1. Table of references of learning outcomes for the study programme to:

− universal characteristics of PQF level one, at level 6 for first-cycle students/at level 7 for second-cycle degree programmes, laid down in an annex to the Act on Integrated Qualifications System (Journal of Acts of 2020, item 226) – "Reference – symbol",

− characteristics of PQF level two, at level 6 for first-cycle students/at level 7 for second-cycle degree programmes, laid down in the regulation on level two characteristics at levels 6-8 of the Polish Qualifications Framework (Journal of Acts of 2018, item 2218) – "Reference – symbol I".

No.	Symbol of the learning outcome for the study programme	Learning outcomes	Reference-symbol I/III	Reference - symbol
1	*2*	*3*	*4*	*5*
Knowledge				
1	I2A_W01	Knows and understands selected facts, objects and phenomena, and methods and theories related to them, explaining complex relationships between them, constituting advanced knowledge in the field of mathematics.	I.P7S_WG.o	P7U_W
2	I2A_W02	Knows and understands in-depth algorithmics, data structures and methods of algorithms' design.	I.P7S_WG.o	P7U_W
3	I2A_W03	Knows and understands in-depth facts, objects and phenomena, and methods and theories connected with them, explaining relationships in complex specialised information systems.	I.P7S_WG.o	P7U_W
4	I2A_W04	Knows and understands main development trends of technical computer science in the area of specialised information systems.	I.P7S_WG.o	P7U_W
5	I2A_W05	Knows and understands processes occurring in the life cycle of complex specialised information systems.	III.P7S_WG	P7U_W
6	I2A_W06	Knows and understands the methods of management of complex IT undertakings, economic, legal and ethical rules connected with the profession of IT specialist, the need to consider social effects of IT technology development and the rules of running business activity.	I.P7S_WK III.P7S_WK	P7U_W
Skills				
1	I2A_U01	Can collect, select and critically interpret technical information and formulate opinions, ideas, problems and their solutions, as well as express and present them to specialists and non-specialists.	I.P7S_UW.o I.P7S_UK III.P7S_UW.o	P7U_U
2	I2A_U02	Can use mathematical knowledge to analyse and optimise IT solutions.	I.P7S_UW.o III.P7S_UW.o	P7U_U
3	I2A_U03	Can design efficient algorithms and justify their correctness, understands the impact of computer architecture on the execution of an algorithm and can conduct an analysis of time complexity of an algorithm.	I.P7S_UW.o III.P7S_UW.o	P7U_U

No.	Symbol of the learning outcome for the study programme	Learning outcomes	Reference-symbol I/III	Reference - symbol
1	*2*	*3*	*4*	*5*
4	I2A_U04	Can analyse multi-threaded algorithms and employ parallel programming to solve complex problems.	I.P7S_UW.o III.P7S_UW.o	P7U_U
5	I2A_U05	Perceives the constraints and weaknesses of existing IT tools and can propose their improvements.	I.P7S_UW.o III.P7S_UW.o	P7U_U
6	I2A_U06	Can pose hypotheses on engineering and scientific problems in the field of computer science.	I.P7S_UW.o III.P7S_UW.o	P7U_U
7	I2A_U07	Can plan, prepare and conduct a research experiment.	I.P7S_UW.o III.P7S_UW.o	P7U_U
8	I2A_U08	Can present results of experiments in a clear way.	I.P7S_UK	P7U_U
9	I2A_U09	Can lead a discussion with co-workers and stakeholders, when working in a team can clearly justify their actions to their co-workers.	I.P7S_UK I.P7S_UO	P7U_U
10	I2A_U10	Can efficiently use English at the B2+ level of the Common European Framework of Reference in various fields and communicate in professional contexts.	I.P7S_UK	P7U_U
11	I2A_U11	Can work on their own, in a team and lead a small team, using IT project management techniques in practice.	I.P7S_UK I.P7S_UO	P7U_U
12	I2A_U12	Can conduct a preliminary economic analysis of an IT undertaking.	I.P7S_UW.o III.P7S_UW.o	P7U_U
13	I2A_U13	Can define phases of implementation and practically carry out a complex IT project.	I.P7S_UO	P7U_U
14	I2A_U14	Can independently identify directions for further learning and carry out the process of self-education.	I.P7S_UU	P7U_U
15	I2A_U15	Can design, develop and test complex specialised IT systems and solve engineering problems using relevant methods, techniques, tools and technologies.	I.P7S_UW.o III.P7S_UW.o	P7U_U
Social competence				
1	I2A_K01	Critically evaluates the acquired knowledge and information received.	I.P7S_KK	P7U_K
2	I2A_K02	Is aware of the importance of knowledge when solving problems and understands the need to consult experts.	I.P7S_KK	P7U_K
3	I2A_K03	Understands the social consequences of the presence of computer and telecommunication technologies in all aspects of social life, the need to inform the society – e.g., through mass media – on the achievements of IT and other aspects of IT specialist's activity and can present such information in a widely understood manner.	I.P7S_KO I.P7S_KR	P7U_K
4	I2A_K04	Is prepared to think and act in a creative and entrepreneurial way.	I.P7S_KO	P7U_K
5	I2A_K05	Is aware of the responsibility for tasks completed together as a team.	I.P7S_KR	P7U_K

No.	Symbol of the learning outcome for the study programme	Learning outcomes	Reference-symbol I/III	Reference - symbol
1	2	3	4	5
6	I2A_K06	Is aware of the importance of professional conduct and following the rules of professional ethics.	I.P7S_KR	P7U_K

2. Methods of verification and assessment of the learning outcomes achieved by the student during the whole education cycle *(include also internships if foreseen)*:
- Formative assessment during the semester – scoring assessment of tests, scoring assessment of tasks done in laboratories, scoring assessment of homework, including IT projects, scoring assessment of participation in tutorials;
- Summative assessment – grade for a written test or examination consisting of solving tasks or explaining issues posed in the form of questions;
- Assessment of learning outcomes during the diploma award proceedings – grade for the diploma thesis, grade for the diploma examination.

The methods of verifying the achievement of learning outcomes used by teachers depend on the form of conducting classes. Detailed information on the methods of evaluation of learning outcomes is included in the Course Sheet.