Bachelor's Programme (BSc) in Computer Science Engineering

For students who started their studies after September 1, 2021

Contact information	
Topic	Contact address
Stipendium Hungaricum admission and administrative issues	stipendiumhungaricum@nje.hu
Non scholarship holders' admission and administrative issues	admission@nje.hu
Issues related to the organization of the study programme (e.g., mandatory internship, final thesis signature, final exam, general issues)	Márk Kovács, instructor in charge of organization kovacs.mark@nje.hu
Issues related to the content and quality of the study programme	Zsolt Csaba Johanyák, full professor, head of the programme johanyak.csaba@nje.hu
Mobile and Web Application Development Specialization	Kálmán Bolla, PhD, associate professor, head of the specialization bolla.kalman@nje.hu
Network Security and Operation Specialization	László Göcs, PhD, senior lecturer, head of the specialization gocs.laszlo@nje.hu
Industrial Informatics Specialization	Rajmund Drenyovszki, PhD, senior lecturer, head of the specialization drenyovszki.rajmund@nje.hu

Structure of the Programme

Length of the study programme: 7 semesters, full-time course. Graduate students attain a BSc in Computer Science Engineering.

- level of education: *BSc*
- qualification: *Computer Science Engineer*
- field of studies: informatics

Specializations
- Mobile and Web Application Development
- Network Security and Operation
- Industrial Informatics

Computer Science Engineering is the ideal program for individuals interested in computers, IT systems, software development and maintenance, as well as computer network planning and operation. It appeals to students fascinated by industrial applications such as industrial robot programming, the development of industrial information systems, and the use of artificial intelligence. The program also provides comprehensive training in professional web, desktop, and mobile app development, utilizing modern and cutting-edge technologies for both personal and corporate use.

Academic Objectives

The objective of the program is to train and educate engineers who can install, operate, and maintain information technology-based systems and services, including the design and development of the necessary software systems. Graduates can progress into a Master of Science degree program in Computer Science Engineering and/or are prepared to embark upon a professional career in the field.

Graduates of Computer Science Engineering possess professional knowledge in science, technology, economics, and soft skills. After completing the mandatory internship, they become proficient in information technology and computer science, qualifying them to solve IT-related tasks in the following areas:

- Design, development, and creation of technical constructions, particularly information infrastructure systems and services that require knowledge of technical IT techniques
- Solving technical development tasks of average complexity in the fields of information technology and automation
- Developing various software applications

For further education, the total number of study credits will be counted towards the MSc degree program in Computer Science and Computer Science Engineering. The BSc degree may also be considered for admission to other MSc degree programs. More information can be found in the descriptions of the respective MSc degree programs.

Graduates of the MSc program may also have the opportunity to pursue a PhD in Information Science.

Admission Requirements

High school graduation examination requirements:
- At least intermediate level school graduation exam in mathematics.
- At least intermediate level school graduation exam in informatics or physics or electronics.

Disciplines leading to the Qualification

The degree is built upon the following fields of expertise:

- Courses in Economic and Human Sciences Skills 17 credits,
- Foundation Courses in Sciences: 40 credits,
- Core Courses: 84 credits,
- Differentiated Professional Proficiency (specialization): 40 credits,
- Optional Courses: 10 credits,
- Professional English: 4 credits,
- Final Thesis: 15 credits.

Courses

Economic and Human Skills (credits to be fulfilled: 17)

Course	Precondition	Ev.	Cr.	Lec.	Sem.	Lab.	Semester
Economics		ex	4	1	1	0	1
Management		ex	4	2	1	0	3
Basics of Law		ex	4	1	1	0	6
Business Economics		ex	4	1	1	0	6
Soft Skills		tm	1	0	1	0	3

Natural Science Fundamentals (credits to be fulfilled: 40)

Course	Precondition	Ev.	Cr.	Lec.	Sem.	Lab.	Semester
Mathematics for Computer Science 1		tm	5	2	2	0	1
Basic Mathematics		si	0	0	2	0	1
Calculus 1		tm	5	2	2	0	1
Physics		ex	5	2	2	0	1
Electricity		ex	5	2	2	0	2
Calculus 2	Calculus 1	ex	5	2	2	0	2
Algorithms and Data Structures		ex	5	2	0	2	2
Probability and Statistics	Calculus 1	tm	5	2	2	0	3
Mathematics for Computer Science 2	Mathematics for Computer Science 1	ex	5	0	2	2	4

Professional Core Material (credits to be fulfilled: 84)

Course	Precondition	Ev.	Cr.	Lec.	Sem.	Lab.	Semester
Digital Electronics 1		ex	3	2	2	0	1
Computer Networking Fundamentals		ex	5	2	0	2	1
Programming 1		tm	4	2	0	2	1
Digital Electronics 2	Digital Electronics 1	tm	2	0	0	2	2
Introduction to Microprocessor Systems	Digital Electronics 1	tm	4	2	2	0	2
Programming 2	Programming 1	tm	4	2	0	2	2
Computer Architectures 1	Digital Electronics 1	ex	5	2	0	2	2
Databases		ex	4	2	0	2	3
Signals and Systems	Electricity, Physics	ex	4	2	2	0	3

Course	Precondition	Ev.	Cr.	Lec.	Sem.	Lab.	Semester
Operating Systems	Computer Architectures 1	ex	4	2	0	2	3
Programming Paradigms and Techniques	Programming 1, Algorithms and Data Structures	tm	5	2	0	2	3
Comprehensive Exam in Programming	Prerequisites: Programming 1, Programming 2, Algorithms and Data Structures Parallel condition: Programming Paradigms and Techniques	ce	0	0	0	0	3
Database Systems	Databases, Programming 1	tm	5	2	0	2	4
Introduction to Information System Security		ex	3	2	0	0	4
Linear Control Systems	Signals and Systems	ex	4	2	2	0	4
Enterprise Resource Planning Systems 1	Databases	tm	4	2	0	2	4
Visual Programming	Programming Paradigms and Techniques	tm	5	2	0	2	4
Web Programming 1	Programming 1	tm	5	2	0	2	4
Advanced Programming Techniques	Programming Paradigms and Techniques	tm	4	2	0	2	5
Software Engineering	Programming Paradigms and Techniques	ex	5	2	0	2	5
IT Project	120 credits	tm	5	0	0	1	6

Specific professional knowledge – Specializations

Students may choose a specialization at the end of the fourth semester, provided they have earned at least 100 credits. There are three available specializations, each offering nine subjects. Students are required to complete eight of these subjects, totaling 40 credits. This group of courses is collectively referred to as "Specific Professional Knowledge." The process for selecting a specialization is governed by the relevant dean's order.

Mobile and Web Application Development

As part of this specialization, students gain a solid foundation in both mobile and web development, exploring technologies for smartphones, tablets, and other mobile devices, as well as the latest approaches to web application development. The curriculum also delves into artificial intelligence and game development, equipping students with advanced programming skills. Overall, this specialization is designed to help students deepen their expertise and prepare for innovative roles in the rapidly evolving tech landscape.

Courses	Precondition	Ev.	Cr.	Lec.	Sem.	L	Semester
Java Applications	Programming Paradigms and Techniques + 100 cr	tm	5	2	0	2	5
Server Side Applications	100 cr	tm	5	2	0	2	5
Developing Mobile Applications 1	100 cr	tm	5	2	0	2	5
Introduction to Artificial Intelligence	100 cr	tm	5	2	0	2	5
Web Programming 2	Web Programming 1 + 100 cr	tm	5	2	0	2	5
Cloud based Services	100 cr	tm	5	2	0	2	5
Developing Mobile Applications 2	Java Applications + 100 cr	tm	5	2	0	2	6
Game Development	Introduction to Artificial Intelligence + 100 cr	tm	5	2	0	2	6
Application Development Using Web Technologies	Web Programming 1	tm	5	2	0	2	6

Network Security and Operation Specialization

Students will explore topics related to the security and operation of computer networks and become familiar with the latest technologies in the field. They will study the core components of computer networks, network-building technologies, and the installation and configuration of software tools used in network management. Additionally, students will learn methods for operating and administering computer networks, as well as the principles of IT service management. The specialization also covers cloud computing technologies.

Course	Precondition	Ev.	Cr.	Lec.	Sem.	Lab.	Semester
Network Administration 1	100 cr	tm	5	2	0	2	5
Introduction to Artificial Intelligence	100 cr	tm	5	2	0	2	5
Network Configuration and Management	Computer Networking Fundamentals + 100 cr	tm	5	2	0	2	5
Enterpise Resource Planning Systems 2	Enterpise Resource Planning Systems 1 + 100 cr	tm	5	2	0	2	5
Cloud based Services	100 cr	tm	5	2	0	2	5
Network Security	100 cr	tm	5	2	0	2	6
Network Administration 2	100 cr	tm	5	2	0	2	6
Ethical Hacking	100 cr	tm	5	2	0	2	6
IT Service Management	100 cr	tm	5	2	0	2	6

Industrial Informatics Specialization

Students develop competencies in the design, implementation, control, operation, and application of fundamental system components for autonomous industrial information systems. Additionally, they gain expertise in the development, design, operation, and control of industrial robots and robotic systems.

Courses	Precondition	Ev.	Cr.	Lec.	Sem.	L	Semester
Computer Architectures 2	Computer Architectures 1 + 100 cr	tm	5	2	0	2	5
Industrial Robotics 1	Calculus 1 + 100 cr	tm	5	2	0	2	5
Electronics	Signals and Systems + 100 cr	ex	5	2	0	2	5

Courses	Precondition	Ev.	Cr.	Lec.	Sem.	L	Semester
Development of Microcontroller Based Systems	Introduction to Microprocessor Systems +100 cr	tm	5	2	0	2	5
Industrial Information Systems	Signals and Systems + 100 cr	tm	5	2	0	2	5
Introduction to Artificial Intelligence	100 cr	tm	5	2	0	2	5
Industrial Image Processing	Calculus 2 +100 cr	tm	5	2	0	2	6
Digital Signal Processing	Calculus 2 +100 cr	tm	5	2	0	2	6
Industrial Robotics 2	Industrial Robotics 1 + 100 cr	tm	5	2	0	2	6

Other courses

Courses	Precondition	Ev.	Cr.	Lec.	Sem.	L	Semester
Physical Education 1		si	0	0	2	0	3
Physical Education 2		si	0	0	2	0	4
English for Computer Science 1		tm	3	0	2	0	2
English for Computer Science 2		tm	3	0	2	0	3
Optional courses			10				
Mandatory Internship (8 weeks=320 hours)	100 cr	si	0				7
Thesis	170 credits	si	15			1	7

Acronyms

cr	credit point
Ev.	evaluation method (s, tm, e)
tm	term mark
ex	exam
ce	comprehensive exam
si	instructor's signature
Lec.	weekly hours of lectures
Sem.	weekly hours of seminars
Lab.	weekly hours of labs

Based on feedback from students, teachers, and industry partners, the content and requirements of individual courses may be updated regularly. Instructors closely monitor student

performance and provide helpful consultations as needed. High-performing students also have the opportunity to participate in scientific research and collaborate with lecturers or professors on advanced studies or workshops.

Mandatory Internship

All students are required to complete a mandatory internship as part of their academic curriculum. The internship must consist of a minimum of **320 hours** and must be conducted in the field of Information Technology. This practical experience is an essential component of the student's studies, designed to provide hands-on learning and application of the theoretical knowledge gained during the program.

The typical duration of the internship is **8 weeks**, assuming the student works **8 hours per day**. If the daily working hours differ, the total length of the internship will adjust accordingly to meet the required 320 hours.

A precondition for starting the internship is the completion of **100 credits**. Completion of the internship is a prerequisite for obtaining the university leaving certificate (absolutorium), which is required for the student to take their final examination and graduate from the program. Without fulfilling this requirement, the student cannot complete their degree.

Internship Placement

It is the **responsibility of the student** to find a suitable place for the internship. The internship can be fulfilled at partner companies, institutions, professional organizations, enterprises, or at the University itself. Additionally, students can carry out their internship abroad as well, allowing for valuable international professional experience.

All companies or organizations offering internship placements must be approved by the university, ensuring they meet the quality principles of the program.

Internship Documentation Requirements

At the end of the internship, the company hosting the student is kindly requested to provide the following documentation on official company letterhead:

1. A certification confirming that the internship was completed, including:

    - The start and end dates of the internship,
    - The total working hours, which must be at least 320 hours,
    - An evaluation of the student's work during the internship.

2. A one-page job description outlining the tasks performed by the student during the internship.

In addition, the student is required to prepare an internship report of at least **five pages**, detailing their activities, experiences, and insights gained during the internship period. This report must be submitted to John von Neumann University as part of the academic requirements.

Thesis

The thesis is a written, creative exploration of a professional computer science engineering task. It represents the student's individual work, conducted under the guidance of a supervisor who must be an employee of the university. At the end of the sixth semester, the student selects a supervisor and proposes a thesis topic, which must be approved by both the supervisor and the head of the supervisor's department. The student then registers for the thesis course in the seventh semester.

Final Exam

The Final Exam consists of three parts:

- Defense of the thesis.
- Elaboration of a question related to the topic *Databases and Network Technologies*. This topic covers selected materials from the courses Databases, Database Systems and Computer Networking Fundamentals.
- Elaboration of a question related to the topic *Computer Architectures and Operating Systems*. This topic covers selected materials from the courses Computer Architectures 1 and Operating Systems.

The preconditions of participating in the final exam:

- obtaining the pre-degree certificate (absolutorium) stating that all course-units have been completed,
- submitted and accepted final thesis,
- application for the final examination.

The result of the final exam is the mathematical average of the results of the final thesis and the final exam marks achieved regarding the two topics.