages in a light-hearted company just while playing a game.



AACIMP Football Championship

In the second week of the Summer School participants and tutors are invited to another competitive event. Four teams — each one represents one of the streams — will contend for the title of AACIMP-2012 football champion. The tournament will be held at the new and cozy stadium in KPI campus. Again, participants, tutors and organizers gather together and enjoy the summer time in Kyiv.









Impressions and emotions

Kyiv Photo Quest: picture the moment

Kyiv Photo Quest is an opportunity for both students and tutors to get acquainted with sights of Kyiv, show your erudition, and spend enjoyable and memorable time together. Participants of the Quest are devided into several teams. Each team has to find places of interest which are depicted in the team's travel list. The team, which scores the most points for completed assignments, wins.

Pinchuck Art Centre

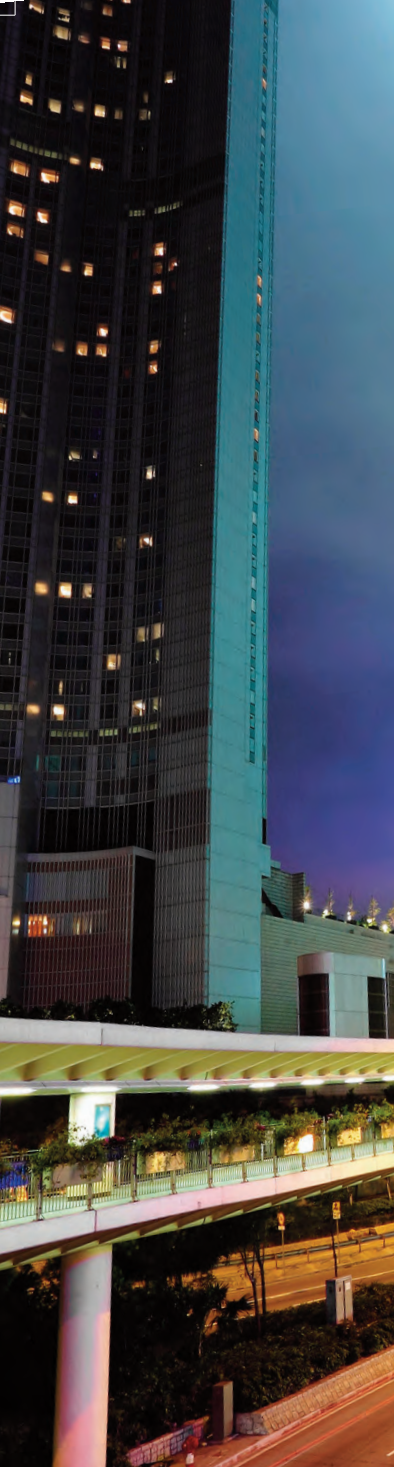
Pinchuk Art Centre is an international centre of contemporary art. Its definite innovative profile aims to interlace new production, presentation and collection bridging national identity and international challenge. Participants are invited to visit solo exhibition by Anish Kapoor, and collection platform "Forever Now" — dynamic combination of modern leading artists.

AACIMP cinema club

Once Alfred Hitchcock said that cinema is life with the boring bits cut out. Thus participants and tutors of the Summer School are invited to join our AACIMP cinema club where they are given an opportunity to take a look at real scientific masterpiece about prominent scientist Steven Hawking. Perfect combination of pure science and real life story makes it very interesting for both participants and tutors.



Partners of the Summer School



Special partners

Siemens
http://siemens.com

Siemens AG is a global powerhouse in electronics and electrical engineering, operating in the fields of industry, energy and healthcare as well as providing infrastructure solutions, primarily for cities and metropolitan areas.

For over 160 years, Siemens has stood for technological excellence, innovation, quality, reliability and internationality. The company is the world's largest provider of environmental technologies. Around 40 percent of its total revenue stems from green products and solutions.

EPAM
http://epam.com

EPAM is the leading software services and solutions provider from Central and Eastern Europe. From software products to core business applications, EPAM has provided expert consulting, development, testing, support and infrastructure services to many of the world's leading organizations.

Headquartered in Newton (Pennsylvania, USA) the company has software development centers and branch offices in the United States, Canada, UK, Sweden, Switzerland, Hungary, Germany, Poland, Belarus, Ukraine, Russia and Kazakhstan.

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