



# PÁZMÁNY PÉTER CATHOLIC UNIVERSITY

FACULTY OF INFORMATION TECHNOLOGY AND BIONICS

LET US ENGINEER THE FUTURE TOGETHER





## Welcome

*"This is a new field, where life-sciences, electronics and computer technology meet. New inventions and services are born, such as fMRI, lab-on-a-chip devices, or prostheses, and body-machine symbioses, like a pacemaker or a neuro-stimulator in the brain. This is a brand new world in which we are laying down the foundations of a specialization that will lead to a new industry in the future."*

Following these ideas of the late Professor Tamás Roska, founding Dean of our Faculty, around twenty internationally-renowned researchers developed an innovative Electronic and Computer Engineering curriculum with a hint of neuroscience, which later expanded into an independent Molecular Bionics Engineering

program. Along with Imperial College London, PPCU was the first in Europe to offer the study of this new area at undergraduate level.

In addition to the academic subjects, intensive practical classes and laboratory work ensure that our students acquire marketable knowledge before entering the labor market.

I invite you to come and visit us and join one of our programs. You will find an environment that is both professionally and personally inspiring, and I am sure you will return with knowledge and memories that will last you a lifetime.

**Kristóf IVÁN, PhD**

Dean



Did you know?  
We provide versatile  
training to increase your  
chances of finding a job.

## Program Structure

### PhD: 2+2 years

Computer Science and Engineering,  
Electrical Engineering, Biological Sciences

### MSc: 4 semesters

MSc Computer  
Science Engineering

MSc Info-Bionics  
Engineering

MSc Medical  
Biotechnology

### BSc: 7 semesters

BSc Computer Science  
Engineering

BSc Molecular Bionics  
Engineering

## Credit System

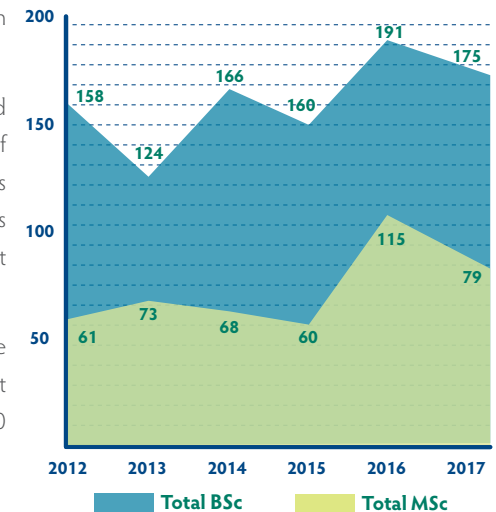
### What is ECTS?

The abbreviation ECTS stands for European Credit-Transfer System. 1 ECTS = 30 study hours.

**What are the aims of ECTS?** ECTS is intended to facilitate and standardize the recognition of academic achievements within Europe. By means of a credit point system, students' achievements can be graded and recognized by different European universities.

**What are ECTS credits?** ECTS credits are a value allocated to course units to describe the student workload required to complete them. In ECTS, 60 credits represent one whole year of study.

### Number of enrolled students per year



Further information:

[ec.europa.eu/education/resources/european-credit-transfer-accumulation-system\\_en](http://ec.europa.eu/education/resources/european-credit-transfer-accumulation-system_en)

### Undergraduate programs

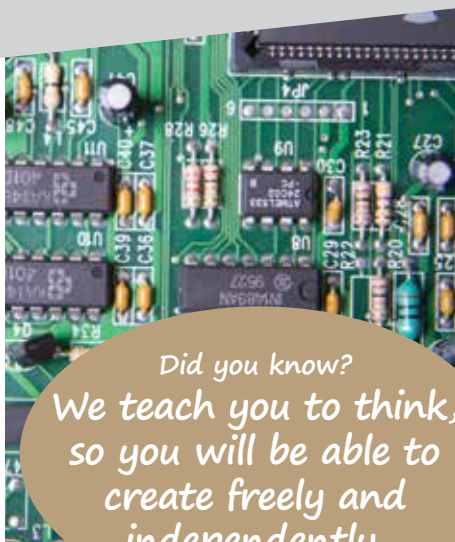
During the BSc program students acquire the theoretical foundations and basic practical skills, and learn how this knowledge can be applied in real-life situations. 210 credits are needed for the BSc degree, and these are distributed over seven semesters. Individual student work, individual laboratory practice and an internship all form part of our curriculum. BSc programs prepare students for further study on one of the MSc programs.

### Graduate programs

MSc programs allow students to gain knowledge of specialized areas, while offering a much deeper insight into the theoretical aspects of the subject. Students are required to accumulate 120 credits in order to earn a Master's degree. In addition to compulsory subjects, students can choose from a wide selection of elective courses, enabling MSc students to follow a study track based on their interests.

Did you know?  
The student-teacher  
ratio is 6.4 to 1





*Did you know?  
We teach you to think,  
so you will be able to  
create freely and  
independently.*

## BSc Computer Science Engineering (BSc CSE)

Surveys show that the demand for computer engineers will increase significantly over the next few years in Hungary and all over the world. We intend to satisfy these labor market needs by providing practice-oriented, internationally-recognized, high-level qualifications with a strong theoretical background.

The Computer Science Engineering program is an excellent choice for those who are interested in the fastest developing areas of information technology. The training gives students a special insight into those fields where information technology is facing new, unknown challenges such as medical sciences, human-machine contact, parallel computation, and the world of nano- and micro-electronics.

In addition to the traditional aspects of computer technology, our curriculum also includes several uniquely innovative features. We study living organisms in order to understand how they work and apply our findings to the world of microchips and sensors. Areas in which we are able to explore new ground at both domestic and international level include the revolution of sensors, the growth of chip complexity, ubiquitous kilo-processor chips, the facilitation of natural human communication, and human language technology.

### Specializations:

- Info-bionics, sensing computers and robots
- Microelectronics and info-communication
- Software and language technology

*Did you know?  
Our bionic engineering  
program connects the  
living with modern  
technology.*

## BSc Molecular Bionics Engineering (BSc MBE)

Molecular Bionics is a real novelty in Hungary. It is at the frontiers of biology, molecular physics, chemistry, and computer technology and guides the way for rapidly developing fields of science, such as computer-assisted pharmaceutical industry, medical biotechnology or nanobiotechnology.

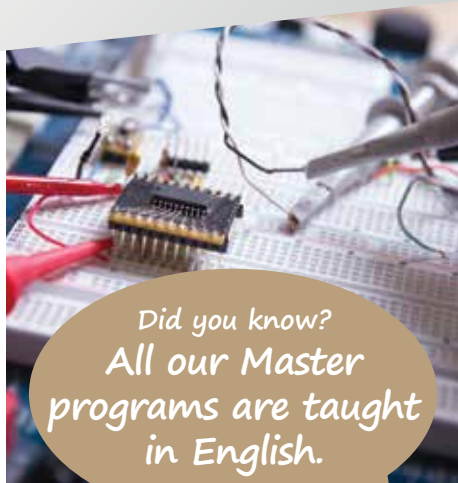
**The program, which is run together with Semmelweis Medical University, has four disciplinary pillars:**

- Molecular biology,
- Electromagnetic waves on a nano- and micron- scale,
- Foundations of computing and electronics,
- Neurobiology.

Students will encounter lab-on-a-chip technology, computer-aided drug design, complex biolaboratory practice, physiology measurements, 2D and 3D imaging and processing, genome-chip technology, etc. After finishing the BSc program, students can pursue their studies on the Info-bionics or Medical Biotechnology Master courses in order to become the pioneers of a new industry.

*"We know that development today is focused on molecular machines. Managing diagnosis, intervention and control would facilitate the healing role of medical doctors and would also improve the health of the patients."*

**Professor Árpád CSURGAY,**  
Member of the Hungarian Academy of Sciences



*Did you know?  
All our Master  
programs are taught  
in English.*



## MSc Computer Science Engineering (MSc CSE)

Beside Hungarian companies and institutions, international firms are also interested in our graduates. Graduates of our Computer Science Engineering program have no problems finding employment. Labor market surveys indicate that there is a growing demand for computer engineering/informatics graduates.

In addition to the theoretical foundations of natural science, students study several programming languages and their application in diverse environments. They also become acquainted with methods for designing

complex software systems and the principles of artificial intelligence. Unlike other Computer Science Engineering programs, we put particular emphasis on hardware-related issues, kilo-processor architectures and preconfigurable architectures.

### Specializations:

- Sensing computers and neuromorphic robots
- Software and language technology
- Info-communication
- Micro- and nanotechnology
- Image Processing and Computer Vision



*Did you know?  
We have a human-oriented  
and nature-motivated  
approach to information  
technology.*



## MSc Info-Bionics Engineering (MSc IBE)

Over the last decade, we have witnessed the appearance of a new branch of industry, info-bionics, which has already resulted in great products (gene-chips, cochlea implants for the hearing impaired, personalized medicines, neuromorphic sensing robots) within a short period, and is still developing at an amazing pace. It is the combination of two state-of-the-art technologies, informatics and biotechnology.

The program has two focuses. One of them comprises issues relating to engineering, electronics, and informatics where the data processing of living organisms provides models for engineering solutions or computational algorithms as well as methods needed to understand life better

(e.g. neural modeling, bioinformatics). The other direction includes procedures, instruments and devices aiding the measurement, control and operation of vital processes affecting living organisms and the quality of human life. This program is especially important in the context of interfaces, prostheses and rehabilitation. Examples include bionic eyeglasses, brain computer interfaces, neural electrodes, leg actuation, wheelchair navigation or devices that facilitate invasive operations with only minor intervention.

### Specializations:

- Bionic interfaces
- Bio-nano-measurement and imaging



## MSc Medical Biotechnology (MSc MB)

The program, which is operated jointly with Semmelweis University Budapest, allows students to gain advanced theoretical and practical knowledge at the cutting edge of medicine and informatics. Medical biotechnologists work in the bio-medicinal field where their responsibilities include research, development, application and management. They are able to model and simulate biological systems on computers, apply the methods and instruments of computational biology and biochemistry, and design, create, manage and use databases in the field of medical biotechnology. They will be able to model different biological systems on a computer and handle large-scale data sets for

such systems. As specialists trained in science, informatics and specific fields of medicine, they can be employed in basic research, or in the field of pharmaceuticals, medical/molecular diagnostics or biotechnology.

### Optional course groups:

- Molecular biotechnology
- Applied bioinformatics

*Did you know?  
We do research  
to improve people's  
lives.*



## Doctoral School

The **Roska Tamás Doctoral School of Sciences and Technology** opened in 2001. The Doctoral School is accredited to issue PhD degrees in three fields of science: information science and technology, electrical engineering, and biology. The education and research work is organized into the following five sub-programs:

- **Bionics, Bioinformatics, Bio-inspired Wave Computers, Neuromorphic Models.**  
(Head: **Prof. Sándor PONGOR**)
- **Computer Technology Based on Many-Core Processor Chips, Virtual Cellular Computers, Sensory and Motoric Analog Computers.**  
(Head: **Prof. Péter SZOLGAY**)
- **Feasibility of Electronic and Optical Devices, Molecular and Nanotechnologies, Nano-architectures, Nanobionics, Diagnostic and Therapeutic Tools.**  
(Head: **Prof. Árpád CSURGAY**)
- **Natural Language Technologies, Artificial Understanding, Tele-presence, Communication.**  
(Head: **Prof. Gábor PRÓSZÉKY**)

- **On-board Advanced Driver Assistance Systems.** (Head: **Csaba REKECZKY, PhD**)

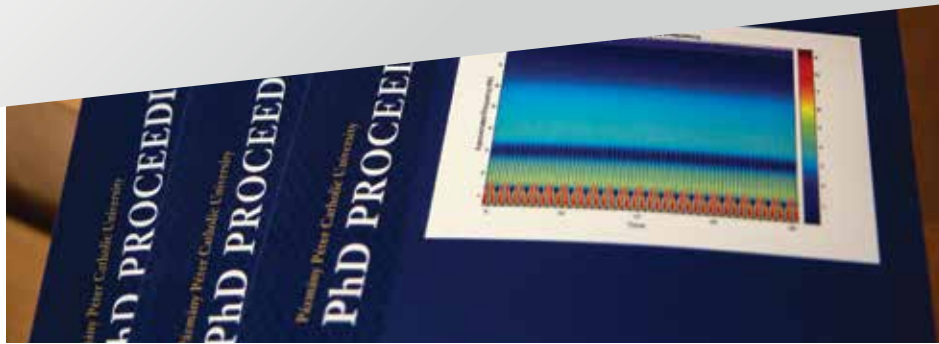
The Faculty has international cooperation agreements and particularly active scientific cooperation with several foreign universities, most notably with

- University of Notre Dame, USA
- Polytechnic University of Turin, Italy
- Catholic University of Leuven, Belgium
- University of California, Berkeley, USA

This extensive cooperation network, together with the Faculty's outstanding resources, gives students access to state-of-the-art research infrastructure and opportunities for scientific discussion.

Graduates either pursue an academic career or engage in applied research through spin-off companies. A number of successful spin-off companies have been launched from research projects at our Faculty.





## Research work and environment

Research work at the Faculty focuses mainly on the interdisciplinary area between life sciences, computer science and engineering, and on strengthening the convergence paradigm of these fields. The flat departmental organization of the Faculty makes cooperation between different research groups particularly easy.

The Faculty's capacities in computing and dedicated hardware architecture design are also outstanding, which in particular helps solve complex computational problems that arise in engineering design or biological data analysis.

Research and education are closely linked at the Faculty, which was awarded the title of **'Research University Faculty'** by the Hungarian Government in 2013. This title was only given to 4 faculties out of 115 in Hungary.

Students actively take part in research during their university years. They can work individually or in teams on a chosen topic with the assistance of a researcher or professor within the framework of the

**Research Experiences for Undergraduates Program**, and later join one of 22 research groups of the Jedlik Laboratories.

**Jedlik Laboratories** is the center of scientific activity at the Faculty, where professors and researchers are joined by PhD and Master students. Study and innovation are linked through major research laboratories and state-of-the-art SMEs, from both Hungary and abroad. Jedlik Laboratories was established with partners like the Semmelweis Medical University, major start-up companies, and five research institutes of the Hungarian Academy of Sciences:

- Institute for Computer Science and Control,
- Institute of Experimental Medicine,
- Institute of Enzymology,
- Institute of Technical Physics and Materials Science,
- Institute of Cognitive Neuroscience and Psychology.

*Did you know?  
We have one of the  
largest bionics  
research teams  
in Europe.*

## Research result highlights

- \* The algorithmic combination of logical, analogue and noise signals along with the application of spatial temporal metrics, and commands for solving nonlinear wave equations on cellular wave computer chips.
- \* Design and development of a bionic eyeglass for visually impaired people
- \* Development of new methods for the modeling of molecular dynamics on supercomputers
- \* Lab-on-a-chip development with microfluidic laboratory background
- \* Development of ultrasound technologies for diagnostic purposes (e.g. for cancer detection)
- \* Development of bio-inspired devices and algorithms in sensory robotics to solve high-level tasks requiring intelligence
- \* Designing and characterizing MEMS electrode for cerebral bionic interfaces
- \* Electronic phonendoscope as a sensing-computing device for newborn phonocardiography and diagnostics
- \* Developing new hardware/software tools for medical image analysis
- \* New language technological devices for Hungarian and foreign language text analysis and computer-assisted translation (CAT)



*Did you know?  
A two-course lunch  
costs EUR 3-5.*

## Student Services

### Mentors

Mentors welcome international students and help them throughout their training period. The active community life organized by the buddy system is strengthened by many cultural programs and sports activities where students have the opportunity to get to know one another better.

### Accommodation

Mentors help to find lodging in a dormitory, hostel or small apartment.

### Meals

The Faculty has a cafeteria, where special menus such as gluten-free, lactose-free, and diabetic are provided. There are several other self-service restaurants and cafeterias in the area offering a wide range of meals from pizza to gyros, as well as traditional Hungarian lángos or kürtőskalács.

### Sport

The Faculty offers facilities for badminton, basketball, football, gymnastics, table tennis and volleyball. Sports classes are free, but registration for the classes is necessary. Furthermore, there are many sport and fitness facilities nearby.

### Public transport

Budapest has an extensive public transport network of buses, trolley buses, trams, suburban trains and subway lines. With the student ID,

students are entitled to buy a monthly Budapest pass at a reduced price. The operating company, BKK, has an English website with information on daytime and night transportation services. It also allows you to plan your route around the city: [www.bkk.hu/en](http://www.bkk.hu/en).

### Services for students with special needs

At the beginning of their studies students with special needs are assisted by the Equal Opportunity Coordinator to find student mentors who provide individualized assistance to students. The mentors study together with the students with special needs, helping them to prepare for everyday life. The Faculty offers additional opportunities for digitalization and the possibility to buy special tools and software. The Faculty building is fully accessible by wheelchair.

### Students with families

Students arriving with their families receive extra administrative and practical help.

Estimated living costs per month in EUR	
Accommodation: in dormitory or hostel in a room/small flat	130-180 260-320
Utilities	50-80
Laundry/Toiletries	100
Meals	100
Public transport	12



*Did you know?  
We are a young  
institution, so we shape  
our future and  
operations flexibly.*

## Catholic University

### What does being a Catholic university mean for students?

This primarily represents an opportunity, not an obligation. The university's Catholic nature is reflected mainly in the values of its lecturers and staff, and in its community-based organizational structure. For Catholic students, it is certainly a bonus to study in a place that reflects their values, and to practice their religion in different forms. In the chapel a Mass is held every week (participation is optional). The university chaplain is happy to answer your questions and is there for conversations, advice, etc. We also organize spiritual and religious events on a regular basis.

On the other hand, non-religious students or students from other religions are not compelled to conform to the beliefs of the Catholic Church, merely to respect its value system. It is important to know that there are no compulsory religious subjects in the curriculum, but there are optional courses about Christian values and the Bible for those who are interested.



## Student experience

For me, PPCU FIT is a unique human-centered educational institution where you can learn about state-of-the-art technologies in small groups of talented students. Here you can not only gain useful knowledge and meet top researchers, but you can also make life-long friends with the same interests as you. The best decision of my life was to study here and I am really grateful for the special opportunities and experiences that I got at PPCU FIT.

**Flóra ZIEGER**, Hungary

*MSc Info-Bionics Engineering graduate*

*Did you know?  
99% of our students  
graduated found jobs in  
the field of computer science  
engineering and bionics.*

I felt pleased when I joined PPCU as an MSc student. The hospitality of the teachers and library and international student staff is fantastic. There is a strong culture of unity in diversity. Studying at ITK has been a breath of fresh air. It is a professional environment in a nice location where we can gain access to many useful resources and enjoy this extraordinary city as well. I always urge students to make the right choice by enrolling here.

**Wissem SELMI**, Tunisia

*MSc Computer Science Engineering,  
Stipendium Hungaricum Scholarship holder*

*Did you know?  
A supportive, professional  
and friendly community  
is waiting for you.*

## ERASMUS+ Partner Institutions



## Image Processing and Computer Vision Erasmus Mundus Joint Master Degree

Erasmus Mundus Joint Master Degrees (EMJMDs) are international study programs delivered by a consortium of higher education institutions from different countries.

The EMJMD scholarship covers the participation costs (including tuition fees, library and laboratory costs, and full insurance coverage); it contributes to travel and settlement costs and includes a monthly allowance for the entire duration of the study program.

The Image Processing and Computer Vision (IPCV) program trains specialists in a field of increasing importance. Processing images and videos is essential in domains such as medicine, surveillance, industrial control, remote sensing, e-commerce and automation.

Three partner universities with internationally recognized experience in these domains have pooled their complementary expertise and developed this two-year Master's program. The result is a high-quality, widely recognized, triple Master's degree that respects the 120 ECTS syllabus, and is well adapted to job market criteria. All students follow the same curriculum and spend an entire semester at each university:

- 1st semester: Pázmány Péter Catholic University, Budapest, Hungary
- 2nd semester: Universidad Autónoma de Madrid, Spain
- 3rd semester: University of Bordeaux, France
- 4th semester: Internship in an academic laboratory or industry

Program website: [www.ipcv.eu](http://www.ipcv.eu)



PÁZMÁNY PÉTER CATHOLIC UNIVERSITY  
Faculty of Information Technology and Bionics



Co-funded by the  
Erasmus+ Programme  
of the European Union



## Stipendium Hungaricum Scholarship Program

The program was launched in 2013 by the Hungarian Government to increase the number of foreign students in Hungary and thus promote competitive Hungarian higher education around the world. Another goal is to strengthen cooperation between the international and Hungarian scientific elite. The program is managed by the Tempus Public Foundation.

### Provisions covered by the scholarship:

- Tuition-free education
  - ◆ exemption from tuition fees
- Monthly stipend\*
  - ◆ *Masters level*: monthly scholarship of HUF 40 460 (approx. EUR 130) as a contribution toward living expenses in Hungary, for 12 months a year, until the completion of studies

- ◆ *Doctoral level*: the monthly scholarship is HUF 140 000 (approx. EUR 450) for the first phase of education (4 semesters) and HUF 180 000 (approx. EUR 580) for the second phase (4 semesters) - for 12 months a year, until the completion of studies

### ➤ Accommodation\*

- ◆ dormitory place or a contribution of HUF 40 000 (approx. EUR 130) toward accommodation costs for the duration of the scholarship period

### ➤ Medical insurance

\*financial data reflect the 2017/18 academic year and are only given for information purposes  
Further information: [itk.ppke.hu/en/admissions/stipendium-hungaricum](http://itk.ppke.hu/en/admissions/stipendium-hungaricum)





## Scholarship Program for Christian Young People

The core mission of the program is to give young Christian students living in the crisis regions of the world and/or being threatened in their country because of their faith the opportunity to study in Hungary. After completing their studies, scholarship holders will return to help their home communities.

### Provisions covered by the scholarship:

- Tuition-free education
  - ◆ exemption from tuition fees
- Monthly stipend\*
  - ◆ *Masters level:* monthly scholarship of HUF 119 000 (approx. EUR 390) as a contribution toward living expenses in Hungary, for 12 months a year, until the completion of studies
  - Accommodation\*
    - ◆ dormitory place or a contribution of HUF 40 000 (approx. EUR 130) toward accommodation costs for the duration of the scholarship period
  - Reimbursement of travel costs
    - ◆ HUF 200 000 / year (approx. EUR 650)
  - Medical insurance

\*financial data reflect the 2017/18 academic year and are only given for information purposes  
Further information: [itk.ppke.hu/en/admissions/christian-scholarship](http://itk.ppke.hu/en/admissions/christian-scholarship)

*Did you know?  
For us, people are the core  
value in scientific work,  
education and everyday  
relationships.*



## Admissions

Application documents required for MSc programs:

- Application Form
- Transcript of Records
- English language proficiency certificate
- BSc degree - with rating over 70%

### Qualification requirements

- ◆ **MSc CSE:** BSc degree in Computer Science, IT Engineering, Engineering Information Technology
- ◆ **MSc IBE:** BSc degree in Molecular Bionics, Biomedicine, Electrical Engineering, Engineer in Informatics, Chemical Engineering, Biology or Chemistry
- ◆ **MSc MB:** BSc degree in Molecular Bionics, Biomedicine, Chemical Engineering, Medical Laboratory and Imaging Diagnostic Analysis, Biology or Chemistry

Further information: [itk.ppke.hu/en/admissions](http://itk.ppke.hu/en/admissions)

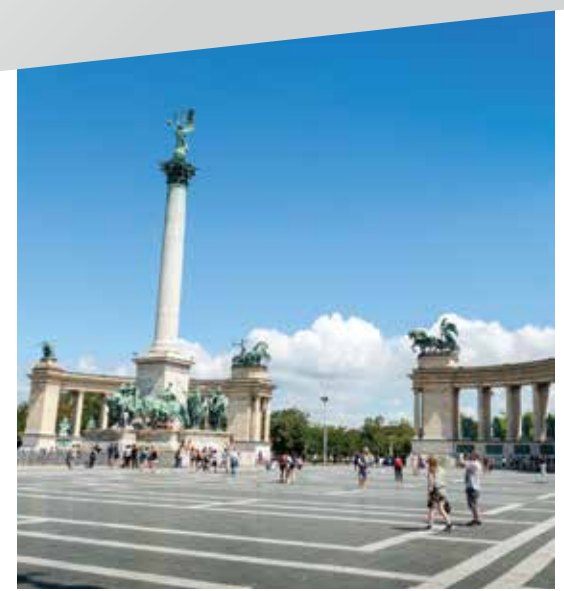
Application documents required for PhD programs:

- Application Form
- Transcript of Records
- English language proficiency certificate
- MSc degree in Electrical Engineering, Biology or Information Technology - with rating over 70%
- Research plan (2-3 pages) containing the applicant's results, projects, proposed research topic
- Reference letter from the applicant's mentor (previous professor or other mentor) (optional)

**English language proficiency certificate** - equivalent to B2 according to the CEFR or any of the following:

- IELTS average score of 5.5 points
- internet-based TOEFL (altogether at least 72 points)
- PTE Academic (at least 51 points)





## Budapest

The Romans called modern-day Hungary 'Pannonia'. They liked the region, because there were many thermal baths, and these still exist today! It was no different for the Ottomans. The invading Turks also enjoyed the warm waters that come from deep underground. Times have changed, but the water is still flowing to the surface, and Pannonia is developing fast.

Hungary's cultural history goes back more than 1000 years. With its population of 10 million, it is situated somewhere between the East and the West, which is a big advantage in education because here you can meet a wide range of people and ideas.

Budapest, the capital, has much to offer for all who come here: museums, libraries, well-established universities, friendly people, good transport and

most importantly, safety. Budapest is also cheap compared to big cities in Western Europe. The city is full of clubs and interesting 'ruin pubs', so Budapest never sleeps. The old part of the capital is a World Heritage Site with its dominant panorama that includes the Buda Castle, Gellért Hill, and the Chain Bridge as it spans the majestic Danube. It is no wonder that many Hollywood movies are filmed in Budapest to make use of its architectural style. The Hungarian language may not be the easiest language in Europe, but this should not scare anyone. You can always find someone who speaks English and is willing to help you in any given situation. Budapest is a place where you will always find something to do. This may sound like a cliché and true for all big cities, but Budapest has more - a story and people that you will find captivating.





## Pázmány Péter Catholic University

### Faculty of Information Technology and Bionics

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**Let us engineer the future together**



[www.itk.ppke.hu/en](http://www.itk.ppke.hu/en)