Bachelor's Programme (BSc) in Computer Science Engineering

For students who started their studies after September 1, 2021

Contact information	
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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
- Network Security and Operation
- Industrial Informatics
- Mobile and Web Application Development

Computer Science Engineering is the perfect 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, 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, using modern and cutting-edge technologies for both personal and corporate use.

Academic Objectives

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

Graduated computer science engineers possess the professional knowledge in science, technology, economics, and soft skills, and after having completed the mandatory internship become proficient in information technology and computer science, which qualifies them to solve information technology tasks in the following fields:

- design, development, and creation of technical constructions, in particular information infrastructure systems and services that require knowledge of technical information technology techniques,
- solving average complexity technical development tasks in the field of information technology and automation,
- developing different software applications.

For further education the total number of study credits will be counted in the MSc degree programme in computer science and computer science engineering. The BSc degree can be considered in other MSc degree programmes as well. More information about it can be found in the description of the respective MSc degree programmes.

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

Admission Requirements

High school graduation examination requirements:
- An intermediate or an advanced school graduation exam in mathematics.
- An intermediate or an advanced school graduation exam in informatics or physics or electronics.

Specificities of the Programme

The disciplines leading to the qualification, the fields of expertise from which the degree is built:

- 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: 6 credits,
- Final Thesis: 15 credits.

Courses

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

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

Science (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		s	0	0	2	0	1
Calculus 1		tm	5	2	2	0	1
Physics		e	5	2	2	0	1
Electricity		e	5	2	2	0	2
Calculus 2	Calculus 1, Basic Mathematics	e	5	2	2	0	2
Algorithms and Data Structures		e	5	2	0	2	2
Probability and Statistics	Calculus 2	tm	5	2	2	0	3
Mathematics for Computer Science 2	Mathematics for Computer Science 1 Calculus 1	e	5	0	2	2	4

Courses of the professional core material (credits to be fulfilled: 84)

Course	Precondition	Ev.	Cr.	Lec.	Sem.	Lab.	Semester
Digital Electronics 1		e	3	2	2	0	1
Computer Networking Fundamentals		e	5	2	0	2	1
Programming 1		tm	4	2	0	2	1
Digital Electronics II.	Digital Electronics I.	tm	2	0	0	2	2
Introduction to Microprocessor Systems	Digital Electronics I.	tm	4	2	2	0	2
Programming II.	Programming I.	tm	4	2	0	2	2
Computer Architectures I.	Digital Electronics I.	e	5	2	0	2	2
Databases		e	4	2	0	2	3

Course	Precondition	Ev.	Cr.	Lec.	Sem.	Lab.	Semester
Signals and Systems	Electricity, Physics	e	4	2	2	0	3
Operating Systems	Computer Architectures I.	e	4	2	0	2	3
Programming Paradigms and Techniques	Programming I., 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 I.	tm	5	2	0	2	4
Introduction to Information System Security		e	3	2	0	0	4
Linear Control Systems	Signals and Systems	e	4	2	2	0	4
Enterpise 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 I.	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	e	5	2	0	2	5
IT Project	120 credits	tm	5	0	0	1	6

Specializations

Students who earned at least 100 credits can choose one out of the following specializations at the end of the 4th semester.

Network Security and Operation Specialization

Credits to be fulfilled: 40 credits
8 courses have to be chosen out of the 9 available ones

Students will learn questions related to the security of computer networks and get acquainted with recent technologies. They get acquainted with regular components of computer networks and technologies of network building, and with the installation/configuration of software tools used in network management. They get acquainted with methods of operating/administering computer networks and learn questions of IT service management. They learn about the technologies of cloud computing.

Course	Precondition	Ev.	Cr.	Lec.	Sem.	Lab.	Semester
Network Administration 1	100 cr	tm	5	2	0	2	5
Network Security	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 2 + 100 cr	tm	5	2	0	2	5
Cloud based Services	100 cr	tm	5	2	0	2	5
Introduction to Artificial Intelligence	100 cr	tm	5	2	0	2	5
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

Credits to be fulfilled: 40
8 courses have to be chosen out of the 9 available ones

The students get competence in design, realization, control, operation, and application technology of basic system components of autonomous industrial information systems, moreover in the area of development, design, operation, and control of industrial robots and robot 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	e	5	2	0	2	5
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

Mobile and Web Application Development
Credits to be fulfilled: 40
8 courses have to be chosen out of the 9 available ones

During the specialization the students learn the basic fundamentals of mobile and web development, smartphones, tablets, and other mobile devices as well as development opportunities of web applications. In addition, the aim is to learn artificial intelligence, game development, and acquire skills in the field of programming and to specialize and deepen existing knowledge.

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

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

Other courses

Courses	Precondition	Ev.	Cr.	Lec.	Sem.	L	Semester
Physical Education 1		s	0	0	2	0	3
Physical Education 2		s	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	s	0				7
Final Thesis	170 credits	s	15			1	7

Acronyms

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

The Student Service Center at the University helps students with various programmes and trainings, and if necessary, by providing mentors.
Based on student, teacher, and industry feedback, the content and requirements of individual courses may change regularly. Teachers closely monitor student performance and offer helpful consultations when needed. High-performing students also have the opportunity to participate in scientific work and join a lecturer or professor for advanced studies or workshops.

Mandatory Internship

The duration of Mandatory Internship is 8 weeks, 320 hours. The precondition of fulfilment is to have 100 credits. The Mandatory Internship can be fulfilled at partner companies, institutions, professional organizations, enterprises or at the University.

Companies offering internship places have to be accepted by the university, by taking the quality principles of programme into the consideration. At the end of the internship students have to submit a report to the university.

General rules of the evaluation and examination:

Assessment of the student's performance:

If the assessment scale of the student's performance has five grades:

a) 86 – 100 % excellent (5),
b) 75 – 85 % good (4),
c) 63 – 74% satisfactory (3),
d) 50 – 62 % sufficient (2),
e) under 50 % insufficient (1)

The method of the evaluation and examination

(1) The methods of assessment of students' abilities and skills are determined by the curriculum, the content requirements, and competences to be developed are determined by the course descriptions. They can be found in the Neptun electronic study system.
(2) The methods of assessment of proficiencies are as follows:
   a) Term mark
   b) Exam
   c) Comprehensive exam
   d) Instructor's signature

All the other details can be found in Study and Exam Regulations:
https://nje.hu/en/regulation-and-documents

Final thesis

The thesis is the creative elaboration of a professional computer science engineering task in written form. It is a result of the individual work of the student carried out under the guidance of a supervisor. The student chooses a supervisor and proposes a thesis topic at the end of the 6th semester. The topic has to be approved by the supervisor and the head of the department of the supervisor. The student registers for the thesis course in the 7th 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.