
INTERNATIONAL SEMESTER

**"Advanced Technologies of Information
Systems for Enterprises"**

taught in English



**St. Petersburg State Polytechnical University
Institute of International Educational Programs**

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WHY study in IIEP SPSPU?

Saint-Petersburg State Polytechnical University (SPSPU) is one of the city's oldest and most prestigious institutions of higher education. Institute of International Educational Programs (IIEP) is the largest department of SPSPU having long and wide experience in providing educational programs in area of informational technologies, business, international relations, culture and Russian language for SPSPU partner universities, international educational organizations and companies from all over the world.

WHY study in international semester "Advanced Technologies of Information Systems for Enterprises"?

The program is developed according to the **European requirements** and can be recognized as a semester abroad. It provides students with opportunity to study in the **international environment** getting the intercultural experience. Our program is proposed to students of technical **and information management specialities** who are willing to deepen their knowledge of **information technologies and intelligent systems and their applications**.

The program comprises **compulsory and elective courses** conducted in English. You have opportunity to combine your studies, professional and international experience. We organize **field-trips and study visits** to the enterprises and leading companies of Saint - Petersburg working in the field of **information technologies and intelligent systems**. During the last weeks of the program students are suggested to develop **interdisciplinary project** where they will be able to use all knowledge they obtained during the program and to **apply it to practice**.

University administration and Russian tutor students will make the stay of visiting students **pleasant, comfortable and safe** and will help them settle in and explore the metropolis of 5 million inhabitants.

In this brochure you will find program description and syllabi of the courses offered within the framework of the program.

PROGRAM DESCRIPTION

Program Duration: 17 weeks

Program Begins: February 01, 2007
September, 2007 (in process of a complete set)

Participants: international and Russian students

Prerequisites: undergraduate students - at least two years of Bachelor level studies, with good command of English

Teachers: St. Petersburg State Polytechnical University Professors

Training methods: lectures, laboratory works, practical trainings, company visits and group discussions

Credits: maximum 30 ECTS credits per semester

Program Scheme: Compulsory courses + Elective courses + Interdisciplinary project. Compulsory courses and interdisciplinary project are obligatory. Students can also choose elective courses from the list to get 30 ECTS credits as maximum.

Program Content:

Compulsory Courses:

Business operations research and management science 2.5 ECTS
Internet programming for enterprises 2.5 ECTS
Technologies of programming 2.5 ECTS
Neuroinformatics: theory and applications 2.5 ECTS
Knowledge engineering 2.5 ECTS
Planning for enterprises 2.5 ECTS
Modern operation systems 2.5 ECTS
Russian language 3.5 ECTS

Elective Courses*:

System modeling. Engineering and economics 2.5 ECTS
Information systems of safety 2.5 ECTS

* Course can be cancelled if there are less than three persons applied for.

BUSINESS OPERATIONS RESEARCH AND MANAGEMENT SCIENCE

Objectives	The course introduces the modern approach in practical modeling of optimization problems in management science
Content	<p>The course gives a complete overview of different types of modern optimization techniques which are of value in dealing with the company's problems: cooperative genetic algorithms, linear fractional programming, application map planning, navigation planning. Students will be introduced to the theory and practice of the following problems:</p> <ul style="list-style-type: none"> - Algorithms of forecasting in econometric researches based on Neural Networks (traditional approach to supervised neural networks, genetic search for neural network weight optimization, flexibility in the choice of criteria, forecasting the future direction of share market prices, research studies and practical applications) ; - Catastrophe Theory algorithms for investigation of the structural adaptability of economic systems (dynamical processes, degenerate and non degenerate critical points, transversality and structural stability, normal, splitting and conflicting factors, attractive surface, 2- and 3 -parameter models of structural instability, successful applications) ; - Cluster's method in modeling of company's activity (construction and use of Input-Output models, cluster identification techniques using employment and Input- Output data, modeling of agglomeration forces, geographical and functional dimensions of specific cluster identification, an empirical approach to the identification of the specific cluster, practical applications)
Teaching and learning methods	The educational process includes lectures on the modern algorithms and their practical applications. Interactive lecturing promotes students' participation. Numerous practical examples provide a clear understanding and profound knowledge of the subject. Small case studies will enable students' active participation
Readings	<p>Fredric M, Ham and Ivica Kostanic . Principles of Neurocomputing for Science and Engineering. Mc-Graw-Hill Companies, Inc 2001.</p> <p>Stephen W . Mathematics of Neural Networks: Models, Algorithms and Applications (Operations Research/Computer Science Interfaces Series),1995.</p> <p>Agarwal . Recent developments in operation research . Narosa Publishing House,2000.</p> <p>Monahan G. Management Decision Making, UK: Cambridge University Press,2000.</p>
ECTS	2.5
Assessment	<p>Written exam</p> <p>Group work</p> <p>Class participation</p>

INTERNET PROGRAMMING FOR ENTERPRISES

Objectives	The goal of study is to get knowledge on methodology and philosophy of the internet programming. The practical applications are given with Java programming language for business processes modeling.
Content	Java language fundamentals. Objects, classes, fields, methods and access modifiers. Platform independent and native methods. Primitive type and object references converting and casting. Exception classes and exception processing. File input and output. Streams, readers and writers. Threads control. Suspending, sleeping, blocking and scheduling implementation, object lock and synchronization. Graphics User Interface (GUI) programming. Layout managers, visual components, containers, menus. Events processing. Events delegation model and explicit event enabling model. Painting and graphics context. Clipping. The GUI thread and spontaneous painting. Images. Animation. Applets and frames. Drawing in applet. Open system interconnection model. TCP/IP protocols architecture. Internet addresses, DNS. Network programming. TCP based client-server application. Servicing a set of clients. UDP based client-server application. Distributed applications and RMI. URL in applet. Distributed and client-server database architecture. Hierarchical, relational and object-oriented databases. ODBC and JDBC interfaces. JDBC based routines. Selection, projection and updating statements. Statement, prepared statement and query results processing. Web servers and browsers. Servlets for HTTP request and response, Http-session, cookies, java server pages scripts. Security policy and security manager for java applets and applications. Keys generation algorithms. Message digest algorithms and its implementation, data digital signature and digital certificates.
Teaching and learning methods	Students develop 7 java routines such as: object-oriented program on computational mathematics, thread control program, GUI application code, develop applet (drawing, images loading and sound playing), database interface programming, client-server TCP/IP based application, information guarding and security providing. Lectures are combined with practical training in a class of computers linked to the Internet and equipped with on-line electronic tutorials and knowledge testing facility.
ECTS	2.5
Readings	S. Roberts, P. Heller, M. Ernest. Java-2 certification study guide. San Francisco, 1999. J. Jaworski, P. Perrone. Java security handbook, a division of Macmillan Computer Publishing, USA, 2001.
Assessment	Written exam Group work Class participation

TECHNOLOGIES OF PROGRAMMING

Objectives	This course is aimed at developing skills to create flexible data structures and methods of processing based on fundamental OOP concepts: abstract data types, encapsulation, inheritance and polymorphism. The course is based on the Microsoft .NET Framework platform. It gives the students the intermediate-level skills needed to write applications for the .NET available in Windows operating system. .NET Framework is a set of technologies that are designed to transform the Internet into a full-scale distributed computing platform. The goal is to reduce the time needed to build professional applications, while increasing the overall quality and functionality.
Content	<p>Content provides new ways to build both Windows-based applications and Web-based applications. New approaches reside on fundamentals that are covered in: Principles of Windows operating system. Message handling mechanisms. Structure of a standard Windows application based on API elements, such as: functions, macro extensions, messages, interfaces.</p> <p>The run-time environment (CLR). The code execution management. Portable executables. C# console applications. Namespaces and classes of .NET Framework. Assemblies and CLR metadata. Tools for exploring namespaces. Managed and unmanaged code. Garbage collector and memory allocations. Value and reference types. Built-in data types. Class Object as the super-class in .NET Framework. Creating class hierarchy. Virtual functions and their overridden versions. Exception handling. Class Array, its properties and methods. Overriding operators and functions. Interfaces implementation. Sorting the objects and IComparable. Enumerations and their usage. Properties as named members of a class. Indexer declaration and usage. Delegate declaration and usage. Delegates and system events. Handling and raising events. Dynamic data structures in .NET Framework class library. Windows forms-based Win32 desktop applications. GDI+ graphics classes. Device contexts and graphical primitives drawing. Main GDI+ instruments, their usage and management. Bitmap-image structures, management and animation using timers. Debugging technology, methods and tricks. Investigating the coordinate transformations. Modal and modeless dialogs. Basic control elements. Data grid and its management. Creating file system and timer components. Overview of Web forms applications. Platform-independence. Browser-neutral user interface. ASP.NET applications. Creating the simple ASP.NET distributed application using ASP.NET classes. Basics of Network programming.</p>
Teaching and learning methods	Students create and implement numerical and other algorithms in C# console application. They implement a full-featured Windows-based application that meets the standard requirements, create and implement applications using basic controls and system colors/metrics, create and implement an ASP.NET applications. Lectures are combined with practical training in a class of computers linked to the Internet and equipped with on-line electronic tutorials and knowledge testing facility.
ECTS	2.5
Readings	Andrew Troelsen. C# and the .NET Platform. 2005. Andrew Troelsen. Pro C# 2005 and the .NET 2.0 Platform. 2005.
Assessment	Written exam Group work Class participation

NEUROINFORMATICS: THEORY AND APPLICATIONS

Objectives	<p>With the phenomenal growth in the area of intelligent systems in the past years, the subject of artificial neural networks and its application for information management has become very popularity. Another perspective direction of intelligent theory concerns intelligent data analysis and decision making support systems. This course aims to combine two novel instrumentation concepts of neural net simulation algorithms for intelligent data analysis with virtual instruments engineering technology on base of LabVIEWR Graphical Programming Systems (National Instrument-STM, USA).</p> <p>The course is oriented to provide an basic knowledge of neuroinformatics and artificial neural network, and large area its application in industry and scientific experimentation. The course proceeds from a clear but concise exposition of neuroscience fundamentals, mathematical theory and algorithms as medicine, intelligent security system, technical diagnostics, at est.</p>
Content	<p>Introduction. Preface to problem. Artificial intelligence and intelligent data analysis. Brain computer and "brainware".</p> <p>Foundations of neural networks. Biological prototypes, artificial neurons and neuron models. Artificial neural networks: architectures and algorithms. Learning of neural networks: : supervised and unsupervised training.</p> <p>Mathematical Backgrounds of NN-Theory. Algebraic formulation of neural networks learning via optimization problem. Unconstrained optimization and gradient descent algorithms. Stochastic gradient optimization. Genetic algorithms. The algorithm of dual functioning and back-propagation.</p> <p>Models, Architectures and algorithms. Perceptions and threshold logic classification. Multilayer Feedforward Networks. Radial Basis Function (RBF) and RBF-Networks. Supervised Learning in Multilayer Feedforward Networks. Backpropagation theory. Competitive Learning Rule and Competitive Dynamics. Kohonen self-organizing maps. Feedback recurrent networks and associative memories. Discrete Hopfield net and bidirectional associative memory.</p> <p>Information-theoretical approach to self-organizing neural networks. Overview of the emergent properties of non-linear self-organizing neural networks within the context of a blind signal separation problem and independent component analysis approach. Entropy-based criterions and independent component analysis.</p> <p>Application of Neural networks. Knowledge -base system. Discussion working support system. Business processes of optimization.</p>
Teaching and learning methods	<p>Interactive lecturing promotes student participation. Group discussions are planned to activate student's involvement. The students work with the original LabVIEW toolkit, which is oriented to applications in industry and science laboratory applications.</p>
ECTS	2.5
Readings	Haykin S. Neural Networks: A Comprehensive Foundation. Mac-Millan. N.York.1998.
Assessment	Written exam Group work Class participation

KNOWLEDGE ENGINEERING

Objectives	Main objective of the course is to give understanding concepts and methodology of planning for manufacturing systems, enterprises, and corporations. Other objective is a student learning to practical skills for building centralized and distributed planning systems of an enterprise using modern software tools for the planning.
Content	The course considers many theoretical and practical issues according to the following topics: short descriptions of manufacturing systems, enterprises, and corporations as objects for planning; common approach to planning; motivation for using distributed planning approach; methods of modeling objects of planning; various approaches and methods of planning; distributed planning methods; multi-agent plan coordination; distributed job shop scheduling; distributed supply chain management; resource, task, and role allocations; example of planning for multi-agent game and flexible manufacturing systems; descriptions of existing software tools for planning (ERP, Material Management and Human resource System, Multi-agent Production Planning System of Certi-Con, MASCOT); Multi-agent Development Kit for application design; perspectives of planning methods development.
Teaching and learning methods	The course includes theoretical part (lectures) and practical lessons. The theoretical part covers the topic in theoretical terms. The practical lessons are led in computer class where students work in small groups and then report results in the classroom. Finally the course project must be done before exam.
ECTS	2.5
Readings	M. Ghalab, D. Nan, and P. Traverso. Automated Planning Theory and Practice, Morgan Kaufmann Publications, Elsevier, 2004. M. Yokoo. Distributed Constraint Satisfactory. Foundation of Cooperation in MAS, Springer Series on Agent Technology, Springer, 2001.
Assessment	Written exam Group work Class participation

PLANNING FOR ENTERPRISES

Objectives	Main objective of the course is to give understanding concepts and methodology of planning for manufacturing systems, enterprises, and corporations. Other objective is a student learning to practical skills for building centralized and distributed planning systems of an enterprise using modern software tools for the planning
Content	The course considers many theoretical and practical issues according to the following topics: short descriptions of manufacturing systems, enterprises, and corporations as objects for planning; common approach to planning; motivation for using distributed planning approach; methods of modeling objects of planning; various approaches and methods of planning; distributed planning methods; multi-agent plan coordination; distributed job shop scheduling; distributed supply chain management; resource, task, and role allocations; example of planning for multi-agent game and flexible manufacturing systems; descriptions of existing software tools for planning (ERP, Material Management and Human resource System, Multi-agent Production Planning System of CertiCon, MASCOT); Multi-agent Development Kit for application design; perspectives of planning methods development
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Readings	M. Ghalab, D. Nan, and P. Traverso. Automated Planning Theory and Practice, Morgan Kaufmann Publications, Elsevier, 2004. M. Yokoo. Distributed Constraint Satisfactory. Foundation of Cooperation in MAS, Springer Series on Agent Technology, Springer, 2001.
Assessment	Written exam Group work Class participation

MODERN OPERATION SYSTEMS

Objectives	<p>This course is base for system administrators, listeners will be trained in base operations with file systems and their reserve copying, will execute standard installation Solaris from CD, will learn to operate the software and its updatings, will receive skills on management of users, will get acquainted with process of loading and stop Solaris, and also with a control system of services. Except for that they will teach necessary knowledge on safety of system, management of processes and a process of system printing.</p>
Content	<p>The course will examine a number of related topics, such as:</p> <p>File system. Hierarchy of file system Solaris. Work with local disk stores. Work with external connected carriers of data. Dynamic configuration stores. Management of file systems in Solaris. Assembling file systems. Monitoring behind use of file systems.</p> <p>Reserve copying. Work from CD and DVD. Performance of reserve copying and restoration. Use of instant pictures UFS (UFS Snapshots).</p> <p>Installation Solaris. Principles of installation Solaris from CD. Planning of installation. The information demanded for successful installation. Performance of installation Solaris from CD.</p> <p>Management of the software and updatings. Management of the software. Updating of the software.</p> <p>Management of users. Management of users. Management of groups of users. Management of passwords.</p> <p>Loading of system and start of services. Process of loading. Adjustment Boot PROM (For SPARC). Loading and stop of the systems. Management of services by means of SMF.</p> <p>System safety. Access rights to files. Check of access to system.</p> <p>Processes. Management of processes. An essence of processes and their life cycle. Reception of the information on processes. Signals. Management of a priority of processes.</p> <p>The postponed and regular performance of tasks.</p> <p>Printing processes. Service of a printing processes. Performance of a printing processes.</p>
Teaching and learning methods	<p>The course includes theoretical and practical parts. The theoretical part covers the topic in theoretical terms. The practical part are leaded in computer class where students work in small groups and then report results in the classroom. Finally the course project must be done before exam.</p>
ECTS	2.5
Readings	SUN Solaris10 Ver. 10
Assessment	Written exam Group work Class participation

RUSSIAN LANGUAGE

Objectives

- Acquaintance to system of Russian.
- Training to speech behavior in sphere of daily dialogue.
- Practical skills of reading and the letter.

Content

Phonetics. The Russian alphabet. Rules of a pronunciation. Intonational registration of speech.

Morphology. Concept about parts of speech, their value and the use in speech.

Noun. The animated and inanimate nouns. A sort and number of names of nouns. Case system of names of nouns. Major importance's of cases and their use.

Pronoun. Personal, interrogative, possessive, index, negative pronouns. Values and forms of change.

Adjective. The full form of names of adjectives. The coordination of adjectives with nouns in a sort, number, a case. Declination of adjectives.

Verb. An infinitive. Conjugation, forms of a verb. An imperative. Verbal management.

Name the numeral. Quantitative and ordinal numerals. The coordination of ordinal numerals with nouns in a sort, number, a case.

Adverb. Adverbs of a place, time, an image of action, a measure and a degree, predicative adverbs.

Service parts of speech. Pretexts, the unions, particles, their major importance's and functions.

Syntax. Idle time and a compound sentence. The subject and a predicate in the offer, their coordination. Expression of attributive, objective relations, time, a place, the reason, a condition, the purpose in simple and a compound sentence. Direct and indirect speech. Replacement of direct speech indirect.

The thematic contents of a rate. My biography. My family. My friends. Study. A free time. Sights of Saint Petersburg. Moscow - capital of the Russian Federation.

Situations of dialogue. Acquaintance. On employment, at university. In dean's office. In library. Purchases. In city.

Teaching and learning methods

Practical employment in an audience. Employment in a linguaphone cabinet, in a video class, in a computer class. Independent work.

ECTS

3.5

Assessment

Written exam
Group work
Class participation

SYSTEM MODELING, ENGINEERING AND ECONOMICS

Objectives	<p>The lectures provide an introduction to modern visual technology of modeling and simulation of complex dynamical systems</p> <p>Course is intended for surveying students and professionals wishing get basic knowledge of new visual technologies for modeling and simulation of hierarchical event-driven systems with variable structure.</p> <p>Basic knowledge of ordinary differential equations theory and object-oriented programming are desirable.</p>
Content	<p>Topic 1. Mathematical modeling and computer experiment.</p> <p>Topic 2. Modern tools for beginners</p> <p>Topic 3. Dynamical systems</p> <p>Topic 4. Open systems</p> <p>Topic 5. Component modeling</p>
Teaching and learning methods	<p>Learning theory, solving substantial problems and using computer tools are foundations of achieving much success in any field of engineering especially in computer modeling.</p> <p>Training practice provides a firm and clearly understanding of visual modeling technology. To illustrate the main steps of model design and investigation Model Vision is used. Model Vision is a very popular in Russia graphical environment for modeling and simulation with expressive and intuitive object-oriented language. The suggested way of design is compared with Matlab and its toolboxes way of modeling and simulation.</p>
ECTS	2.5
Readings	<p>The main: MODEL VISION STUDIUM</p> <p>Additional -MATLAB, SIMULINK.</p>
Assessment	<p>Test exam</p> <p>Lectures</p> <p>Laboratory practice</p>

INFORMATION SYSTEM OF SAFETY

Objectives

The objective is to expose students to the basics of computer security. The reality reveals the importance of protected and reliable environment for every computer user.

We start with some introduction, further we pass to the security standards and protocols overview, both de facto and de jure, as well as the basics of user program and data protection by means of operating system. We will also assume business continuity ensuring. We pass then to the secure passwords using and management, cryptographic methods and anti-virus tools. After this theoretical background we get down to secure internetworking and local and global network security. We will also focus on everyday real computer threats and adequate countermeasures.

Content

Main subject areas include:

- Introductory part: information security as an inseparable part of computer technologies;
 - Standards and laws overview: world and national standards (ISO 17999-BS7799, CCITSE etc) ;
 - Operating systems overview and administrative methods of protection; safety procedures scheduling;
 - User program and data protection. Safe passwords, using of cryptography;
 - Anti-virus tools and countermeasures;
 - Business continuity ensuring - planning, responsibilities and roles, personnel trainings;
 - Network security: secure web browsing and e-mail, firewall technology.
- Conclusive part.

Teaching and learning methods

Group work

ECTS

2.5

Readings

Dmitry Sklyarov Hidden Keys to Software Break-ins and Unauthorized Entry. Amazon.com
Grennan, Mark. Firewalling and Proxy Server HOWTO. Version 1.0.8. July 4, 2000. Available at <http://metalab.unc.edu/LDP/HOWTO/IPCHAINS-HOWTO.html>.
Hall, Eric. Internet Firewall Essentials. Network Computing Online. Manhasset, NY: CMP Media, Inc., November, 1996. Available at <http://www.networkcomputing.com/netdesign/wall1.html>

Assessment

Test exam
Lectures
Laboratory practice

STUDY ENVIRONMENT

Accommodation:

single or double room in two-room apartment with shared facilities and kitchen in a comfortable student hostel.

Application procedure:

Application form for the program can be requested at e-mail info@mdp-itis.ru.

Filled in application form should be sent by e-mail or by fax. Please do not forget to enclose the following documents:

- transcript of records
- copy of international passport (for visa arrangements)

DEADLINE for the application: July 1

Financial terms:

Program is open for all types of applicants:

- bilateral exchange students (tuition fee is free of charge)
- group of students from partner universities (special offer)
- free-movers (tuition fee is required)

NOTES