

UNDERGRADUATE AND GRADUATE STUDIES IN ELECTRICAL AND COMPUTER ENGINEERING



**FACULTY OF ELECTRONICS
AND INFORMATION TECHNOLOGY**

WARSAW UNIVERSITY OF TECHNOLOGY

Bulletin 2007–2008



Faculty of Electronics and Information Technology

Dean

Professor Bogdan GALWAS,
PhD, DSc

Vice-Deans

Professor Wiesław WINIECKI,
PhD, DSc

Professor Marzena
KRYSZKIEWICZ, PhD, DSc

Sławomir KULA, PhD

Roman SZABATIN, PhD

1. FROM THE DEAN

Are you interested in computers and their applications? Are you thinking about studying electrical and computer engineering?

Many young people are and it is not very difficult to say why. The future development of the world is inevitably tied to continued progress in this area. The immense growth in the applications of electronic circuits and computers, a growth which shows no sign of slowing down as we entered the twenty-first century, has resulted in the current shortage of electrical and computer engineers. In a few years, job opportunities will be limitless.

If you are planning to get your degree or just take a few courses in electrical and computer engineering, I would like to draw your attention to the Faculty of Electronics and Information Technology at the Warsaw University of Technology.

For many years, our Faculty has been a place where exceptional people come together to work and study. As such, the Faculty would like to open its doors to the most talented and promising people of all nationalities. We therefore offer programs of study in Electrical and Computer Engineering with English as the official language of instruction and administration.

Our undergraduate and graduate programs taught in English cover the most rapidly developing areas of electrical and computer engineering. In the following pages you will read about exciting degree options in Computer Systems and Networks and Telecommunications. Our students are offered a balanced program of lectures, tutorials, laboratory, and practical instruction. There is a lot of design and "hands-on" experience with computers in all our courses. Our laboratories are well equipped, and courses are constantly reviewed and revised to keep them up-to-date and relevant to the demands of students and employers. The strength of the Faculty of Electronics and Information Technology lies in its commitment to the achievement of excellence in everything it does.

Engineering studies are not simple and a student's life is not always easy — that's the bad news. The good news is that we have a long-standing and well-earned reputation as a friendly university. There is a large and supportive staff. Student social life is active and varied; you will not feel lost in the crowd. You will also be in good company. Admission to our programs is granted mainly to those with excellent academic records. A distinguished teaching staff, a lively student body, including international student groups from all corners of the globe, all help to create the right atmosphere for personal development and fruitful study.

The choice you have to make will be one of the most important you will ever make. I strongly believe that if you choose the Faculty of Electronics and Information Technology at Warsaw you will not be disappointed.

You will develop your talents, you will discover new opportunities, you will extend your knowledge and your skills, you will grow in intellect, in competence and in confidence. You will learn more about the world, its peoples and their cultures. You will eventually graduate with a Bachelor's, Master's or Doctor's degree. The academic standing of the Faculty is sufficiently high and internationally recognized to ensure that your degree will be of maximum value in a competitive world, whatever career you may choose. Our graduates possess the right combination of skills that employers are looking for: intelligence and personal qualities, an ability to efficiently solve problems, and technical expertise in the critical areas of today's engineering. Our alumni are pursuing professional careers in Poland, in other European countries, and in most other parts of the world. They have distinguished themselves as professors, administrators, researchers for government and industry, entrepreneurs, and inventors.

We are proud of the Warsaw University of Technology and its Faculty of Electronics and Information Technology. If you come here to take your degree, you too will be proud to be our graduate.

I hope very much to meet you at some time in the near future.

Professor Bogdan GALWAS, PhD, DSc



2. WHY STUDY ELECTRICAL AND COMPUTER ENGINEERING AT WARSAW

Making a decision about what to study and which university to go to is not easy. There is a variety of conflicting opinions, and a bewildering range of choices. If you are interested in computers, if you are thinking about a career in engineering or business, if you are attracted by the prospect of living in an exciting and continuously changing environment, and ... if you want to save some money, then this bulletin is for you. Before you read it carefully, you might want to know that:

- Poland, benefiting from its strategic geo-political position, is now a dynamic country, member of the European Union, leading post-communist Central and Eastern Europe with unprecedented reforms, unrestrained free-market economy and new ideas transforming the lifestyles of its citizens.
- Warsaw is now the site of thousands of foreign companies doing business in Poland and of international institutions coordinating economic and scientific cooperation between the European Community/U.S.A. and Central/Eastern European countries. This unique situation has created a high demand for good engineers fluent in English and excellent job prospects for those who graduate from the Warsaw University of Technology.
- The Warsaw University of Technology is the highest-ranked institution for advanced engineering education and research in Poland and one of the most prestigious academic institutions in Europe.
- Students of over 40 nationalities, from all over the world, are now studying at the Warsaw University of Technology.
- The tuition fee and living costs in Warsaw are approximately 40–70% of typical costs in English-speaking countries.
- The Faculty of Electronics and Information Technology, with more than 250 professors and more than 3500 students, is the largest teaching and research center at the Warsaw University of Technology. Its educational and research activities range from micro- and optoelectronics, through instrumentation, measurement, control and robotics, to telecommunications and computer networks.
- The programs of studies and academic regulations at the Faculty of Electronics and Information Technology resemble those of highly reputed U.S. universities. The Faculty is known to attain the highest teaching standards and enjoys worldwide recognition for its research. Furthermore, the low ratio of students to professors and the warm working relationship between students and instructors helps those studying to develop confidence in their ability to make significant contributions to engineering work.
- The demand for good electrical and computer engineers will continue to far exceed the supply from the universities and there will be a wealth of opportunities for new graduates seeking both creative and rewarding work. Employment prospects are excellent not only in the obvious areas, such as electronics, communication and computing industries, but also in other technological areas, as well as in banking, accountancy, management, medicine, and education.



Faculty of Electronics and Information Technology

Located at:

Nowowiejska 15/19

00-665 Warszawa, Poland

phones: +48-22 234-74-97

+48-22 234-61-61

fax +48-22 234-58-85

e-mail: dziekan@elka.pw.edu.pl

<http://www.elka.pw.edu.pl>



3. WHERE WE ARE



Poland, located in central Europe, has been endowed by Nature with a wide variety of landscapes.

3.1. POLAND

In the northern part of the country, long and wide sandy beaches stretch along the Baltic Sea for over 500 kilometers. Just a few kilometers south of the coast, the landscape becomes hilly. More than three thousand lakes, numerous rivers, and lush forests form a beautiful natural scenery that attracts sailors, canoeists, water skiers, fishermen and all those who love direct contact with nature. The predominantly flat central Poland with a number of picturesque villages and cities which witnessed the origins and development of Polish statehood is a must for connoisseurs of history, architecture, art and culture. The southern part of the country features a diversified terrain full of beautiful valleys, rocks of fantastic shapes, caves, and health spas. Two major mountain chains, the Carpatians and the Sudety, with thousands of hiking and ski trails offer their beauty all year long.

Poland is a country with more than a thousand years of turbulent history. It is also a country with a great cultural and scientific heritage, the birthplace of Nicolas Copernicus, Frederic Chopin, Henryk Sienkiewicz, Maria Curie-Skłodowska, Arthur Rubinstein, Ignacy Paderewski, Krzysztof Penderecki, Stanisław Lem, and Karol Wojtyła — the previous Pope John Paul II.

Although the people of Poland have had more than their fair share of hardship, they have always been able to overcome obstacles and face new challenges. Poles are, for the most part, friendly, outgoing, smiling people with big hearts. Respect for tradition goes hand in hand with modernity. Poland is now a member of the European Union, leading post-communist Central and Eastern Europe with unprecedented reforms transforming the political and economic structures of the country and the lifestyles of its citizens.



WHERE WE ARE

3.2. WARSAW

Warsaw has seven centuries of history full of hardship. During World War II alone, 90% of the city was destroyed, as the Nazi authorities intended to erase Warsaw from the map of Europe. It raised itself from ruin like the phoenix emerging out of the ashes. In 1980, the heart of Warsaw — the Old Town — restored with amazing detail, was added by UNESCO to the world heritage list. Over the centuries, the Old Town has witnessed a number of events of primary importance to the nation's history. In 1773, in the Royal Castle, the Polish Parliament established Europe's first Ministry of Education, the Commission for National Education. In the same place, in 1791, the Constitution of May the Third, Europe's first and the world's second (after that of the United States) written democratic constitution was signed. You can absorb the history of Warsaw and Poland just by walking around the city and visiting palaces, museums, churches and cemeteries.

As the capital of the country, Warsaw is the center of public and cultural life;

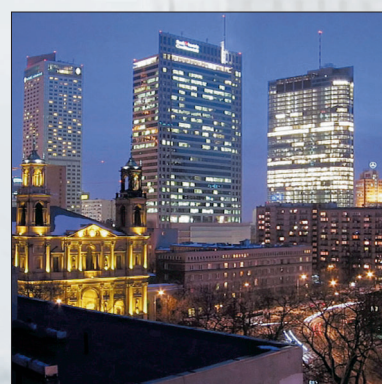
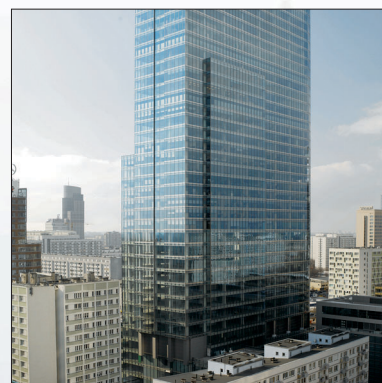
there are hundreds of galleries, theaters, cinemas, music scenes; several prestigious international cultural festivals and competitions take place here every year.

Warsaw is a nice city to stay in. Located on both sides of the Vistula river, it has numerous parks and gardens, including the world-renowned palace and park complex, Łazienki, where a piano concert takes place every Sunday. Mild weather makes outdoor activities pleasurable from mid-spring to late fall; in winter you can sometimes enjoy snow covering streets and trees. More important, with its 1.8 million population Warsaw managed to avoid many of the social problems that have affected large North American and European cities.

Warsaw is also one of the largest academic centers in Europe. More than 250 000 young people are currently studying at more than 60 universities and colleges. We, engineers, are particularly proud of one of these — the Warsaw University of Technology.

Warsaw, the capital of Poland and its largest metropolitan area, is located in the central part of the country.

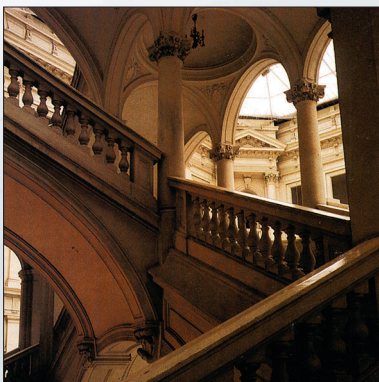
You can reach it in 1–1.5 flight hours from any major European city: Paris, London, Rome, Zurich, Frankfurt, Moscow. The Warsaw downtown is just 8 kilometers from Warsaw International Airport.



4. WHO WE ARE



Warsaw University of Technology, whose origins can be traced back to the first half of the 19th century, is with 32500 students the largest technical university in Poland. The academic staff of nearly 2500, including 1700 professors of various ranks, makes it also the highest-ranked institution for advanced engineering education and research in the country. The University is organized into 17 faculties (schools) that cover virtually all areas of modern engineering.



4.1. UNIVERSITY

The Warsaw University of Technology is well known for its excellent academic staff. All the lecturers have outstanding research accomplishments and a strong commitment to teaching. As the University has an exceptionally low ratio of undergraduate students to professors (about seven to one), the students have many opportunities for close interaction with their instructors.

The programs of study taught in Polish follow a typical continental-European curriculum; students pursue four-year programs that lead to a degree equivalent to the Bachelor of Science in the selected area of engineering. Then a two-year program can lead to a degree of Master of Science in engineering. The academic year is split into two semesters, beginning in the first week of October and in the last week of February, with a three-month summer vacation period.

The Warsaw University of Technology is involved in active cooperation with many foreign academic and research institutions. About 100 members of our academic staff are currently working as experts for international organiza-

tions or are taking visiting positions at foreign universities and research institutes in more than 20 countries. Numerous international technical conferences and symposia have been organized at the University. Groups of Polish students frequently go abroad to enhance their practical skills. Extensive international contacts allow the academic staff and students to be kept familiar with state-of-the-art developments in their field of study and research.

The University is becoming more and more a cosmopolitan place. Each year we welcome students of over 40 nationalities, from all over the world. Currently, about 300 undergraduate and 200 graduate international students are attending the classes at the Warsaw University of Technology. As most courses are taught in Polish, the international students are provided with a one-year intensive language training. In the academic year 1993–1994, for the first time the University offered a number of engineering programs of study taught in English. Today, about 700 students attend the courses taught in English.

WHO WE ARE

4.2. FACULTY OF ELECTRONICS AND INFORMATION TECHNOLOGY

The Faculty, formerly part of the Faculty of Electrical Engineering, was established as a separate school in 1951. Since that time, it has been growing steadily, both in its facilities and in the variety of and depth of its educational and research programs. Currently, it has about 3600 students. They are served by more than 300 members of the academic staff, including 19 full professors, 52 associate professors, and 175 assistant professors, as well as 170 members of technical and administrative staff. The Faculty is known to attain the highest teaching standards and enjoys worldwide recognition for its research. Both the teaching and administrative staff are continuously encouraging measures aimed at consolidating this well-deserved position. Courses are constantly reviewed and revised to keep them up-to-date and relevant to the demands of students and employers.

The Faculty of Electronics and Information Technology has a wide variety

of educational and research facilities. A large number of spacious and well-equipped laboratories in all the subject fields studied here are available. More than 400 workstations and personal computers, running hundreds of computer-aided design programs and other software tools, directly support teaching and research. The computer resources are connected by Ethernet with a gateway for access to other University facilities and to national and international networks.

The Faculty has seven small libraries that house more than 90,000 volumes and serve specific areas of electrical and computer engineering. These local libraries are part of the University Library System that contains approximately 1,400,000 volumes and 3,300 current periodicals. About 70% of the books and journals available in the libraries are in English.

In the dedicated Foreign Language Interactive Learning Laboratory, stu-



The Faculty of Electronics and Information Technology occupies a large, 20600 m² building located at the University's main campus, just one kilometer from downtown Warsaw. It is the largest teaching and research center at the Warsaw University of Technology. Its educational and research activities cover almost the whole spectrum of electrical and computer engineering — from microelectronics and optoelectronics, through instrumentation, measurement, control and robotics, to computer networks and telecommunications.





dents have access to audio and video equipment, a wide range of computer-assisted language learning materials, as well as books, newspapers and magazines. Courses in English, German, French, Italian and Russian are offered at elementary, intermediate, and advanced levels. Special courses in Polish are also available to international students.

The typical form of studies at the Faculty of Electronics and Information Technology has been a four-year program leading to the Bachelor's degree. The next level of education, a two-year program leading to the Master's degree has also been very popular. Many students have continued their education in programs leading to the Doctor's degree. In addition, many short, vocational or continuing education courses and programs have been offered.

There are traditionally many more candidates who apply for studies than the Faculty can admit. The candidates with the best scores from high schools are admitted. As all students are both academically and intellectually outstanding, studying at the Faculty of Electronics and Information Technology is an exceptional opportunity for academic and intellectual growth.

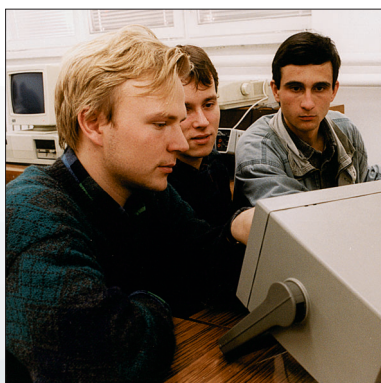
In the academic year 1990–1991, the Faculty restructured its undergraduate curriculum by introducing a new system of studies, giving students a lot of flexibility in planning their individual programs and course loads for each

semester, and in some cases, selecting course instructors. The admission, registration, course and examination scheduling, assignment of classrooms, and other administration procedures have been fully computerized.

The reorganization of the Faculty has been conducted with the active participation of students. Students play a significant role in the decision-making process, serving as full voting members of various committees. The organization of all students, Student Self-Government, through its annually elected representatives, is given authority and sole responsibility to act in specific matters affecting education and student life.

The Faculty attracts students from all over the world and maintains relations with academic and research institutions in more than 30 countries. Based on formal agreements regarding scientific cooperation with international organizations and individual universities, many joint research projects are being carried out. Student and academic staff exchange programs are also conducted. In addition, through various less formal links, out teachers and researchers share their knowledge and experience with their colleagues working at academic and research centers in many countries.

The number of foreign institutions cooperating with the Faculty of Electronics and Information Technology is growing very fast; new links are being established almost every day.



5. STUDIES IN ELECTRICAL AND COMPUTER ENGINEERING

5.1. STRUCTURE OF STUDIES IN ENGLISH

— DEGREE PROGRAMS

The program of study leading to the B.Sc. degree (undergraduate) is a four-year program. The program requires a minimum of 240 ECTS (European Credit Transfer System, in general one ECTS credit corresponds to ten teaching hours in one semester) credits, including credits earned for final project and diploma thesis.

The program of study leading to the M.Sc. degree (graduate) is a two-year program. The program requires a minimum of 120 ECTS credits, including credits earned for research and thesis. If a M.Sc. candidate holds a B.Sc. degree (or equivalent) in the related area, up to 30 credits earned from other academic institutions can be transferred to the M.Sc. program.

The program of study for the doctoral degree requires a minimum of 240 ECTS credits beyond the Bachelor's degree, including credits earned for research and dissertation. If a Ph.D. candidate holds a M.Sc. degree (or equivalent) in the related area, up to

30 credits from the M.Sc. program can be transferred to the Ph.D. program.

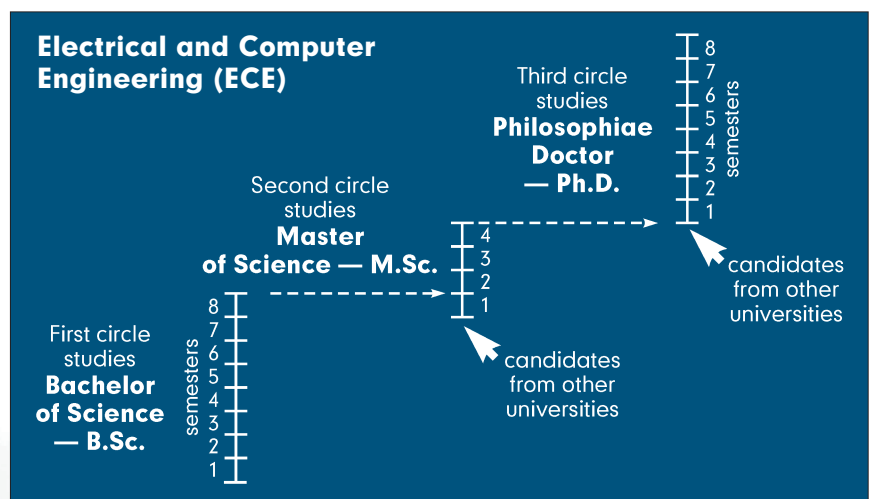
The programs are offered in the following specializations:

- Computer Systems and Networks,
- Telecommunications.

For all the programs, English is the official language of administration and instruction.

The Faculty of Electronics and Information Technology offers the following studies in English, in the area of *Electrical and Computer Engineering*:

- **Bachelor of Science — B.Sc.**
- **Master of Science — M.Sc.**
- **Philosophiae Doctor — Ph.D.**



5.2. ACADEMIC YEAR

The academic year consists of two semesters. The Winter semester starts in the first week of October, the Summer semester starts in the last week of February. Each semester comprises 15 weeks of classes, followed by a two-week reading and examination period. There is a two-week Christmas break, one-week Easter break, and one-week break between the Winter and Summer semesters.

The undergraduate and graduate studies start in October and in February.





The Warsaw University of Technology welcomes applications from candidates of all social and ethnic backgrounds, regardless of their sex, race, age, religion, or political belief. In its admissions policy the University is committed to the promotion of equal opportunity.

The official Polish currency is the złoty (PLN) and most payments in Poland are made using this currency. In this bulletin, however, to simplify financial planning, all fees, estimated expenses, prices, etc., are given in euros.



5.3. ADMISSIONS

Admission is based on the personal and academic records of applicants. All available information is considered, including school records, English language proficiency, evidence of academic maturity and independence, extracurricular activities, and motivation. Applicants' qualifications are judged by the Admissions Committee on a case-by-case basis. The Committee admits to programs of study those applicants who present satisfactory evidence of their ability to pursue the program successfully and who submit all the required materials on time.

A candidate for the B.Sc. program must hold a document certifying a completed secondary school (high school) education.

To qualify for the graduate program, a candidate must have a strong academic background and hold at a Bachelor's degree (or the equivalent) in Electrical Engineering, Computer Engineering, or other related discipline. To qualify for admission to

the Ph.D. program, a candidate must hold a Master's degree (or the equivalent) and, in addition, submit evidence that he/she is capable of undertaking substantial, original research in Electrical and Computer Engineering.

Applications may be submitted at any time. The deadlines are:

- August 15, for admission in the Winter Semester, or
- January 5, for admission in the Summer Semester,

but candidates, especially those from overseas, are strongly advised to submit the completed application form, the application fee, and as many required credentials as possible at the earliest possible opportunity.

The candidates will be notified of their admission status as soon as possible after receipt of all required documents, usually within three weeks, unless additional information is required.

More information on the admission procedure is given in the following sections of this bulletin.

5.4. FINANCIAL MATTERS

Rates for tuition fees are set annually and are subject to review and change without further notice.

5.4.1. Tuition

For the 2006–2007 academic year, the undergraduate tuition is 4000 euros (2000 euros per semester) and the graduate tuition is 5000 euros (2500 euros per semester). The tuition fee for Ph.D. students is 6000 euros (3000 euros per semester). The tuition covers registration, supervision, courses (up to 30 ECTS credits per semester), examinations, and charges for most laboratory equipment and materials. The tuitions are applicable to international students, who are not citizens of the European Union countries. For Polish students and EU citizens the regular studies are free of charge, however if they want to study the ECE program they are obliged to pay an extra tuition fee (2000 PLN per semester for the undergraduate ECE program and 2500 PLN per semester for the graduate ECE program) as a com-

pensation for higher costs of education in English.

5.4.2. Admission

Each candidate for the ECE program has to pay the admission fee of 200 euros while applying for the admission.

5.4.3. Payment

Two forms of payment are acceptable:

- 1) bank transfer to the Warsaw University of Technology bank account,
- 2) banker's check payable to the order of Warsaw University of Technology.

The bank account data for **bank transfers** is as follows:

Bank Name
Bank PEKAO S.A.
IV o/Warszawa
Address of Bank
Grójecka 1/3
02-019 Warszawa, Poland

Account
No 81 1240 1053 1111 0000
0500 5664
 IBAN **No PL 81 1240 1053**
 Swift code **PKOPPLPW**

Please add text "ECE Study" followed by the full name of the student. The required amounts must reach the University account no later than on the day preceding the Registration Day. Late payments are subject to an additional charge.

The **banker's check** payable to the order of Warsaw University of Technology should be sent to:

**Warsaw University
 of Technology
 International
 Students Office
 room 119
 Plac Politechniki 1
 00-661 Warsaw, Poland**

On the check please add text "ECE Study" followed by the full name of the student. The check must be sent early enough to be cleared by Bank PEKAO S.A. in Warsaw by the day preceding the Registration Day. Late payments are subject to an additional charge.

5.4.4. Estimate of Expenses

Costs of studies vary, of course, according to the type of accommodation, arrangements for meals, and the lifestyle of each student. The following estimates are for the 2006–2007 academic year.

Undergraduate students

Average total expenses (excluding travel to/from Poland) of an undergraduate student should be about 7250 euros for the nine-month academic year. These estimates are based on the following figures:

Tuition	4000
Accommodation	1000
Food and other basic living expenses	1350
Books and supplies	450
Personal expenses	450

Graduate students

Average total expenses (excluding travel to/from Poland) of a graduate student should be about 8250 euro for the nine-month academic year. These

estimates are based on the following figures:

Tuition	5000
Accommodation	1000
Food and other basic living expenses	1350
Books and supplies	450
Personal expenses	450

A student living in a University dormitory, budgeting carefully and enjoying few "extras" could probably spend less, but an undergraduate student is unlikely to be able to manage on less than 6000 euros, and a graduate student on less than 7000 euros per academic year.

A student accompanied by his/her spouse should calculate at least an additional 2000 euros for each year, and if accompanied by children, a further 1250 euros for each dependent child.

5.4.5. Financial Support

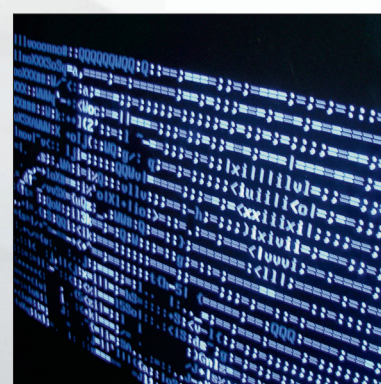
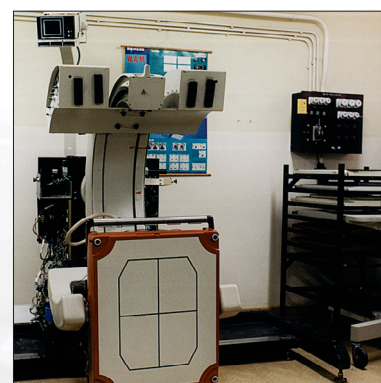
The University does not offer scholarships to international students from non-EU countries. They are eligible to financial prizes for excellent results in the studies or for outstanding achievements in sports. Some of the graduate students are able to act as teaching assistants in various laboratories and classes, but prospective students should not rely on this source of income, and in any case the payment for such work does not amount to more than a few hundred euros per semester.

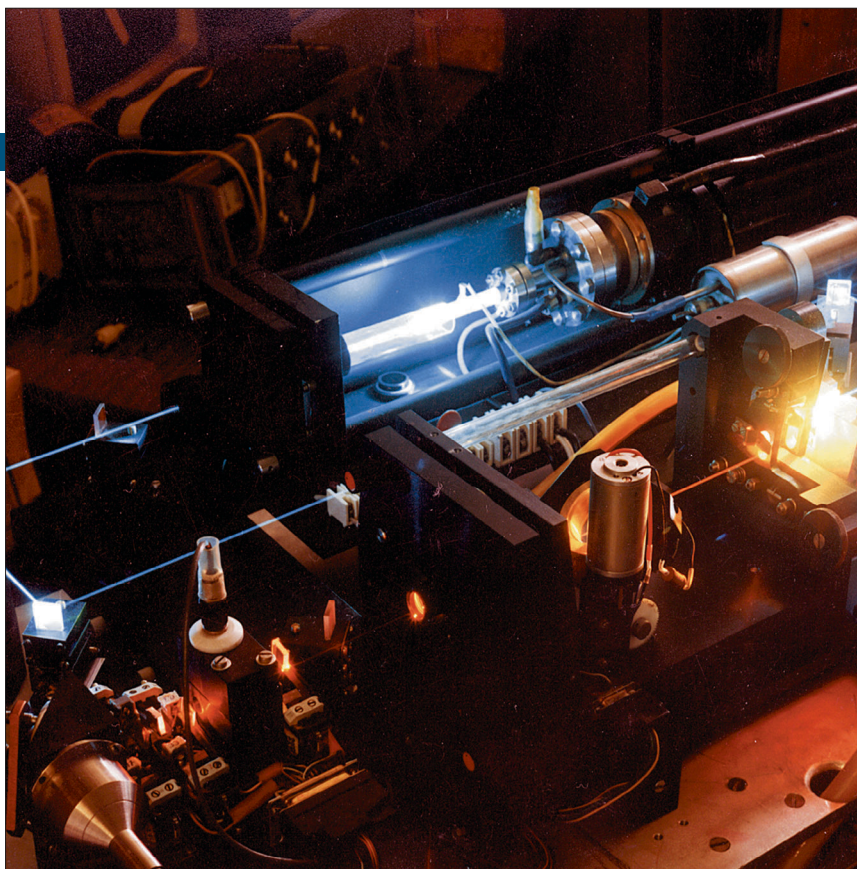
International students may, with the prior approval of the Department of Employment in Warsaw, augment their income by taking part-time or vacation employment in Poland.

Students are encouraged to apply for financial support from outside organizations. A number of national and international organizations offer fellowships to students from both developing and industrialized countries. The fellowships usually do not cover all costs of study and living, but are substantial contributions towards basic expenses.

5.4.6. Financial Guarantees

As mentioned earlier, the University will not be able to provide financial assistance to any student whose funds





prove to be inadequate at any stage of his/her studies. All students will therefore be required to sign a financial statement confirming their understanding of this situation and confirming that they have sufficient financial support for the duration of their studies. For international students, documentary evidence of satisfactory financial support is a condition of admission to the University.

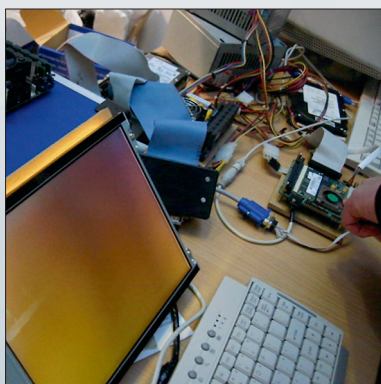
5.4.7. Financial Clearance

A financial hold is placed on a student's record when that student is delinquent in fulfilling his/her financial obligation to the University.

Students with outstanding unpaid charges will not be allowed to register for any semester. No transcript of academic records, official or unofficial, will be issued for a student who has an outstanding debt. The degrees of graduating students will be withheld until all charges due the University are paid in full and all University property is returned in acceptable condition.

5.5. FORMALITIES IN POLAND FOR INTERNATIONAL STUDENTS

Every student that starts studying in Poland has to complete formalities presented below. After arriving to Poland foreigners are obliged to register themselves in a city hall for a temporary residence with the address they have been staying for 48 hours after their arrival.



If a foreigner lives in a dormitory all the formalities are completed by the university. Certificate of registration is required during the procedures of legalisation of residence.

Foreign students who are citizens of European Union countries or Iceland, Lichtenstein, Norway, Switzerland must gain Residence Permit if they are staying over three months in Poland. Permission for residence is given for 1 year — in case of studying.

Foreign students who **are not** citizens of European Union countries or Iceland, Lichtenstein, Norway, Switzerland must gain Card of Temporary Residency in Poland. They need to apply for the card to voivode at least 45 days before the expiry date of visa or previous permission.

Every student is obliged to take care of his or her medical insurance. If you forget about this formality you will have to cover all the costs of possible treatment. Unfortunately, these costs are relatively high.

Person who wants to obtain the voluntary medical insurance should apply to the right department of National Health Fund where all needed forms are available. Next step is to sign the agreement with NFZ. Cost of voluntary medical insurance is about 10 euros per month.

The medical insurance is not the same as accident insurance. Medical insurance does not protect you from the after-effects of accidents. Therefore it is worth to buy an accident insurance.

Foreign students who **are not** citizens of EU countries, Iceland, Lichtenstein, Norway or Switzerland need a permission to work. Such permission is given by Wojewódzki Urząd Pracy (voivodship job centre) in Warsaw. Student's employer has to apply for the permission. The whole procedure doesn't last longer than one month (very often is much shorter). Foreign students have right to work without permission for no longer than 3 months during summer holiday.

5.6. ACADEMIC REGULATIONS AND PROCEDURES

§ 2. General Rules

1. A student shall be admitted to the Warsaw University of Technology upon matriculating and taking the academic oath before the Rector or the Dean. After matriculation the student shall receive a student identity card and a student record book. A student record book is a document which shows the progress and achievements of the student and which will be kept by the student after graduation.
2. The Rector shall be the superior and guardian of all students at the Warsaw University of Technology.
3. Student self-government bodies shall represent the interests and voice the opinions of students of the Warsaw University of Technology.

§ 3. Student's rights and obligations

1. In addition to the rights stemming from Acts of Parliament and the Statutes of the Warsaw University of Technology, a student shall have the right to:
 - develop his or her interests in the areas of research, culture, tourism and sports, and use teaching facilities, equipment and other resources of the Warsaw University of Technology as well as receive support from the academic staff and bodies of the University for this purpose;
 - evaluate classes through student feedback questionnaire surveys conducted in accordance with the regulations in force at the University;
 - voice his or her opinions on matters relevant to students and the University, directly or through student representatives in the collective bodies of the University;
 - make use of the collection of books and journals as well as scientific information available in the university library system;
 - make complaints and proposals concerning academic arrangements and student welfare issues.
2. A student shall conduct himself or herself in accordance with the academic oath and the academic regulations. In particular, a student shall:
 - pursue his or her studies in accordance with the overall study schedule and curriculum;
 - act with honesty towards the University and the academic community;
 - observe the rules of social conduct;
 - uphold the interests of the Warsaw University of Technology.
3. A student shall also observe administrative regulations in force at the Warsaw University of Technology, and in particular shall undergo periodic medical examination.
4. A student shall pay tuition fees by the specified deadlines, in accordance with the rules in force at the University.
5. A student shall immediately notify the Dean of the change of his or her first name, surname or address.

[...]

§ 9. Grading scale

1. The following grades and their verbal descriptors shall be used when assessing student achievements in a given course:

5.0	=	five	or	very good
4.5	=	four and a half	or	above good
4	=	four	or	good
3.5	=	three and a half	or	fairly good
3	=	three	or	satisfactory
2	=	two	or	unsatisfactory

Some selected paragraphs of Academic Regulations concerning studies held in the English language resolved by the Senate of Warsaw University of Technology on 26 March 2003 can be found in this chapter. The whole document is available in printed form or in the Faculty web page: <http://www.elka.pw.edu.pl>





2. The grade "2" shall be equivalent to non-completion of a given course by a student.

[...]

§ 20. Graduation

1. Graduation shall take place once a student has received a positive assessment of the diploma thesis and passed the diploma examination. A graduate shall obtain a higher education diploma, confirming the award of a relevant degree, on the basis of the decision taken by the diploma examination board.
2. The final numerical result achieved by a student shall be calculated up to two decimal points and shall be equal to the sum of:
 - a) 0.6 of the weighted average of all overall grades for courses, with weightings proportional to the number of credits allocated to each course,
 - b) 0.3 of the grade for the diploma thesis,
 - c) 0.1 of the grade for the diploma examination.
3. The final grade shall be based on the final numerical result and determined in accordance with the following rule:

	4.70	and	above	=	excellent
between	4.30	to	4.69	=	very good
between	3.90	to	4.29	=	good
between	3.50	to	3.89	=	fair
		up to	3.49	=	satisfactory

4. A higher education diploma shall consist of two parts:
 - the first part shall give the degree awarded to the student, the name of the field of study and, where applicable, the specialisation area taken by the student and his or her final grade;
 - the second part, a **Diploma Supplement**, shall give information concerning the degree programme completed, including the courses completed together with grades.
5. At the request of a student, submitted either together with the diploma thesis or seven days after the diploma examination at the latest, the University shall issue, in addition to a higher education diploma in the Polish language, a copy of the diploma in one of the following languages: English, French, Spanish, German or Russian.
6. Before receiving the diploma, a graduate shall be required to fulfil all obligations towards the University.
7. The Faculty Board may request the Rector to award a distinction to a student who has graduated with the grade "excellent". The types of distinction for graduates shall be determined by the Senate of the Warsaw University of Technology.
8. Higher education diplomas shall be presented by the Dean at a graduation ceremony.



[...]

§ 25. Final and transitional provisions

1. The Rector shall be the appeal authority in all matters governed by these regulations.
2. Long-cycle students shall be subject to the provisions applicable to first-cycle students, and the deadlines for the submission of the diploma thesis by long-cycle students shall be those applicable to second-cycle students.
3. A credit system in part-time degree programmes shall be introduced on a compulsory basis in programmes commencing in 2007.

6. UNDERGRADUATE STUDIES

The program embraces a great variety of subjects corresponding to diverse subject areas. All students study the same program in the first and second year, and then they choose their specialization.

Two specializations are currently offered:

- Computer Systems and Networks (CSN),
- Telecommunications (TCM).

In future we plan to open additional specializations, i.e.:

- Control and Management,
- Instrumentation, Measurement and Control,
- Microelectronics and Optoelectronics,
- Systems and Signal Processing.

Area				Specialization			
Electrical and Computer Engineering (ECE)				Computer Systems and Networks (CSN)			
				Telecommunications (TCM)			
sem. 1	sem. 2	sem. 3	sem. 4	sem. 5	sem. 6	sem. 7	sem. 8

6.1. ADMISSION REQUIREMENTS

6.1.1. Eligibility

Every foreign candidate who wishes to study in Poland must hold a Maturity Certificate in order to qualify for admission to an academic institution. A certificate of the completion of a higher secondary school abroad may be accepted if the total duration of the education leading to the certificate has been at least 11 years. Secondary school matriculation certificates awarded abroad and secondary school completion certificates from abroad are considered as the equivalent to the matriculation certificates of public secondary schools and secondary vocational schools if: they contain a clause confirming the right to apply for admission to academic institutions in the country where the certificate was issued. If this is not the case, the applicant must supply, together with the school certificate, a letter from the school or from an appropriate authority in the country where the certificate was issued (i.e. the Ministry of Education, local educational authority etc.) stating that with such a certificate the candidate is eli-

gible for admission to an academic institution. The Polish foreign service representative office or a consular office can offer advice on how to obtain such a document [*Documents issued in one country which need to be used in another country (i.e. Poland) must be authenticated or legalized before they can be recognized as valid by Polish authorities. The apostille is the legalization provided by the appropriate institution in the country where the document/certificate was issued*] or can assess as to whether the presented certificate entitles the holder to apply to a university in Poland.

6.1.2. How to Apply

The **application form**, together with copies of the documents listed in the form, must be sent by post to:

International
Students Office
Warsaw University of Technology
Pl. Politechniki 1,
00-661 Warsaw, Poland

The program of study leading to the B.Sc. degree (undergraduate) in the area of **Electrical and Computer Engineering** is a four-year program. The area of study encompasses two main streams: **information technology and telecommunications, as well as some courses in related fields like control, robotics and electronics.**

Admission procedure is carried out solely by the International Students Office:
<http://www.cwm.pw.edu.pl/students>
e-mail:
students@cwm.pw.edu.pl





The originality of the Maturity Certificate and, if necessary, the letter confirming that this certificate entitles the candidate to be admitted to an academic institution must be confirmed by the Polish Foreign Service representative office, or a consular office. This statement must be attached to the sent documents.

Only applications received **until the 15th August for the Winter Semester or until the 5th January for the Summer Semester** sent with the copy of application fee payment slip will be considered as valid submissions for the academic year beginning in October or in February, respectively. Within two weeks the International Students Office will send the decisions to the applicants. Additional information about programmes, application procedures and other related matters can be obtained from the International Students Office:

e-mail: students@cwm.pw.edu.pl

A non-returnable application fee of 200 euros must be paid to:

**Warsaw University of Technology
International Students Office**

Account details:

Bank PEKAO SA, IV o/Wawszawa
account number: **PL 81 1240
1053 1111 0000 0500 5664**

The payment order must include the student's full name.

6.1.3. On Being Accepted

Candidates will get the admission decisions. For non-EU citizens requiring an entry visa a **letter to the Polish Consulate or Embassy supporting the visa application will be provided**. An application form for a Polish visa is available at: <http://www.msz.gov.pl/?document=2348>.

At this stage the candidate must cover some costs. The Polish Consulate or Embassy will issue a conditional *pro forma* promise which is valid for a short period of time. After obtaining it the candidate will be expected to arrange international health insurance cover (detailed information about the type and length of required insurance is available at the Polish Consulates or Embassies) and to pay the tuition fee [*The fee is repayable upon encountering any problems with the student's arrival*] for the first year of the course.

A Polish visa will be issued upon the presentation of the health insurance and the original receipt for the payment of fees.

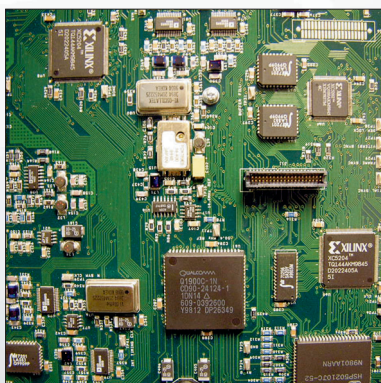
At the moment of the final application for the Polish visa an **application for a place in a students' hall of residence** (if necessary) must be submitted.

6.1.4. On Arrival

Prior to arrival the candidate must check if a place in the students' hall of residence was assigned (if applicable).

The candidate must bring and present the following documents to the International Students Office:

- originals of all documents submitted as copies with the application form,
- sworn translation in Polish [*The translation can be arranged upon arrival (in Poland) and the International Students Office can assist in this matter*] of the school certificate,
- the payment slip confirming the tuition fee transfer,
- the certificate of long-term health insurance,
- a **medical report** completed by a medical doctor.



6.2. COMMON PROGRAM OF STUDY

The second (sophomore) year offers more mathematics and fundamental ECE classes, emphasizing circuits, analog and digital electronics, signals and systems. During the third (junior) year, more ECE courses are taught, including fields and waves, control systems, design of digital systems and computers, and a few courses associated with a particular specialization area. During the final (senior) year

most courses taken are specialization electives. In addition to science and engineering courses, courses in humanities, arts, economics, or social sciences (non-ECE electives) are also required to be taken each year. Physical education is compulsory for three years despite that students gain no credits for it. Students are expected as well to study foreign languages for four semesters.

The first two years are common to all students. The first (freshman) year provides a broad foundation in mathematics, physics and computer programming, and offers an introductory course in *Electrical and Computer Engineering*.

Electrical and Computer Engineering (ECE) — Common								
Semesters:	1	2	3	4	5	6	7	8
Groups of courses	ECTS credits							
CSN/TCM Specialization					3	12	27	27
Mathematics	12	6	6	6				
Physics	6	6	6					
Programming	6	6	6	6				
Electronics		6	6	6	6			
Computer Systems				6	6	6		
Telecommunications				6	6	6		
Control					6	6		
Non-ECE Electives	3	3	3		3	3	3	3
Language	3	3	3	3				
Physical Education	0	0	0	0	0	0		
Σ	30	30	30	33	30	33	30	30

During the third (junior) year and the final (senior) year most courses are associated with a particular specialization. The last year of studies also includes Senior Design Project —

a course in which the student, under the supervision of his/her advisor, works individually on a practical engineering problem.



The graduates of the Bachelor's degree program in the *Computer Systems and Networks* know modern operating systems, programming languages, databases, fundamentals of information processing and various software applications.

6.3. PROGRAM OF THE CSN SPECIALIZATION

The graduates have good qualifications in the computer science fundamentals, in the area of algorithms and in various aspects of computer engineering and applications. They know the methodologies of object oriented

programming, CASE-tools-aided design, system analysis, modeling and prototyping. They are self-reliant in the design, implementation and operation of complex computer systems and networks.

Computer Systems and Networks (CSN) — Specialization								
Semesters:	1	2	3	4	5	6	7	8
Courses	ECTS credits							
ECE Common & Non-ECE Electives	30	30	30	33	27	21	3	3
Senior Design Project & Seminar							3	15
Principles of Computer Science					3			
Algorithms and Data Structures						6		
Graphical User Interfaces						6		
Data Bases							6	
Operating Systems							6	
Software Engineering							6	
Computer Graphics							6	
Compiling Techniques								6
Computer Networks								6
Σ	30	30	30	33	30	33	30	30

6.4. PROGRAM OF THE TCM SPECIALIZATION

The graduates of the Bachelor's degree program in the *Telecommunications* know fundamentals of the digital processing of telecommunication signals (coding and compression of speech and image signals, digital modulations, redundant coding) and are prepared for the jobs related to the design of digital telecommunication circuits, as well as telecommunication (telephone, data-communication and integrated) networks.

The graduates' qualifications include the capabilities necessary for solving system problems that require comprehensive knowledge in the areas of telecommunications and computer science, combined with considerable non-engineering knowledge. They are

prepared for the jobs offered by the operators of telecommunication and data-communication systems, as well as for the jobs related to the operation of modern telecommunication equipment and systems, offered by other companies.

Telecommunications (TCM) — Specialization								
Semesters:	1	2	3	4	5	6	7	8
Courses	ECTS credits							
ECE Common & Non-ECE Electives	30	30	30	33	27	21	3	3
Senior Design Project & Seminar							3	15
Introduction to Signal Transmission					3			
Signal Processing in Telecom. & Radar						6		
Digital Signal Processing						6		
Multi-Service and Multimedia Networks							6	
Contemporary Heuristic Techniques							6	
Optical Fiber Transmission							6	
Satellite Communication Systems							6	
Wireless Networking								6
Computer Networks								6
Σ	30	30	30	33	30	33	30	30

7. GRADUATE STUDIES

Two specializations are currently offered:

- Computer Systems and Networks (CSN),
- Telecommunications (TCM).

In future we plan to open additional specializations, i.e.:

- Control and Management,
- Instrumentation, Measurement and Control,
- Microelectronics and Optoelectronics,
- Systems and Signal Processing.

Specialization			
Computer Systems and Networks (CSN)			
Telecommunications (TCM)			
sem. 1	sem. 2	sem. 3	sem. 4

The master's degree program requires a minimum of 120 ECTS credits, including credit units earned for research and thesis. The 120 credits requirement may be met by completion of courses offered at the Warsaw University of Technology in combination with transfer credit from other academic institutions. The total amount of transfer credit cannot exceed 30 credits.

Each graduate student has a faculty advisor. This professor helps the student plan an academic program of course work consistent with the degree requirements and the student's educational objective. The advisor also supervises the student's research and thesis. The thesis is based on a research project that involves, in part, original material.

The program of study leading to the M.Sc. degree (graduate) in the area of *Electrical and Computer Engineering* requires course work in one specialization and a thesis.

The program lasts two years and students have to choose their specialization from the beginning.

7.1. ADMISSION REQUIREMENTS

7.1.1. Eligibility

Every foreign candidate who wishes to study in Poland must hold a Maturity Certificate in order to qualify for admission to an academic institution. A B.Sc. diploma (or equivalent diploma) in area according or related to Electrical and Computer Engineering is required. It is recognized by the Faculty Council, if the undergraduate education satisfies the expectations of our M.Sc. program (and the candidate is capable of taking it). The diploma has to be legalized — it has to be supplemented by a statement that it is authentic (there are different legal ways of legalization including a statement from Polish diplomatic post). Along with the B.Sc. diploma (or equivalent diploma) it is necessary to submit a certificate of the completion of a higher secondary school. The certificate of the completion of a higher secondary school abroad may be accepted if the total duration of the education leading to the certificate has been at least 11

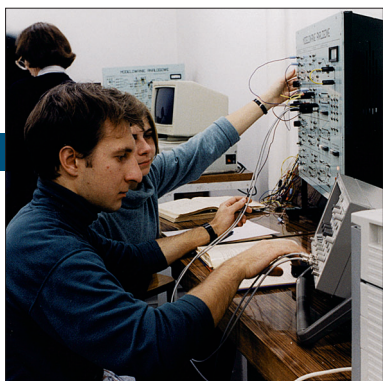
years. Secondary school matriculation certificates awarded abroad and secondary school completion certificates from abroad are considered as the equivalent to the matriculation certificates of public secondary schools and secondary vocational schools if: they contain a clause confirming the right to apply for admission to academic institutions in the country where the certificate was issued. If this is not the case, the applicant must supply, together with the school certificate, a letter from the school or from an appropriate authority in the country where the certificate was issued (i.e. the Ministry of Education, local educational authority etc.) stating that with such a certificate the candidate is eligible for admission to an academic institution. The Polish foreign service representative office or a consular office can offer advice on how to obtain such a document [*Documents issued in one country which need to be used in another country (i.e. Poland) must be authenticated or legalized before they can be recognized as valid by*

Admission procedure is carried out solely by the International Students Office:

<http://www.cwm.pw.edu.pl/students>,

e-mail: students@cwm.pw.edu.pl





Polish authorities. The apostille is the legalization provided by the appropriate institution in the country where the document/certificate was issued] or can assess whether the presented certificate entitles the holder to apply to a university in Poland.

7.1.2. How to Apply

The **application form**, together with copies of the documents listed in the form, must be sent by post to:

International Students Office
Warsaw University of Technology
 Pl. Politechniki 1, 00-661 Warsaw, Poland

The originality of the maturity Certificate and, if necessary, the letter confirming that this certificate entitles the candidate to be admitted to an academic institution must be confirmed by the Polish Foreign Service representative office, or a consular office. **This statement must be attached to the sent documents.**

Only applications received **until the 15th August for the Winter Semester or until the 5th January for the Summer Semester** sent with the **copy of application fee payment slip** will be considered as valid submissions for the academic year beginning in October or in February, respectively. Within two weeks the International Students

Office will send the decisions to the applicants. Additional information about programmes, application procedures and other related matters can be obtained from the International Students Office:

e-mail: students@cwm.pw.edu.pl

A non-returnable application fee of 200 euros must be paid to:

Warsaw University of Technology
International Students Office

Account details:

Bank PEKAO SA, IV o/Warszawa
 account number: **PL 81 1240 1053 1111 0000 0500 5664**

The payment order must include the student's full name.

7.1.3. On Being Accepted

Candidates will get the admission decisions. For non-EU citizens requiring an entry visa a **letter to the Polish Consulate or Embassy supporting the visa application will be provided**. An application form for a Polish visa is available at: <http://www.msz.gov.pl/?document=2348>.

At this stage the candidate must cover some costs. The Polish Consulate or Embassy will issue a conditional *pro forma* promise which is valid for a short period of time. After obtaining it the candidate will be expected to arrange international health insurance cover (detailed information about the type and length of required insurance is available at the Polish Consulates or Embassies) and to pay the tuition fee [*The fee is repayable upon encountering any problems with the student's arrival*] for the first year of the course.

A Polish visa will be issued upon the presentation of the health insurance and the original receipt for the payment of fees.

At the moment of the final application for the Polish visa an **application for a place in a students' hall of residence** (if necessary) must be submitted.

7.1.4. On Arrival

Prior to arrival the candidate must check if a place in the students' hall of residence was assigned (if applicable).



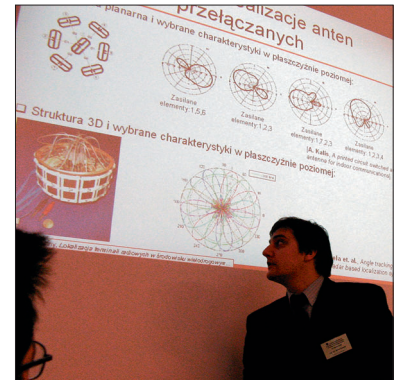
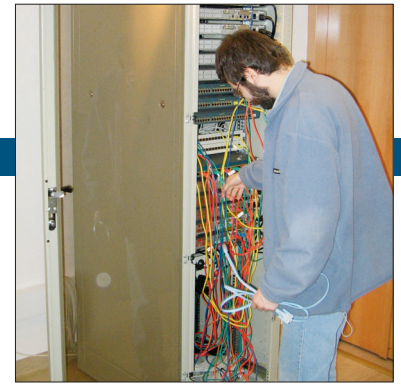


The candidate must bring and present the following documents to the International Students Office:

- originals of all documents submitted as copies with the application form,
- sworn translation in Polish [*The translation can be arranged upon arrival (in Poland) and the Inter-*

national Students Office can assist in this matter] of the school certificate,

- the payment slip confirming the tuition fee transfer,
- the certificate of long-term health insurance,
- a **medical report** completed by a medical doctor.



7.2. PROGRAM OF THE CSN SPECIALIZATION

The graduates are proficient in computer programming and skilful in using the computer tools efficiently. They are self-reliant in scheduling, implementing and verifying complex computer projects. Their knowledge enables them to quickly adapt themselves to the rapidly changing environment. Depending on the final profil-

ing, the graduates are well prepared for the research work, for the design, implementation and operation of computer systems and digital equipment, for the software development, for the administration of computer systems and networks as well as for the implementation of security systems.

The graduates of the Master's degree program in the *Computer Systems and Networks* have the comprehensive qualifications in the area of computer science fundamentals, including fundamentals of information processing, as well as in the area of algorithms and system modeling.

Computer Systems and Networks (CSN) — Specialization					
Semesters:	1	2	3	4	
Courses (or groups of courses)	ECTS credits				
Discrete Random Processes		6			
Parallel Numerical Methods		6			
Image and Speech Recognition		6			
Digital Signal Processor Architecture & Programming		6			
Pattern Recognition			6		
Cryptography & Data Security			6		
Data Mining			6		
Evolutionary Algorithms			6		
CSN Fundamentals	30			6	
Non-ECE Electives				3	
M.Sc. Diploma Project & Seminar	3	6	6	18	
Σ	33	30	30	27	



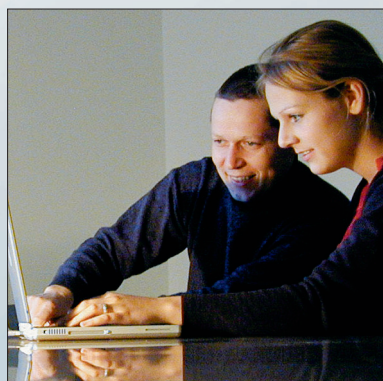


The graduates of the Master's degree program in the *Telecommunications* have the knowledge and skills necessary for the design, implementation and operation of telecommunication circuits, equipment and systems based on modern technologies.

7.3. PROGRAM OF THE TCM SPECIALIZATION

The graduates know, in particular, the methods and techniques for transmission of information by means of radio-waves — using the potential of digital techniques, computers and other advanced technologies — as well as the methods for image and sound processing. The qualifications of the graduates include the capabilities necessary for solving system problems that require comprehensive know-

ledge in the areas of telecommunications and computer science, combined with some non-engineering knowledge. Depending on the final profiling, the graduates are well prepared for the research work or for the design and operation of telecommunication and data-communication equipment and systems, as well as for designing multimedia systems and their Internet applications.



Telecommunications (TCM) — Specialization				
Semesters:	1	2	3	4
Courses (or groups of courses)	ECTS credits			
Discrete Random Processes		6		
Wide Area Networking		6		
Quening Theory		6		
Adaptive Image Recognition		6		
Techniques and Algorithms for Signal Processing			6	
Analysis and Design of Communication Protocols			6	
Intelligent Networks			6	
Digital Communications			6	
TCM Fundamentals	30			6
Non-ECE Electives				3
M.Sc. Diploma Project & Seminar	3	6	6	18
Σ	33	30	30	27

8. RESEARCH PROFILE

8.1. INSTITUTE OF COMPUTER SCIENCE

■ **Computer Architectures and Software Engineering Division's** research profile includes formal methods and tools for computer-aided design of concurrent systems, parallel processing architectures, local area networks, embedded and real-time systems, performance and reliability analysis of concurrent systems, system dependability, software quality, reliability and testing, fault diagnostics and fault tolerance in digital and mixed mode systems, advanced logical synthesis. Current research projects embrace:

- diagnostics and fault tolerance in computer systems (hardware and software),
- selected formal methods of software specification, design and verification
- COSMA environment and methodology for systems' design and verification,
- multi-agent systems (robotic-agents), problems of cooperation and social behaviour,
- software metrics and UML modelling.

■ **Information Systems Division's** research consists of practice and theory of information systems and database systems, as well as, vagueness, uncertainty and approximate reasoning, in particular — knowledge representation, data mining, reasoning about knowledge, machine learning, and the application of rough set theory in the above fields. Examples of research projects are as follows:

- logical tools for semantic database description,
- development of rough set theory and its applications to knowledge discovery,
- implementation of decision support systems,
- application of developed software to vague data analysis, voice

recognition, pattern recognition etc.,

- knowledge discovery, data, text and WEB mining, theory and practice.

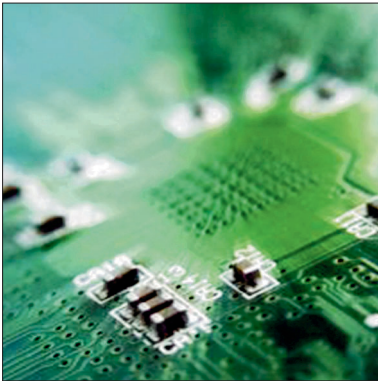
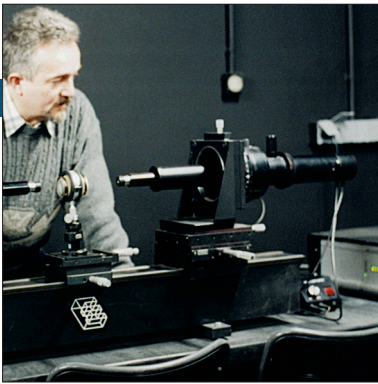
■ **Computer Graphics Division's** research interests are: image generation and image processing: modelling and rendering, colour in computer graphics, modelling of natural phenomena and objects, real time image generation and processing (algorithms, hardware and software), virtual reality systems. Current research projects include:

- modelling and rendering of plants and their growth,
- colour spaces,
- application of image processing methods in computer graphics,
- interaction in virtual reality systems,
- data visualisation,
- document processing,
- visualisation of fractal objects,
- compositing computer generated and real images.

A research is conducted in six Institutes, which belong to the Faculty of Electronics and Information Technology. A concise description on the research profile of all Institutes is given in subsequent sections.



8.2. INSTITUTE OF CONTROL AND COMPUTATION ENGINEERING



■ **Complex Systems Group** concentrates on the theory and methodology of model-based predictive repetitive control and hierarchical control structures for non-linear systems under uncertainty, methods for solving continuous and discrete time optimization problems, and software for computer aided analysis and design of complex systems. Particular attention is given to distributed and parallel, synchronous and asynchronous computations, as well as to the analysis and design of control algorithms and pricing techniques for computer networks. Moreover, the group develops techniques for information systems security.

■ **Biometrics and Machine Learning Group** deals with biologically inspired control and information technology, including biometrics, machine learning, uncertainty modeling, and biological modeling. Biometrics consists in using personal characteristics for identity authentication. Group's research in biometrics includes pattern recognition for iris, hand-written signature, hand shape and lines, etc. Also, safety of biometric data storage and exchange, biometrics intelligent cards, and data encryption using biometrics are investigated. Machine learning research focuses on learning algorithms, adaptive control, multi-agent systems.

■ **Robot Programming and Pattern Recognition Group** focuses on service robots, i.e., two-handed devices using reasoning, visual servoing, force control, and speech recognition to fulfill tasks in human oriented environments. The research concentrates on robot motion planning and control systems, autonomous mobile robot localization and navigation, robot programming methods, position-force control, computer vision systems and speech recognition systems.

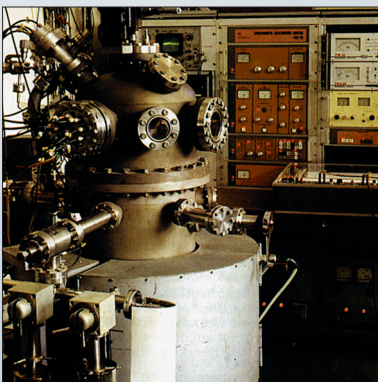
■ **Control Engineering Group** deals with industrial process control. The focus is on predictive and fuzzy control algorithms, multilayer optimizing and supervisory control, non-linear system

control and analysis. Model-based predictive control algorithms for linear and nonlinear process modeling are developed and investigated. Soft computing methods for design and tuning of control systems are used, based on fuzzy systems, neural nets, and genetic algorithms. Theoretical considerations are combined with simulation analysis in the investigations.

■ **Software Engineering Group** develops software and evaluates its quality. Research focuses on software processes, analysis, design and quality evaluation methods, and software audit. The group has worked on a number of commercial projects related to the development and evaluation of huge software systems for public organizations and for the industry. The scope of those projects included business process modeling, requirements analysis, strategic planning, conducting the testing process, and software audit.

■ **Operations Research and Management Systems Division** is concerned with operation research and structural discrete optimization methods for control and management of discrete processes, including applications in the deregulated electric power industry, computer integrated manufacturing and educational systems. Research focuses on market and auctions design, scheduling techniques, efficient structural-based optimization algorithms, time-table generation, strategic and tactical planning, detailed scheduling, and real-time operational control. Object oriented and relational database management systems as well as CASE methods are investigated for the purpose of design of distributed multi-functional heterogeneous information systems.

■ **Optimization and Decision Support Division** concentrates on the theory of distributed and parallel computational methods, and software for optimization. The theory covers



a whole area of linear and non-linear, dynamic, stochastic and multiple criteria problems, and deals with such topics as their sensitivity and parametric aspects. Another area covers decision theory, including multi-person

decisions and game theory, and deals with software for decision support, organization and management of computer networks. Methods of reasoning in knowledge based systems are also investigated.

8.3. INSTITUTE OF MICROELECTRONICS AND OPTOELECTRONICS

■ The research carried out in the **Microelectronics and Nanoelectronics Devices Division** is focused on fabrication, characterization and modeling of MOS (metal-oxide-semiconductor) structures. Research topics include: kinetics of silicon oxidation, deposition of ultrathin dielectric layers (SiO_2 , Si_3N_4 , SiO_xN_y), MEMS/MOEMS processing, electrical characterization of modern MOS structures (SOI, double gate, vertical, etc.) modeling of modern MOS structures (e.g. SOI, double gate, resonant tunneling diode) and phenomena (transport mechanisms, quantum effects).

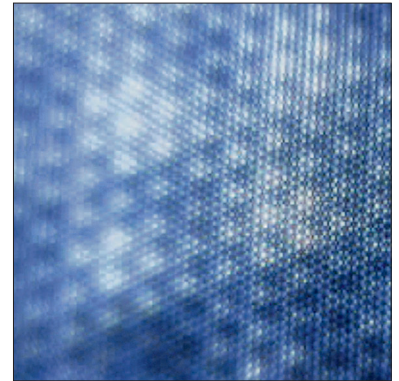
■ The research carried out in the **VLSI Engineering and Design Automation Division** is focused on design of microelectronics IC's (integrated circuits) and application of microelectronics in digital signal processing. Research topics include: methods of formal and functional verification of IC design, logic circuit verification, studies of circuit-topography sensitivity to spot defects; novel mathematical methods of process modelling in application to statistical simulation; novel two-dimensional mathematical simulation of semiconductor devices.

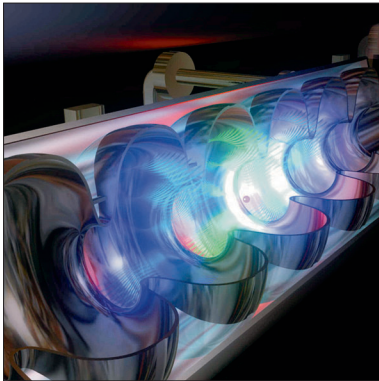
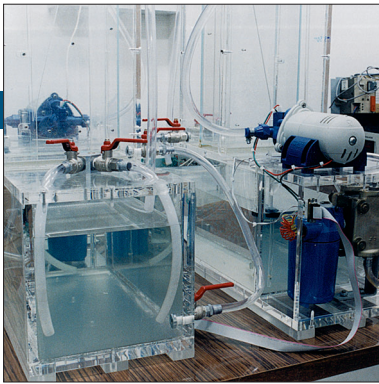
■ The research carried out by the **Microsystem and Electronic Material Technology Division** concentrates on optoelectronic and hybrid devices. Research topics include: fabrication and investigation of numerous optoelectronic devices, application of thin and thick film technology in hybrid devices and thick film sensors fabrication, electronic packaging technology, new materials (semiconductors and dielectrics) for microelectronics applications (e.g. diamond-like-carbon, boron nitride, silicon carbide).

■ The research carried out in the **Microwave Electronics and Photonics Division** is focused on propagative electronics and microwave photonics. Research topics include: analysis of oscillation conditions, frequency stabilisation and synthesis in microwave bands, automation and computerisation of measurement techniques of microwave circuit and device parameters, modelling and computer aided design of microwave devices and circuits; investigations and modelling of optical-microwave frequency conversion processes, modelling of optically controlled microwave devices.

■ Research carried out in the **Optoelectronics Division** is focused on laser physics, spectroscopy, construction and application in medicine and air pollution monitoring. Research topics include: solid state laser construction and laser applications in material processing; spectroscopic research of new laser materials, theoretical research of laser generation, nano-optical structures and photonic band-gap materials, research of light generation in metal vapour gas lasers optimisation of the construction of ion gas lasers.

■ The research carried out in the **Image Processing Division** is focused on the technology of electronic imaging devices and of digital image processing. Research topics include: theoretical principles of image modelling, numerical methods of image analysis, implementation of digital image processing for detection, inspection and identification of objects, electro optic effects in liquid crystals and their applications to LCD, photo refractive phenomena in liquid crystals for dynamic holography and optical data storage.





8.4. INSTITUTE OF ELECTRONIC SYSTEMS (ISE)

In recent years, the teaching and research activities in the IES have been focused on design, construction and maintenance of analogue, digital and mixed electronic systems and instrumentation, working in the range of low, high, microwave as well as optical frequencies. These systems are intended for many different applications in: measurement and control, radio — and telecommunication, bioengineering and radar, high energy physics experiments, astronomical and space technology research programs, with broad use of digital, microprocessor and computer techniques and software engineering. Teaching and research activities of the Institute's staff are in the areas: of CAD systems for VLSI analogue, digital and mixed electronic circuits and systems, VHDL/FPGA system design with such techniques as DSP chips and gigabit optical transmission, micro electro-mechanical systems, design and testing of RF and microwave monolithic integrated circuits for communication systems, computer controlled measurement systems, numerical methods, digital signal processing of radar signals, and of biomedical signals, analogue and digital filtering, neural networks, artificial intelligence, molecular DNA computing, semiconductor and smart sensors, flow sensors and flow measurements, optoelectronic metrology, non-linear fiber optics, optical fiber devices and optical fiber sensors.

The IES's staff teaches basic courses such as: Circuit Theory, Signals and Systems, Electronic Circuits and Systems, Basics of Electrical and Electronic Measurements. But the main teaching and research involvement of the Institute is in the advanced and modern areas of electronics and information technology presented above. In a two-stage teaching system of the Faculty, the Institute is responsible for a specialization Electronics and Computer Engineering. In many aspects these two areas of science and engineering have common fields. Staff members of the Institute are involved in most of the teaching activities for Electronics and Computer Engineering specialization, but they also teach and participate in other specializations.

Like other Institutes of the Faculty, The IES is structured into Divisions. The Institute incorporates five Divisions consisting of Research Groups:

- Circuit and Signal Theory — Non-linear Networks, Digital Methods in Signal Processing, Radar Signal Processing Group;
- Microwave Circuits and Instrumentation;
- Electronic Circuits and Systems — Electronic Analogue Circuits, Digital Systems and Digital Signal Processing, Pulse and Digital Equipment, Biocybernetic Instrumentation;
- Measurement Systems and Microsystems — Sensors, Industrial Measurement Systems, Automatic Test Systems, Optoelectronic Circuits, Internet Measurement Systems;
- Artificial Intelligence.

Each year the Institute organizes research conferences on Advanced Electronic and Photonic Systems (devoted mainly for Ph.D. students) and on Evolutionary Algorithms. The Institute participates in a number of international and European research programs, including bilateral and multilateral cooperation on application of electronic systems with technical universities in Germany, Italy, Spain, UK. The IES offers a wide range of teaching and research opportunities for undergraduate, graduate and post-graduate students. It offers also its technical and intellectual resources for the industry. The IES's teaching and research activities respond to the needs of today's electronic and computer engineering.

Students who come to the IES are joining a dynamic, expanding and lively institution, in which the staff is managing to retain one of the long-standing academic tradition to maintain high standards for education and research, while keeping friendly atmosphere and good relations between staff and students.



8.5. INSTITUTE OF RADIOELECTRONICS

The Institute of Radioelectronics employs 68 scientific and didactic workers, therein 15 Professors (9 with the state title) and 45 Assistant Professors. There are almost 50 Ph.D. students under the auspices of the Institute. The Institute of Radioelectronics consists of 5 scientific research divisions: Radiocommunications Division, Microwave and Radiolocation Engineering Division, Electroacoustics Division, Television Division and Nuclear and Medical Electronics Division. The research and development works are concentrated on three main areas:

- **Radiocommunications and radio-navigation:** focused on digital radio transmission problems and advanced computer science applications, radio systems design, particularly cellular and short range systems, radio transmitting and receiving, electromagnetic and signal theory, as well as ecological and electromagnetic compatibility problems. The research also covers smart antennas and satellite techniques, measurements techniques for very high frequency range as well as computer-aided design, data acquisition and data processing. It also deals with the design of high-frequency systems for radar techniques and radiocommunications.
- **Multimedia techniques:** the works concentrate on the areas of television and electroacoustics, covering mainly the subject matter of intelligent multimedia systems, digital and interactive television, e-learning standards and platforms with a special emphasis on multimedia tools for collaborative e-learning using media streaming and searching techniques. There are continuous efforts in developing MPEG standards (MPEG-4 and MPEG-7). The research is also concentrated on the investigation and

modeling of acoustic field distribution, digital audio techniques, noise control and active noise reduction as well as psychoacoustics and architectural and industrial acoustics.

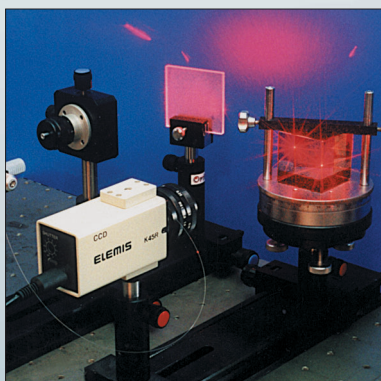
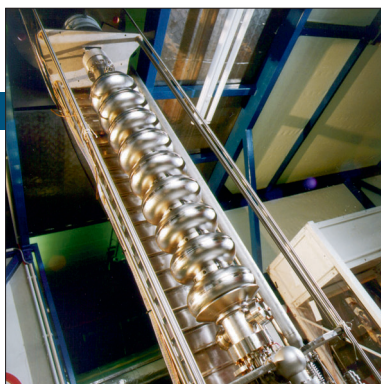
- **Biomedical engineering:** covers a broad range of topics and integrates electronics and information technology with elements of medical knowledge; focused on medical diagnostics, application of magnetic resonance technique, tomography, telediagnosics, processing, analysis and compression of medical images, medical image processing and recognition, biomedical accelerators. Further, the research deals with the methods and instrumentation for electrocardiography and high resolution electrocardiography, CT, MRI, optical tomography and ultrasonography.

Some research is also done in the area of metrology, instrumentation and measuring systems. The research is related to the field of measurement science and technology. It is focused on improving the quality of measurements using signal-processing techniques.

The Institute of Radioelectronics realizes numerous international projects, which are classified into three types: EU Integrated Projects, i.e. SAFESPOT, EU Specific Targeted Research Projects such as CODMUCA, RESOLUTION or WISE and EU Network of Excellence e.g. VISNET, TARGET or ACE2. COMPASS Experiment at CERN is another project, which is an outcome of the long-standing cooperation between our Institute and CERN in Geneva.

The Institute owns over 20 laboratories — equipped with modern instrumentation, which constitutes a good base for the education of new specialists. Among our laboratories one can find acoustic anechoic chamber, mobile radiocommunication laboratory (with PicoNode system), antenna anechoic chamber (with equipment up to 50 GHz), tomography laboratory (with MRI, CT and impedance tomographs) or sound recording studio (equipped with system of registration, processing, mixing and edition of sound).





8.6. INSTITUTE OF TELECOMMUNICATIONS

The Institute of Telecommunications, having currently 53 academic staff members (including 8 tenured professors) and 43 PhD students, carries out research on various hot topics related to the R&D of modern communication network platforms. The research projects being conducted range from the design of digital circuits, devices, systems and networks to the operation and integrated management of multi-service network systems — using wired or wireless transmission media. The institute comprises several research and teaching teams that form four divisions:

■ **Telecommunications Fundamentals Division**, dealing with synthesis and design of digital circuits (with special emphasis on PLD and FPGA circuits) using computer tools for prototyping and industrial applications, logic synthesis, logic synthesis for easily testable circuits, design of self-testing circuits with built in circular test paths, design and control of self-healing network systems, evaluation and testing of cryptographic algorithms and techniques, methods for technical and organizational infrastructure for telecommunication services.

■ **Telecommunication Optoelectronic Systems Division**, working on signal processing, microprocessor programming, design and construction of measurement instruments for optoelectronics and optical telecommunications, radio communications, fibre optic networks and multimedia systems.

■ **Transmission Systems Division**, focusing on further development of data transmission systems, modulation techniques, speech processing, multimedia applications, satellite communications.

■ **Computer Networks and Switching Division**, dealing with teletraffic theory and engineering, telecommunication networks planning, optimization and management, testing of communication protocols, information security systems.

Following the rapid and continuous worldwide progress in developing telecommunication (both backbone and access) network technologies,

the institute often updates its curricula, research and teaching laboratories and research activities. The current major research groups/profiles are determined as follows:

- Digital Circuit Synthesis and Design,
- Optoelectronic Measurement Systems,
- Telecommunication Network Technologies,
- Mobile and Embedded Applications,
- Speech Processing,
- Network Design and Planning,
- Security Systems.

Within a framework of joint project collaboration as well participation in several EU research programs and grants, the institute has developed many international co-operation links with universities of technology, R&D institutions, telecommunication network operators and equipment manufacturing plants. Among these projects are: Terrestrial Wireless Infrastructure Integrated with Satellite Telecommunications for E-Rural Applications (TWISTER), Monitoring and Measurement Cluster (MOME), Design and Engineering of the Next Generation Internet, Towards Convergent Multi-service Networks (EURO-NGI), End-to-end Quality of Service Support over Heterogeneous Networks (EuQoS), Semantic Interfaces for Mobile Services (SIMS), Middleware Platform for Developing and Deploying Advanced Mobile Services (MIDAS), Design and Engineering of the Future Generation Internet — Towards Convergent Multi-service Networks (EURO-FGI), New Methods for Processing Signals and Images in Information Systems, Self-organizing Routing Networks, Multimode Passive Optical Networks for Home and Business Applications, Global Internet Intra-Domain Routing Management.

9. STUDENTS LIFE

9.1. LIVING IN WARSAW

Poland is well known for its Slavic hospitality. The visitors should have no problems making friends as Poles are almost always interested in meeting foreigners. Poles have a highly developed sense of humor; they love jokes and have at least one for every occasion. Humor and laughter in the face of hardship are a big part of being Polish.

Communication in Poland is not a serious problem. Warsaw is a university town and the level of foreign language education is quite high, especially among young people. English is by far most frequently used; German, French, and Russian are also popular.

The zloty is the official Polish currency. If you would like to exchange your money or cash traveler's checks, it can be done in one of many Warsaw banks. If all you need is a simple cash exchange, it might be easier to do it in a „kantór” (kantors are private money exchange offices; you can find them at railway stations, in hotels, shops,

restaurants, movie theaters and many other places). Major credit cards are accepted in hotels, travel agencies, and many shops and restaurants.

Shopping in Warsaw can be fascinating. Today, you will find shops well stocked with a variety of high-quality Polish and Western goods; just about every imaginable product is available within easy walking distance of the University. The free-market economy is alive and the shopping scene in Warsaw, full of department stores, fashion retailers, secondhand bookshops, and street markets, is very well developed and still is changing almost every day.

When it comes to clothing, you have to realize that weather in central Poland varies a lot. Warm clothing and good shoes are needed for winter which can be cold, with snow and temperatures below -10°C . Summer, on the other hand, is warm, but rarely very hot, with average maximum daily temperatures around 22°C .

9.2. ACCOMMODATION

Most students of the Faculty of Electronics and Information Technology live in the 15-story Riviera located within a 5-minute walk of the Faculty building. The residents are accommodated in shared fully-furnished rooms. Bathroom facilities, kitchens, laundries, study areas and meeting rooms are located on each floor. Computer laboratories, music practice rooms, photographic darkrooms, sports and recreation facilities, shops, and dining rooms are also available. Other dormitories with single and shared rooms are located within a few kilometers of the main campus, but are well served by public transportation; travel times vary from 5 to 20 minutes.

Room charges are in the range of 100 euros per month and are payable

each month in advance. Although the dormitories do not provide high-standard accommodation, the cost of the University housing is below market rates. Therefore, the demand for rooms is higher than the supply and not all international students are guaranteed University accommodation, especially if they are not able to meet all conditions of entry (academic and financial). Rooms in the dormitories will be assigned on a first-come first-serve basis within the available limits.

If you would like to apply for accommodation in a University dormitory, you should do so as early as possible.

Living a few kilometers away from the University presents no problem because of the excellent public trans-

While the major emphasis of University life is on classroom and laboratory work, life outside the classroom is important, too. During university studies, people often make friends and develop interests that last for the rest of their lives.

The University has several dormitories scattered throughout Warsaw.



portation system in Warsaw. There is underground train connecting southern and northern districts with the center of Warsaw and the train stop is closed to the University (its name is Politechnika Warszawska, which is a Polish name of Warsaw University of

Technology). There are as well hundreds of tram and bus lines. Even more important, transportation is inexpensive (about 0.70 euro per ride or about 60 euros for a three-monthly travel card).

9.3. DINING

Several dining facilities located on the main campus offer a full range of food services.

In the Faculty of Electronics and Information Technology building there are two cafeterias serving hot dishes, sandwiches, salads, cookies, and beverages. The Main Dining Hall, located next to the Faculty building, offers main meals composed of a soup, main dish, and dessert. Various meal plan options are offered by dining facilities at the dormitories. Prices are very moderate; for example, the Main Dining Hall serves dinners to the University students and employees for just 4 euros.

For those who prefer dining off campus, there are countless restaurants, snack bars, cafes, pubs, cafeterias, and fast food stands. Many of these offer traditional Polish dishes, but one can easily find places that serve all kinds of food from all over the world; French, Italian, Chinese, Vietnamese, Japanese, Indian, Russian, Hungarian, and Jewish restaurants are within a short walk of the University.

9.4. SOCIAL LIFE

The social life of the University is concentrated in student clubs, but many events are hosted in the Great Hall of Main Building.

Two major clubs, located at Riviera-Remont and Stodola cultural centers, and 15 small clubs provide numerous opportunities for students to grow and develop new interests. Each club has a number of activity groups organizing various cultural events. You can enjoy cinema shows, art exhibitions, dramatic group presentations, lectures by visiting speakers, political debates, song recitals, as well as rock, jazz or classical music concerts. Student clubs frequently attract internationally famous people. Many cultural events in student clubs are free

of charge for all University students. When visiting one of the University cultural centers not only can you watch and listen, but also actively participate in happenings or theater productions, or simply dance to the disco music. If you are a gifted singer or dancer, the internationally recognized Song and Dance Ensemble is waiting for you.

Student clubs run their own shops and publish a variety of information materials. A radio station owned and operated by the students broadcast informational and musical programs several hours a day.





9.5. SPORT AND RECREATION

The University Center of Physical Education and Sports, open to all University students, is run by a highly qualified staff of 40 which include former coaches of the national teams and members of the Polish Olympic team.

The Center staff organizes indoor and outdoor activities for keen athletes capable of high-level competition and for those who just enjoy a casual game of volleyball. Most sport facilities located in and around student dormitories are available to all students at no charge; coaching is also free. Currently, the most popular sports are soccer, volleyball, basketball, indoor and outdoor track, swimming, tennis, table tennis, judo, karate, and kickboxing. Chess, bridge, strategy games, and other forms of recreation also attract many students. Clearly, the sport activities are not limited to the campus area; the University has

a strong tradition in skiing, sailing, windsurfing, and mountain climbing.

A very popular form of recreation among the University students is tourism. Tourist clubs frequently organize weekend hiking trips to interesting places in Poland and longer summer expeditions to destinations all over the world.

Approximately, 10000 students participate in some form of sport or recreational activities. Many of them compete in the interfaculty games. The 1400 most talented students are members of the University Sports Club. They compete in a variety of local and intercollegiate leagues as well as in national and international events. For several years, the Club has been ranked as the best among sports clubs of all engineering-oriented universities and colleges in Poland.

Sport gives the students another opportunity to find some relief from academic pressures. On-campus sport and recreation activities are coordinated by the University Center of Physical Education and Sports.





9.6. HEALTH CARE

The University Health Center, located next to the Riviera dormitory, provides comprehensive medical care for the University students and employees.

The Health Center is staffed by full-time physicians, physical therapists, ophthalmologists, gynecologists, dentists, nurses, and many other health professionals. Immunizations, laboratory tests and X-rays are provided. Patients are seen by appointment and as walk-ins. If more specialized care is required, physicians arrange a referral to an appropriate specialist.

All students insured in National Health Fund (NFZ) are entitled to all the ser-

vices available at the University Health Center as well as to all public health service at no charge. It is possible to arrange an insurance plan enabling access to private sector of health care. Appropriate plans are offered by a number of insurance companies. Rates for such programs vary significantly depending on the range of chosen services.

9.7. RELIGIOUS LIFE

Our growing international student body brings together people of many ethnic origins and beliefs and the University tries to maintain an atmosphere of religious freedom for all and to provide opportunity for the exercise of all spiritual interests.

Although the Roman Catholic Church is the dominant church in Poland, there are 48 active religious organizations in Warsaw, representing other Christian denominations, Judaism, Islam, Hinduism, Buddhism, and other faiths. Most of these organizations conduct religious services for their members.

Numerous Warsaw churches and chapels offer opportunities for worship and meditation, social service, personal counseling, and cultural and social events. On request, students are given information regarding houses of worship or are put in touch with their spiritual leaders in the city.

