

# WSB Merito University in Poznań

Faculty of Finance and Banking

## STUDY PROGRAM

for the field of study

## Computer Science

*(English-language track)*

### **Second-cycle studies (Master's level)**

Mode of study: Full-time | Profile: Practical

**Academic Year 2025/2026**

## I. GENERAL CHARACTERISTICS

<b>Name of study program</b>	Computer Science
<b>Level of education</b>	Second-cycle studies (Master's level)
<b>Educational profile</b>	Practical
<b>Mode of study</b>	Full-time
<b>Duration of studies (semesters)</b>	4
<b>Total ECTS credits</b>	120
<b>Total contact hours (full-time)</b>	3001
<b>Academic title awarded</b>	Master (Magister)
<b>Professional internship (hours)</b>	480
<b>Language of instruction</b>	English
<b>Year of commencement</b>	2025

## II. LEARNING OUTCOMES

Symbol	Learning Outcomes
<b>Knowledge</b>	<b>The graduate knows and understands:</b>
Inf_II_W01	processes occurring in the life cycle of IT devices and systems
Inf_II_W02	in an advanced degree contemporary methods for solving complex IT problems, tools and environments used
Inf_II_W03	the structure of complex algorithms and contemporary programming languages
Inf_II_W04	in an advanced degree the operating principles of virtual operating systems and networks
Inf_II_W05	methods of static and dynamic modelling of objects and their production using 3D printing technology
Inf_II_W06	in an advanced degree issues related to the Internet of Things and web applications in service networks
Inf_II_W07	methods for creating and analyzing content in complex databases, their administration and security
Inf_II_W08	economic and legal principles of conducting business in IT and ways to use IT tools in business
Inf_II_W09	the principles of intellectual property and patent protection
Inf_II_W10	data security principles in IT operations
<b>Skills</b>	<b>The graduate is able to:</b>
Inf_II_U01	use equipment and conduct complex experiments at an advanced engineering level
Inf_II_U02	apply advanced analytical and simulation methods to solve theoretical problems
Inf_II_U03	formulate own hypotheses, draw conclusions and verify them using IT methods, techniques and tools

Inf_II_U04	develop existing IT methods, techniques and tools
Inf_II_U05	assess the usefulness of new technical and technological solutions
Inf_II_U06	integrate knowledge from different fields to create new IT solutions, taking into account non-technical aspects (including social and legal)
Inf_II_U07	perform an economic valuation of solutions and actions in the field of engineering problems
Inf_II_U08	critically analyze existing technical solutions and propose improvements
Inf_II_U09	work using the project method — plan and execute assigned tasks
Inf_II_U10	use specialist information techniques to develop and present results
Inf_II_U11	conduct discussions on the IT solutions being applied
Inf_II_U12	use a foreign language at B2+ CEFR level and at a higher level in specialist terminology
Inf_II_U13	collaborate in a team and assume various roles within it, including leadership
Inf_II_U14	develop own professional competences and guide others in this area
<b>Social Competences</b>	<b>The graduate is ready to:</b>
Inf_II_K01	acquire information from available knowledge sources, interpret and critically evaluate it
Inf_II_K02	continuously supplement knowledge in the field of computer science
Inf_II_K03	apply skills in developing public and community projects and acting in an entrepreneurial manner
Inf_II_K04	adhere to applicable professional ethics principles in IT and take action to ensure compliance by third parties

### III. COURSES AND PROGRAM CONTENT

Course / Group of Courses	Program Content	ECTS	Year	Semester
Server Operating Systems and Their Administration	Most commonly used server systems. Historical outline. System structure, functions, differences. Installation and configuration. Server services. Software selection for services. Core server service deployment. User and permissions management.	4	1	2
Algorithms and Data Structures II	Standards for semi-structured data (XML, XML Schema, XSLT, XQuery, JSON). Graph and spatial data standards. Distributed and parallel system architectures. Introduction to process synchronization and interprocess communication. Parallel problem-solving approaches.	4	1	1
Databases	Relational databases, database server, data modelling. ER diagram transformation. Concurrent user access management, transactions, isolation levels. Physical structures. SQL: projection, selection, joins, set operations, subqueries, integrity constraints, views, indexes, transactions, user permissions. PL/pgSQL: cursors, exceptions, stored functions, triggers. Creating database applications.	5	1	1

Computer Networks	Historical background, basic terminology, network classifications, communication models. Bit encoding, error detection. Network architectures, local network standards, network devices. VLANs, wireless networks. Network services. Selected security issues.	3	1	1
Computer Architecture	Historical outline. Computer system construction. Component principles. Processor structure and acceleration techniques (cache, RISC, pipelining, multi-core). Data representations. Arithmetic and logical operations. Assembly language programming. Identifying hardware failures.	3	1	1
Operating Systems	Introduction. Virtual Machine. Shell and desktop environments. Shell scripting. File system. Process management. Memory management. Security.	3	1	1
Programming in C#	Development environment. C# types, variables, statements, operators. Arrays, structures, error handling, exceptions. Files/streams. OOP paradigms: abstraction, encapsulation, polymorphism, inheritance. Classes. Static and dynamic polymorphism. Value and reference types.	6	1	1
Computational Geometry	Introduction and fields of application. Basic geometric algorithms. Convex envelope. Intersecting sections. Triangulation of polygons. Voronoi diagrams. Delaunay triangulations. Windowing. Robot motion planning.	3	1	2
Object-Oriented Languages — Python	Introduction to Python tools. OOP: basic concepts and use cases. Object-oriented application modelling. Object-relational mapping. REST architecture. Documentation, unit tests, static code analysis.	3	1	2
Object-Oriented Languages — Java	Introduction to Java. Unit tests in Java. Creating web applications (Spring). Desktop applications. REST API. Database content management applications.	3	2	3
Network Virtualization	IT solutions based on virtualized services. Hardware virtualization theory. Virtualization platforms. Network communication virtualization. Configure virtualization for server systems. Service-based networks. Virtual Desktop Infrastructure. VPN solutions.	4	2	3
Data Security in Distributed Systems	Network infrastructure security. DHCP distributed across servers. OSPF routing. Distributed firewalls. DFS/NFS file systems. Traffic monitoring and analysis. Threat detection (IDS and IPS). Log analysis. Security in server OS (Windows Server vs. Linux). Server replication. Securing virtualized systems. Hyper-V and ESXi administration. Identity Federation (SAML 2.0). Cloud security.	3	2	3
Mobile Operating Systems	Android: SDK, Activity and Intent, lifecycle, resources, API communication, basic game. iOS: Apple Technology, Storyboard, Controls, Objective-C, Protocols, Lists.	2	2	4
Computer Modelling and Simulations	Simulation and modelling objectives. OpenModelica. Basic modelling definitions. Types	3	2	4

	of statistical distributions. Optimization as a simulation goal. Modelling dynamic systems. Elements of game theory.			
Entrepreneurship in IT Sector	Setting up an IT business. Polish IT market characteristics. IT market innovation. Role of IT and the Internet in entrepreneurship. Financing IT investments. Motivating IT employees. IT company business plan.	3	2	4
Methodology of Master's Dissertation	Determining the research area and problem. Study objectives and research hypothesis. Research methods. Source materials and scope of work. Layout and editorial requirements.	1	1	1
Legal Aspects of Project Management		2	2	3
Psychology of Decision Making		2	2	4

## IV. STUDY PROGRAM

### Specializations for the 2025/26 cohort:

- Advanced Database Systems
- Outsourcing Cloud Solutions

### A) ASSIGNMENT TO SCIENTIFIC DISCIPLINES

No.	Scientific Discipline	% ECTS
1	Technical Computer Science and Telecommunications (leading discipline)	90%
2	Mathematics	10%

### B) BASIC ECTS INDICATORS

Indicator Name	ECTS Credits
Total ECTS for direct instruction (full-time)	63.9
Total ECTS for practical skills courses	85.9
Total ECTS for humanities/social sciences courses	7
Total ECTS for elective courses	64
Total ECTS for professional internships	21

### C) PROFESSIONAL INTERNSHIPS

The aim of professional internships is to develop the ability to apply knowledge, skills and social competences in practice and to familiarize students with the working environment. Students may also seek a diploma project topic

during the internship. The scope for students commencing in 2025/26 is 480 hours (21 ECTS). The modular program requires students to complete mandatory modules and choose 4 elective modules. Placements may be in: IT department, organization and management, development, IT support, project management, production, HR, marketing, commercial, customer service, financial settlements, and other departments.

**Obligatory modules:**

- Legal basis and objects of company activity
- Organization of the company
- Organizational documentation
- Company infrastructure

**Elective modules (choose 4):**

- IT development strategies
- Organization of IT services
- Detailed IT infrastructure
- Database management systems
- Embedded devices and IoT
- IT project management
- IT system security policy
- Effectiveness of IT solutions
- IT solutions in user organizations
- IT solutions in producing organizations

## **D) METHODS OF VERIFYING LEARNING OUTCOMES**

**Verification of knowledge outcomes:**

- Interactive quiz on Moodle platform (test and descriptive questions)
- Written test (test and descriptive questions)
- Written exam (test and descriptive questions)
- Oral test
- Mid-semester assessments
- Individual or group preparation of a topic
- Individual written work in the form of an essay or paper
- Case study analysis
- Report
- Thesis (theoretical part with bibliography)

**Verification of skills outcomes:**

- Project
- Activity during classes understood as engagement in group work
- Practical tasks performed individually or in teams
- Simulations during classes
- Written test (problem-based questions)
- Written exam (problem-based questions)
- Thesis (practical part – survey research, data analysis, conclusions, recommendations)

**Verification of social competences outcomes:**

- Moderated discussion or debate conducted during classes

- Participation in classes understood as active conversation with the instructor
- Presentation of a topic or project to the group, defense of the project
- Peer feedback

A key element of the learning outcomes measurement system is the thesis produced during the master's seminar and its defense. Based on students' participation in the three-semester seminar, preparation of the master's thesis according to university standards, its evaluation by the supervisor and reviewer, and its defense and diploma examination, a broad spectrum of outcomes is measured. This is done according to uniform principles and criteria appropriate to the master's thesis guidelines. The Thesis Quality Committee reviews thesis topics for compliance with the field of study. Master's theses are prepared individually under the supervision of a chosen supervisor. The general principles of the graduation process are set out in the Study Regulations; the detailed procedure for sitting the diploma examination is published on the Extranet/Intranet in advance.

## **E) STUDY PLAN**

*The detailed study plan (timetable) is available in the official university documentation. It includes the schedule of all courses, contact hours, ECTS credits, and assessment methods for each specialization across all semesters of the program.*