



**FACULTY OF
INFORMATION
TECHNOLOGY**

SYLLABUS

Undergraduate studies

The first level program of studies at PJIIT leads to the Engineer of Computer Science degree (equivalent to BSc).

Lectures and classes take place Monday-Friday from 8:00 to 16:00;

The academic year lasts from October to end of June and is broken into two terms. Each term spans 15 weeks of study.

General information about the undergraduate program

- Students participate in lectures, tutorials and laboratory classes;
- Classes are held in groups consisting of 16 people. This ensures that every student has a computer at his/her disposal in computer labs;
- Students doing specialized courses for their degree can use special computer labs dedicated to their area of study.

CURRICULUM

The syllabus is broken into two groups of subjects:

- Basic – common to all students;
- Specialized – connected with majors chosen by students.

Basic subjects are taught during the first three semesters of the full-time course (four semesters in the case of other options). In the following semesters it gradually gives way to specialized courses. Basic subjects are those fundamentals which must be mastered by all IT specialists irrespective of their field. It is, for example the foundations of databases, software engineering, networks and multimedia. Students learn programming in most important languages: Java and C++. Later they will also master, depending of their chosen major, Prolog and Assembler. The basic subjects include also mathematics, electronics, accounting and economics, as well as Business English and basics of Japanese (optional).

Specialized courses are concentrated on giving students opportunities of practical teamwork on a simulated or real project. This is to prepare them for future work. They also expand their knowledge in the chosen area.

The Institute prepares graduates to work as, e.g.:

- Analyst and designer of modern databases;
- Database application programmer;
- Multimedia specialist;
- Administrator of computer systems and networks;
- Designer of information systems;
- Designer of systems for controlling robots or making decisions.

Curriculum

Academic year 2006/2007

Full-time studies - courses available in English and Polish

Subject	Code	Hours per week		Examination/ credit	Pts ECTS
		lectures	tutorials/ laboratories		
1st year					
Semester I					
Linear algebra and geometry	ALG	2	2	E	5
History and culture of Japan	HKJ	2	-	C	2
English	ANG	-	4	C	3
Discrete mathematics	MAD	2	2	E	5
Corporate law	PPB	2	2	C	4
Programming I	PRGI	2	4	C	5
Computer design and technologies	TAK	2	-	E	3
Computer applications	UKO	-	2	C	3
Semester II					
Calculus I	AM I	2	2	E	5
Programming workshops	WPR	2	2	C	4
English	ANG	-	4	C	3
Programming II (object-oriented)	POB	2	2	E	5
Accounting and finances	RPG	2	2	E	4
Relational databases	RBD	2	2	E	5
Operating systems	SOP	2	2	C	4
2nd year					

Semester III					
Algorithms and data structures	ASD	2	2	E	5
Calculus II	AM2	2	2	E	5
English	ANG	-	4	C	3
Programming methods	MPR	2	2	C	3
Electronics	ELK	2	3	E	5
Database systems	SBD	2	2	E	5
Computer networks I	SKO	2	2	E	5
Semester IV					
Multimedia	MUL	2	2	C	4
English	ANG	-	4	C	3
Project	PRO	2	2	C	3
Design of information systems	PRI	2	2	E	5
AI tools	NAI	2	2	E	5
Digital techniques	TEC	2	2	C	4
Physical education	WF	-	2	C	2
<i>Specialized courses</i>					
Internet technologies	TIN	2	2	E	5
Computer networks II	SKO2	2	2	E	5
Intelligent theory control	ISS	2	2	E	5
3rd year					
Semester V					
Statistical data analysis	SAD	2	2	E	5
Computer graphics	GRK	2	2	E	5
Design and integration of information systems	BYT	2	2	E	5
Information systems security	BSI	2	2	E	5
English	ANG	-	4	C	3
Project	PRO	2	2	C	7
<i>Specialized courses</i>					
Corporate taxation	POD	2	2	E	5
Advanced information systems	ZSO	2	2	E	5
Classical and non-classical logic	KNW	2	2	E	5
Semester VI					
Business planning, organization and	POZ	2	2	E	5

management					
Design and analysis of information systems	MAS	-	2	C	5
English	ANG	-	4	C	3
Project	PRO	2	2	C	10
Physical education	WF	-	2	C	2
Internships/work placement (8 weeks)		-	-	C	
Engineer degree thesis		-	3		
Semester VII					
Physics	FIZ	2	2	C	5
English	ANG	-	4	C	3
Data analysis	ADN	2	2	E	5
Internet database applications	IAB	2	2	E	5
Automata and artificial grammars	AUG	2	2	E	5

Majors – Engineer (undergraduate) studies

Undergraduate students can specialize in one of the following areas:

- **Databases**
- **Software and database engineering**
- **System and network programming**
- **Distributed and parallel systems**
- **Intelligent data processing systems**
- **Multimedia**
- **Multimedia – 3D Animation**
- **Multimedia – Game programming**
- **Robotics and multiagent systems**
- **Business applications programming**
- **Mobile networking**

Majors – descriptions

DATABASES

Specialized courses include subjects common to all students, run partially as lectures and partially as project seminars (2 hours/week) or project tutorials (2 hours/week). Students are divided into groups of 3-5. Each group carries out their own project, which makes out their graduate thesis.

We teach:

- computer programming;
- database administration and tuning;
- Oracle, SQL server, Oracle Designer as a CASE tool combining all research projects;
- Knowledge and application of various analytical, design and implementation methods;
- IBM programs (DB2, DB2 Warehouse).

Our graduates are able to:

- analyze users' requirements and design an information system using CASE tools to support, analyze and design prototypes
- design databases and administer a database server
- design an application in the traditional client/server architecture as well as in the multilayer architecture using databases and the Internet
- design and administer an Internet portal

Career prospects:

Specialists with the skills acquired at our major can find employment in IT companies and IT corporate departments as analysts, information systems designers, database administrators, traditional applications programmers, Internet programmers, designers and administrators of Internet portals.

Examples of projects for Engineer degree:

- Testing and examining systems;
- Systems for organizing seminars and conferences;
- Geographical systems on the basis of Japan;

- Job offers system;
- Human Resources system;
- Library system;
- E-shop.

SOFTWARE AND DATABASE ENGINEERING

Apart from general subjects, students have specialized subjects, such as: Internet Technologies, Corporate Taxation and Engineering Project. Classes are run in computer laboratories in groups of 8 – 16.

We teach:

- Analysis and design of information systems using UML object methodologies and CASE tools;
- Aspects of software engineering including program lifecycle (strategic stage, analysis, design, construction, testing, implementation, care and modification);
- Program management;
- Software quality and complexity measurements;
- Engineering Projects which incorporate aspects of databases, software engineering and distributed technologies (the Internet);
- The use of CASE, Microsoft SQL Server, Microsoft Information Server/ASP, Oracle, Visual Basic, Java, .NET platform, www browsers and since 2005 - IBM software (RAD, WebSphere and Rational).

Our graduates are specialists in:

- Analysis and design of large information systems;
- Software engineering methods;
- Database design methods;
- Methods of software quality upgrade;
- Internet integration methods.

Career prospects:

Graduates are sought after by medium and large Polish and foreign computer companies which carry out key projects for government and administration institutions, banks, state and private enterprises, schools, the army, media and public organizations.

Examples of projects for Engineer degree:

- Reuse repository for collecting and providing any information, files and media, which can be exchanged within a company;
- Knowledge and risk management in a programming company – a system which enables to collect information about employees' secret knowledge and which counteracts various threats to the company;
- Software supporting the design and functioning of an e-shop. It allows to realize a Z-shop, i.e. a kind of shop without its own warehouse but which stocks and sells goods and services of external suppliers;
- System of work flow supporting document and software quality management. This system enables to define the process of document and HR management, facilitates instancing and activating these processes as well as managing and monitoring them;
- System supporting teaching object-oriented analysis and design;
- System of index management used to create Internet applications.

SYSTEM AND NETWORK PROGRAMMING

Team projects last three semesters. Students attend specialized lectures and seminars.

We teach:

- Data protection in computer networks;
- Configuration and application of firewalls; detection of and prevention of hacking;
- Stenography and watermarks;
- Use of cryptography;
- Digital forensics;
- Distributed programming;
- Design of safe and efficient software including network software;
- Protocols ensuring QoS in computer networks;
- Computer networks management;
- Advanced routing protocols and LAN and VPN design

- Design and management of devices which provide network diagnostics;
- Network configuration and the estimation of its speed and efficiency;
- Administration and configuration of basic databases, network and operating systems.

Graduates of our major are specialists in:

The management of computer networks, data protection, safe and efficient software design and in digital criminology.

Career prospects:

Graduates can be employed by companies which use computer networks and require high network protection, efficiency and reliability. They are also sought after by software companies operating in e-commerce, e-learning, e-government and e-business which need specialists in software and data protection. A separate category of employees are specialists in digital forensics who can be employed by big organizations which react to digital crimes and violation of data protection.

Examples of Engineer projects:

- Authorization and authentication protocols in computer networks;
- Investigation methods in digital criminology;
- Data protection in e-banking;
- Digital watermarks;
- Audit of hacking detection;
- Planning and implementation of Voice over IP services;
- Device control via computer networks;
- Analysis of network protocols;
- Computer network management and administration.

DISTRIBUTED AND PARALLEL SYSTEMS

Didactic activities take place in the Parallel Programming Laboratory within the Chair of Parallel Calculations. The Laboratory is well-equipped with parallel systems and up-to-date means of analysis and support of parallel and distributed systems design. The basis for students' training are workstations and PCs based on Pentium, Athlon,

Dec-Alpha, SUN-Sparc and PA-RISc processors; 16-processor supercomputer HITACHI; parallel program graphical design, debuggers and screens for parallel systems performance/execution?, GRID-environments, parallel systems compilers, inter-process communication libraries, systems for automated program parallelization, libraries for numeric calculations, tools for analyzing program codes, graphic visualization systems of parallel systems results.

Students' projects are realized for computer networks, GRID networks or the supercomputer and facilitated by parallel systems support tools which operate in the computer networks and the supercomputer.

We teach:

The objective is to educate programmers with broad knowledge of network operations, distributed systems operations in computer clusters, GRID systems, the organization of software implementation in computer networks, fundamentals of multiprocess systems and high-level parallel programming.

Thanks to a close cooperation with the Department of System and Network Programming students get familiar with methods of computer network design and administration.

Career prospects:

- Companies producing software applications for computer networks and parallel computers;
- Companies which install and use computer networks;
- Banks and tax offices;
- Supercomputer centers;
- Computational centers in banks and enterprises;
- Research institutes;
- Universities and colleges;
- Multinational companies;

Examples of engineer projects:

- Projects of parallel programs;
- Projects of network software for computer clusters;
- Projects of programs for GRID;
- Programming of mobile systems;
- Fundamental software design tools;
- Examination and analysis of parallel programs.

INTELLIGENT DATA PROCESSING SYSTEMS

Specialized tutorials take place in general laboratories of PJIIT and in the Laboratory of Data Mining and Artificial Intelligence.

The objective is to educate proficient programmers experienced in designing advisory and decision-support systems which are based on computer analysis of big databases and complex planning and optimization problems.

We teach:

- Decision support systems in management banking, production and transport;
- Mining useful and comprehensible knowledge from big data sets;
- Analysis of multimedia data;
- Construction of automatic control and diagnostic systems;
- Solving complex optimizing problems.

Career prospects:

Graduates can be employed as programmers experienced in advisory and decision support systems who can use in practice computer analysis of big databases, complex planning and optimizing) problems and who can extract information from big databases and data warehouses.

Examples of engineer projects:

- Medical diagnostics support on the basis of a hospital database;
- System of investment decision analysis and support;
- System of consumer goods analysis and determining efficient marketing strategies;
- Analysis of bank operations;
- Analysis of micromatrix examination of DNA;
- Data exploration of the Internet traffic;
- Handwriting recognition;
- Object recognition in the visual field of a mobile robot camera.

MULTIMEDIA

We teach:

- Sound recording and engineering
- Recording of multimedia data
- Video and TV formats
- Advanced Flash technology
- Copyright issues
- Building MM applications
- Building WWW pages
- Algorithms for MM data compression and processing
- Sound and vision interfaces
- Sound synthesis
- Color theory
- Human sight and hearing
- Application of MM technologies
- Human-computer communication using speech (speech recognition and synthesis) and touch (haptic).

Career prospects:

Graduates can find employment in:

- digital studios as postproduction specialists;
- sales departments of companies as developers of applications for e-commerce, software companies as developers of user interfaces;
- information systems integrating companies as MM systems integrators;
- banks (developing and operating systems of monitoring and supervision);
- biomedical companies (visualization);
- Internet services;
- Telecommunication companies;
- Companies which need developers of graphical user interfaces.

Examples of engineer projects:

- Self-study multimedia guitar lessons;
- Tutorial for landscape design;
- Interactive Flash tutorial;
- Sky map;

- Synthesizer of guitar sound;
- Videopedia – guide to the PJIT;
- Multimedia presentation of news adjusting content and form to the user's preferences (face recognition) and his/her distance from the screen.

Multimedia Laboratory

Laboratory possesses a professional recording studio and equipment together with software for recording and mastering of audio and video materials: mixers, corrector, MIDI interface, ADAT recorder, CD, hard-disc recorder, effects processor, synthesizers, microphones, speakers and headphones, cameras, frame grabber, printers, scanners etc.

The laboratory staff research digital sound processing (both speech and music), and moving image processing.

MULTIMEDIA – 3D ANIMATION

We teach:

- Advanced MAYA use (optionally also: Softimage3D, 3D Studio Max);
- Creating and editing 3D objects of any type;
- 3D animation;
- Lighting and camerawork;
- Modeling of atmospheric phenomena;
- The physics of objects in a program;
- advanced rendering;
- the construction and work of MAYA (optionally: Softimage3D);
- character animation – using *inverse forward kinematics*.

Career prospects:

Production of films, commercials, television programs, FX postproduction, game programming, multimedia application programming.

Examples of engineer projects:

- Animation of cat's and cat-like creatures' movements;
- Building a 3D computer game (Tank Battle).

3D Animation and Computer Graphics Laboratory

The Laboratory has a 3D scanner to scan busts together with texture, latest-generation PCs, graphics stations Silicon Graphics, specialized software. We also have a 3D scanner and tactile interface HAPTIC. The Laboratory researches latest television and film technologies, animation and rendering. It possesses own BlueBox.

MULTIMEDIA – GAME PROGRAMMING

We teach:

- 3D programming – basically Direct3d , optionally OpenGL;
- Programming MM applications – DirectX;
- Programming of WINAPI applications;
- 2D graphics – especially texturing;
- Polygon modeling (3D) for games;
- Lighting and camerawork;
- Physics of objects in a program;
- Real time rendering;
- Character animation using *inverse forward kinematics*.

Career prospects:

Members of game developing teams, productions of commercials and developers of any MM applications.

Examples of engineer projects:

- Simple simulator of helicopter flight (Operation Silent Wing);
- Building a 3D computer game (Bomber 3d);
- Programming an advanced game engine based on most up-to-date technologies (e.g. programmable real time shaders);
- Building a simple game/application based on tactile interface;
- Building an interactive real-time application in DirectX on an example of a game (DinoRider);
- Using advanced artificial intelligence algorithms and network protocols on the example of a real-time application (StarFire).

ROBOTICS AND MULTIAGENT SYSTEMS

We teach:

Students practice basic programming languages: JAVA, C++ on Windows, Linux, QNX. The Multimedia Laboratory has its own LAN with two servers, including one with two processors and the GPS system. Computing power is provided by a network of PC computers, 2 Solaris servers and a 2-processor computer. Projects done in the Laboratory combine all areas of computer science taught at PJIIT: artificial intelligence, image processing, network technologies, data mining etc. Students interested in electronics can construct own robots or their elements. We attach special importance to elements of cognitive techniques (artificial intelligence) in robotics and to behavioral architecture.

Career prospects:

Graduates are prepared to solve new problems and work with new equipment as we teach them to deal with non-standard problems. They can work in companies basing their production on industrial robots, in traffic and production monitoring in places where complex devices are used. They can program autonomous vehicles. Our graduates work in many leading companies e.g. Siemens, HP as programmers, etc.

Examples of engineer projects:

- Fuzzy sets in the behavioral model of mobile robotics;
- A systems for stationary robots which plots vector graphs based on photograph analysis;
- Tracking devices for PC computers;
- Global positioning systems in closed spaces;
- Mobile robot navigation using artificial landmarks;
- Using neural networks for controlling a mobile robot;
- A system for controlling a mobile robot which tracks and lifts objects;
- MapBuilder – a system for building a geometric map using a mobile robot;
- TANK++: an alternative platform for the TANK system.

Equipment at the Robotics lab:

- Two stationary robots MOTOMAN S6;
- Two mobile robots PIONEER 2DX;

- Three vehicles based on the tank models of King Tiger (Tamiya);
- Two Hemisson robots (K2 team);
- One walking robot Hexapod;
- One flying robot Dragonfly;
- A humanoid PALADYN (own design);
- D-Link cameras;
- Panasonic high resolution cameras.

Our robots are equipped with: CCD b/w cameras and color (SONY) cameras; SICK lasers; sonar sensors; distance sensors and modems.

Virtual Laboratory – the soon-to-be-completed Remote Robotics laboratory equipped with Panasonic DFK12 cameras , Wireless D-Link DCS5300W and mobile robots will make it possible to conduct robotic experiments at a distance. It will allow to conduct advanced research in the areas of multiagent aspects of mobile robotics, communicative intelligence and human-robot, as well as robot-robot collaboration.

BUSINESS APPLICATION PROGRAMMING

We teach:

Effective programming of business applications, including large scale applications, in modern universal programming languages. The syllabus covers project templates, advanced concurrent programming, multi-layering and many issues of the ‘performance’ type.

Graduates can create, implement and integrate distributed applications in the value-chain context, use universal paradigms and technologies and integrate different systems of the back-end and front-end types.

Career prospects:

Graduates are specialists in business systems programming, well-versed in all technological details and most up-to-date programming technologies for advanced users. This gives them a head start on the job market.

Examples of engineer projects:

- Comparative analysis of selected programming technologies in the four-layered architecture of business applications;

- Creating business portals with the use of RiA technology ("Rich Internet Application");
- Programming user interfaces for business applications – a comparative analysis of languages, tools and platforms;
- Self-explanatory business components and their implementation in corporate information systems;
- Choosing programming technologies in relation to the corporate value-chain in the times of information revolution;
- Programming technologies for building information systems for SMEs.

MOBILE NETWORKING

We teach:

- Architecture and organization of radio channels, commutations, protocols and service signaling and rules of designing radio networks;
- Mobile networks (standards: GSM, CDMA, UMTS);
- Satellite networks and their applications (e.g. GPS);
- 802.11 network and Bluetooth network;
- Operating systems for and architecture of mobile devices;
- Services of IP networks ensuring mobility (Mobile IP) and communication of mobile devices with the Internet (e.g. GPRS protocol);
- Information security in mobile networks;
- ad-hoc networks;
- distributed programming;
- network administration;
- protocols ensuring good quality of services (QoS) in computer networks;
- advanced routing protocols and designing LANs and VPN networks.

Students acquire practical knowledge of programming for mobile platforms, e.g.:

- J2ME technologies, especially network technologies (JSR-82) for creating applications for mobile business;
- Creating applications for Symbian platforms in C++;
- Implementation and maintenance of mobile applications and deployment of mobile networks.

Career prospects:

Among different trends in modern computer networks an important one is a dramatic increase in the number of radio access networks and mobile networks. Together with the development in the functionalities offered by mobile devices this trend has led to the rise in the number and complexity of applications for those devices working in wireless networks. Many IT analysts expect this sector of the market to be crucial in the evolution of ICT.

Graduates of the Mobile Networking major will be well prepared to work in this dynamically growing area. We expect that the demand for specialists in mobile networks will soar when our first graduates leave the Institute.

Examples of engineer projects:

- Secure access point for the 802.11 network;
- English-Japanese translator for mobile phones;
- Remotely controlled vehicles;
- Games for mobile phones;
- Virtual telephone;
- Creating GPS maps;
- Interactive tourist guides;
- Systems for finding the best route.

Graduate studies

The second level program of studies at PJIIT leads to the Master of Computer Science degree.

General information about the graduate program

- The curriculum is adjusted to the European Credit Transfer System (ECTS), which allows to compare courses taken at different European universities and facilitates transferring from one university to another;
- In each term a student has to take several obligatory and a number of elective courses;
- The completion of any course gives a student a relevant number of credits;
- Upon qualifying for the graduate program each student is assigned a tutor who helps plan the individual path of study.

CURRICULUM

Due to expected changes in standards for graduate studies published by the Ministry of Science and Education, the following curriculum may be slightly modified.

Graduate studies – curriculum for the academic year 2006/2007

Subjects (majors)	Code	Hrs/week		Exam /credit	Pts ECTS
		lec- ture	Class/ lab		
1st year					
1st semester					
Foreign language (English/German/French/Japanese)	ANG	-	2	C	3
Designing and analysis of network services	PAS	2	2	E	6
Standards for distributed systems and data bases (A_BD/_IO)	SSR	2	2	E	6
Systems for database management (A_BD/_IO)	SZB	2	2	E	6
Processing of digital signals and images (B/C/D/E/F)	PSO	2	2	E	6

Designing computer networks (B/C)	PSK1	2	2	E	6
Linguistic engineering (E/F)	INL	2	2	E	6
Optional course 1		2	-	E	3
Optional course 2		2	-	E	3
Block lecture		2	2	E	4
Master tutorials	SEM1	2	-	C	2
1st year					
2nd semester					
Foreign language	ANG	-	2	C	3
Creating business portals	AUG	2	2	E	6
Languages and programming environments of data bases (A_BD/_IO)	JPS	2	2	E	6
Advanced data analysis (D/E)	ZAD	2	2	E	6
Behavioral robotics (F)	ROB	2	2	E	6
Designing computer networks 2 (B/C)	PSK2	2	2	E	6
Object and distributed data bases (A_BD/_IO)	KOR	2	2	E	6
Diagnostics of computer systems (B/C)	MID	2	2	E	6
Intelligent information systems (D/E/F)	ISI	2	2	E	6
Optional course 3		2	-	E	3
Optional course 4		2	-	E	3
Block lecture		2	2	E	4
Master tutorials	SEM2	2	-	C	2
2nd year					
3rd semester					
Foreign language	ANG	-	2	C	3
Management of information projects	ZPR	2	2	E	6
Creating secure software (A_BD/_IO)	TBO	2	2	E	6
Advanced data analysis (F)	ZAD	2	2	E	6
Behavioral robotics (D/E)	ROB	2	2	E	6
Linking devices in computer networks (B/C)	UPS	2	2	E	6
Optional course 5		2	-	E	3
Optional course 6		2	-	E	3
Optional course 7		2	-	E	3
Optional course 8		2	-	E	3
Block lecture (if not done in the previous year)		2	2	E	4
Diploma seminar	SEM3	2	-	C	2
Submission of master thesis		-	-		6

Majors – Master (graduate) studies

All majors available for graduate students in Polish and English (if there are enough candidates)

- **Databases – A_BD**
- **Software engineering and databases – A_IO**
- **System and network programming – B**
- **Distributed and parallel systems – C**
- **Intelligent data processing systems – D**
- **Multimedia – E**
- **Robotics and multiagent systems – F**

Majors – descriptions

All majors available for graduate students in Polish and English (if there are enough candidates)

DATABASES

The major covers similar areas to its undergraduate counterpart but in more detail and depth.

Examples of graduate (master) theses:

- Systems for e-learning;
- Systems of archiving legal documents;
- A system of managing an object database;
- A system of managing a database of XML documents for portable devices;
- Surveys in information systems;
- Choosing a commercial data base management systems on the basis of the possibility of its tuning.

SOFTWARE AND DATABASE ENGINEERING

What we teach:

Beside expanding knowledge from undergraduate studies, there are new areas covered by the syllabus such as designing and analysis of network services, and creating business portals. Students will also learn about the world standards for databases and distributed applications (CORBA, ODMG) and acquire the skills of developing and implementing their own query language for a database of their choice (including object data bases and XML repositories) and expanding it by programming language constructs and abstractions like types, classes, procedure and perspectives. Students will learn the way distributed and grid systems are constructed, workflow technologies and advanced Internet technologies.

Career prospects:

Graduates are specialists in the analysis, design and administration of large information systems. They possess advanced knowledge of software engineering, developing data bases, methods for software quality assurance, integration with the Internet. They are sought after by medium and large IT companies which work on large projects, especially for the government.

Examples of graduate (master) theses:

- The concept of digitization of public administration offices with the use of the Public Key Infrastructure;
- Expansion of an object query language with dynamic roles by adding constructions of a programming language;
- The problem of logical coherence and correctness of business rules in workflow-type systems;
- SBQL language for the Objectivity/DB;
- The interpreter for the SBQL query language for Office Object Portal;
- Building an index for the Office Objects Portal system with the use of SDDS structures;
- Automated replies to questions in a natural language;
- CASE-type tools supporting software production, on the example of the PHP/MySQL environment;
- Implementation of ERP-class systems on the basis of Microsoft MBS Navision Attain

SYSTEM AND NETWORK PROGRAMMING

The major covers the same areas as its undergraduate counterpart in more detail and depth.

Examples of graduate (master) theses:

- Transaction protocols and programming of services for electronic banking;
- Implementation of the DiffServ standard ensuring quality in IP networks;
- Methods of trust management in electronic systems;
- Massive Multiplayer Online Games developed according to the partnership model.

DISTRIBUTED AND PARALLEL SYSTEMS

The classes and projects are run in the Parallel Programming Laboratory.

What we teach:

Our aim is to educate specialists who will possess the knowledge of methods of designing, analyzing and implementing computing algorithms and parallel programs for computer networks, GRIDs and parallel systems. Studies comprise also methods of modeling and optimization of parallel computations in distributed and parallel systems

Career prospects:

Possibilities of finding employment in companies developing software for computer networks and parallel computers, companies installing and maintaining computer networks, banks and tax offices, supercomputer centers, computing centers of large companies, research institutes, universities etc.

Examples of graduate (master) theses

- Software for distributed systems and GRID-type networks,
- Designing and constructing parallel programs
- Optimizing parallel and distributed programs;
- Modeling and analysis of parallel computations;
- Parallel algorithms, problems of organizing computations in networks and parallel systems;

- Tools supporting parallel programming;
- Problems of parallelism in operating systems;
- Designing and implementing graphical interfaces for parallel systems.

INTELLIGENT DATA PROCESSING SYSTEMS

Specialized courses are held in general-purpose laboratories of PJIIT and Laboratory of Knowledge Extraction and Artificial Intelligence.

What we teach:

The subject area of the major is a continuation and extension of the similar major at the undergraduate level. The new elements are statistical methods and algorithms useful in automated decision-making. The basic subjects connected with processing large data sets are regression analysis, analysis of temporal relations and developing decision-support systems, steering and diagnostic systems.

Career prospects:

In teams designing decision and advisory systems which use computer analysis of large data sets, including temporal data. In teams analyzing and solving complex planning and optimization problems.

MULTIMEDIA

Specialized courses take place in the Multimedia Laboratory.

What we teach:

We aim at expanding students knowledge regarding multimedia, especially in two sub-disciplines: digital sound and image generation and processing, and man-machine communication. Courses are devoted to computational linguistics, phonetics, methods of recognition and production of speech, as well as digital image processing, physical foundations of animation and sound propagation, color perception and practical applications of artificial intelligence.

The subjects of Master theses are concentrated on problems connected with digital sound and image processing, evaluating quality and usability of information in information systems, speech synthesis and recognition, creating avatars and biomedical applications of multimedia.

Examples of graduate (master) theses:

- A diphones base MBROLA for the synthesis of the Polish speech;
- Quality of special effects in films;
- Using multimedia in educational software for pre-school children;
- Color conversion;
- Advanced simulations of ossiculoplasty surgeries;
- Avatar (artificial head);
- Games and 3D animations for speech problems correction;
- Query-by-whistling – recognizing melodies on the basis of whistling or murmuring their fragments.

ROBOTICS AND MULTIAGENT SYSTEMS

The major is conducted mainly in the Robotic laboratory where theses projects are made. We emphasize teamwork and working in large project teams.

What we teach:

The students who like theory can deal with issues connected with multiagent systems and ‘soft computing’, e.g. combining knowledge, organization and planning in multiagent teams. We also teach problems of approximating programming.

Examples of graduation (master) theses:

- Searching for the solution for the stagecoach dilemma with the use of ant algorithm;
- Binaural system for locating and separating sources of sound;
- An oculomotoric system of active vision;
- A theoretical concept of a walking robot based on the analysis of human gait;
- A system of stereovision for a humanoid robot;
- Paradigm of embodied intelligence;
- Modular architecture – introduction to object-oriented robotics;
- Machine learning – experiments with mobile robots.