

### Learning outcomes of the programme:

1.	Field of study	Mathematics
2.	Academic year of entry	2016/2017 (winter term)
3.	Level of qualifications/degree	first-cycle studies
4.	Degree profile	general academic

Code of the learning outcome of the programme	Learning outcomes The graduate:	Codes of the learning outcomes of the areas of education to which the learning outcome of the programme is related
<b>KNOWLEDGE</b>		
K_W01	understands the civilisational importance of mathematics and its applications	X1A_W01
K_W02	understands well the theory and the meaning of proof in mathematics, and the concept of materiality of assumptions.	X1A_W03
K_W03	understands the construction of mathematical theories, can use mathematical formalism to build and analyse simple mathematical models in other fields of science	X1A_W02, X1A_W03
K_W04	knows the basic concepts and theorems from the studied branches of mathematics	X1A_W01, X1A_W03
K_W05	knows the basic examples, both illustrating concrete mathematical concepts and allowing to disprove erroneous hypotheses or misguided reasoning	X1A_W03
K_W06	knows selected concepts and methods of mathematical logic, plurality theory, and discrete mathematics included in the foundations of other mathematical disciplines	X1A_W01
K_W07	knows the basics of differential calculus and the integral calculus of one and more variable functions as well as other branches of mathematics used in it	X1A_W01
K_W08	knows the basics of computational and programming techniques supporting the work of mathematicians and understands their limitations	X1A_W04, X1A_W05
K_W09	knows at a basic level at least one software package for symbolic calculations	X1A_W05
K_W10	speaks at least one foreign language at the intermediate level (B2)	X1A_U10
K_W11	knows the basic principles of occupational health and safety	X1A_W06
K_W12	knows and understands legal, economic and ethical aspects of mathematics	X1A_W07
K_W13	knows and understands basic concepts and principles of industrial property and copyright protection	X1A_W08
K_W14	has a basic knowledge of management, including quality management and business operation	X1A_W09
K_W15	has a general knowledge of selected scientific methods and is familiar with the issues characteristic of a scientific discipline not related to the programme	
<b>SKILLS</b>		
K_U01	is able to clearly express in speech and writing correct mathematical reasoning, formulate theorems and definitions	X1A_U01, X1A_U06, X1A_U08, X1A_U09
K_U02	uses the propositional calculus and predicate calculus; can use quantifiers correctly also in non-formal language	X1A_U01
K_U03	is able to conduct simple and moderately difficult proof by means of full induction; can define recursive functions and relationships	X1A_U01
K_U04	is able to apply a system of classical logic to the formalisation of mathematical theories	X1A_U01
K_U05	can create new objects by constructing quotient spaces or Cartesian products	X1A_U01
K_U06	uses the language of plurality theory, interpreting issues from different areas of mathematics	X1A_U01
K_U07	understands issues related to different types of infinity and orders in sets	X1A_U01
K_U08	knows the concept of real and complex numbers; knows the examples of real irrational and transcendental numbers	X1A_U01
K_U09	is able to define functions, including the use of border crossings, and to describe their properties	X1A_U01, X1A_U02
K_U10	uses the notions of convergence and limit in various contexts; can at a basic and medium level of difficulty calculate the limits of sequences and functions and study the absolute and conditional convergence of series.	X1A_U01, X1A_U02
K_U11	is able to interpret and explain functional relationships presented in the form of formulas, tables, charts, diagrams and apply them to practical issues	X1A_U01, X1A_U02, X1A_U03
K_U12	is able to use theorems and methods of differential calculus of one and more variable function related to optimization, searching for local and global extremes and examining the course of the function, giving precise and accurate reasoning.	X1A_U01, X1A_U02, X1A_U03
K_U13	uses the definition of the integral of one and more real variable function; can explain the analytical and geometric sense of the concept	X1A_U01, X1A_U02, X1A_U03

K_U14	is able to integrate one and more variable functions by part and by substitution; is able to change the order of integration; is able to express smooth surface areas and volumes as appropriate integrals	X1A_U01, X1A_U02, X1A_U03
K_U15	is able to use tools and numerical methods to solve selected issues of differential and integral calculi; including those based on its application	X1A_U02, X1A_U04
K_U16	uses the concept of linear space, vector, linear transformation and matrix	X1A_U01
K_U17	perceives the presence of algebraic structures (group, ring, body, linear space) in various mathematical issues, not necessarily related directly to mathematics	X1A_U01
K_U18	can calculate determinants and knows their properties; can give a geometric interpretation of a determinant and understand its relation to mathematical analysis	X1A_U01
K_U19	solves sets of linear equations with constant coefficients; can use geometric interpretation of solutions	X1A_U01
K_U20	finds matrices of linear transformation in different bases; calculates eigenvalues and eigenvectors of matrices; can explain the geometric sense of these concepts	X1A_U01
K_U21	is able to solve simple ordinary differential equations: homogeneous, with separated variables, with complete differential form, linear, and linear systems of equations	X1A_U01
K_U22	is able to apply the theorem on the existence of solutions to specific types of differential equations	X1A_U01
K_U23	recognizes and determines the most important topological properties of subsets of the Euclidean and metric spaces	X1A_U01
K_U24	is able to use topological properties of sets and functions to solve qualitative tasks	X1A_U01, X1A_U02
K_U25	identifies problems, including practical issues that can be solved algorithmically; can make specifications for such a problem	X1A_U04
K_U26	is able to construct and analyse an algorithm in accordance with the specification and write it in the selected programming language	X1A_U04
K_U27	can compile, start and test a self-written computer programme	X1A_U04
K_U28	is able to use computer programmes for data analysis	X1A_U04
K_U29	can model and solve discrete problems	X1A_U01
K_U30	uses the concept of probabilistic space; can build and analyse a mathematical model of a random experiment	X1A_U01
K_U31	can give various examples of discrete and continuous probability distributions and discuss selected random experiments and mathematical models in which these distributions occur; knows the practical application of basic distributions	X1A_U01
K_U32	is able to apply the formula for total probability and the Bayes formula	X1A_U01
K_U33	can determine the parameters of a random variable distribution with a discrete and continuous distribution; can use limit theorems and laws of great numbers to estimate probabilities	X1A_U01
K_U34	is able to use statistical characteristics of the population and the sample equivalents	X1A_U02
K_U35	can make simple statistical inferences, including computer tools	X1A_U01, X1A_U04
K_U36	can talk about mathematical issues in a clear and non-formal language	X1A_U06, X1A_U09
K_U37	is able to present mathematical issues in writing and in a clear language	X1A_U05, X1A_U06, X1A_U08
K_U38	can practically apply mathematical knowledge	X1A_U01, X1A_U05
K_U39	can edit mathematical texts using the LaTeX package	X1A_U08, X1A_W05
K_U40	has the ability to establish and analyse problems on the basis of the acquired content of a scientific discipline unrelated to the programme	
<b>SOCIAL COMPETENCES</b>		
K_K01	knows the limitations of their own knowledge and understands the need for further education	X1A_K01, X1A_K05, X1A_U07
K_K02	is able to precisely formulate questions in order to deepen their understanding of a given topic or to find missing elements of reasoning	X1A_K01, X1A_K02, X1A_U09
K_K03	is able to work as a team; understands the need to work systematically on all projects that are long-term	X1A_K02, X1A_K03
K_K04	understands and appreciates the importance of intellectual honesty in the actions of one's own and others; acts ethically	X1A_K04
K_K05	understands the need for popular presentation of selected achievements of higher mathematics to laymen	X1A_K05, X1A_K06, X1A_U08, X1A_U09
K_K06	can independently search for information in literature and online resources, including foreign languages	X1A_K01
K_K07	can formulate opinions on basic mathematical issues	X1A_K06
K_K08	is able to discuss subject-matter related to higher mathematics with an interlocutor who has a different opinion	X1A_K02, X1A_K03

K_K09	can think in terms of entrepreneurship, act in an entrepreneurial way and understands the economic aspects of this activity	X1A_K07
K_K10	understands the need for an interdisciplinary approach to solving problems, integrating knowledge from different disciplines and practising self-education to deepen the knowledge acquired	

Code of the learning outcome of the programme	Learning outcomes related to becoming a qualified teacher The graduate:	Codes of the learning outcomes of the areas of education to which the learning outcome of the programme is related
<b>KNOWLEDGE</b>		
KN_W01	knows the basic terminology used to describe pedagogical (educational) phenomena	H1A_W02, S1A_W02
KN_W02	has a basic knowledge of human development in the life cycle, both biologically and psychologically and socially, extended in relation to selected educational stages	H1A_W03
KN_W03	has a basic knowledge of interpersonal and social communication processes, their regularity and disruption; relates to educational activity (educational, caring and teaching)	H1A_W04, H1A_W05, H1A_W06
KN_W04	has a basic knowledge of education and training, their philosophical, socio-cultural, biological, psychological and medical bases	H1A_W07, S1A_W05
KN_W05	knows the basic theories about upbringing, learning and teaching; understands the various conditions of these processes	S1A_W06
KN_W06	has a basic knowledge of the main educational environments, their specifics and the processes in them	S1A_W07, S1A_W08
KN_W07	has a basic knowledge of designing and conducting diagnostic tests in pedagogical practice, extended in relation to selected educational stages and considering special educational needs of students with developmental disabilities	S1A_W04, S1A_W05, S1A_W06
KN_W08	has a basic knowledge about the structure and functions of the education system - goals, legal bases, organization and functioning of educational and care institutions	S1A_W08, S1A_W09
KN_W09	has a structured and in-depth knowledge of the participants of pedagogy activity (children, students, parents, teachers) and the specificity of functioning related to children and adolescents in the context of developmental regularities and irregularities	H1A_W07, S1A_W07
KN_W10	has an in-depth knowledge of the specificity of functional disorders in children with special educational needs	S1A_W08
KN_W11	has a detailed knowledge of the methodology of performing typical tasks - standards, procedures, and good practices applied in the selected area of pedagogical activity (pre- school education, teaching at schools, special schools and integration departments)	H1A_W05, H1A_W06, S1A_W07, S1A_W08, S1A_W09
KN_W12	has a basic knowledge about health and safety at work in selected educational and caring institutions	S1A_W07, S1A_W08, S1A_W09
KN_W13	has a basic knowledge of how to design a path for personal development and professional advancement	H1A_W08, S1A_W09, S1A_W10, S1A_W11
KN_W14	has a basic knowledge of the ethics of the teaching profession	H1A_W08, S1A_W10
KN_W15	has a basic knowledge of speech organ functioning and its pathology	H1A_W04, S1A_W04, S1A_W05
<b>SKILLS</b>		
KN_U01	is able to observe, analyse and interpret situations and pedagogical events	H1A_U01, S1A_U01
KN_U02	is able to use a basic theoretical knowledge of psychology in order to analyse and interpret a specific type of educational, caring situations and events, as well as motives and behaviour patterns of the participants of these situations	H1A_U02, S1A_U02
KN_U03	is able to use a basic theoretical knowledge of pedagogy, psychology and teaching and detailed methodology in order to diagnose, analyse and predict teaching situations and to select strategies for implementing practical actions at specific educational stages	H1A_U04, S1A_U03, S1A_U04, S1A_U05, S1A_U06
KN_U04	is able to independently acquire knowledge and develop their professional skills related to pedagogical activities (educational, caring and teaching) using various sources (both mother tongue and foreign languages) and modern technologies	H1A_U03, H1A_U07, H1A_U08, H1A_U09, S1A_U06
KN_U05	has basic diagnostic skills to recognize the situation of students with special educational needs, develop the results of observations and form conclusions	S1A_U07, S1A_U08
KN_U06	has developed interpersonal communication skills; can use specialist language and communicate clearly and coherently with people from different backgrounds	H1A_U07, H1A_U08, H1A_U09, S1A_U09, S1A_U10, S1A_U11
KN_U07	is able to assess the usefulness of typical methods, procedures and good practices for the implementation of educational, caring and teaching tasks related to selected educational stages	H1A_U01, H1A_U04, S1A_U01, S1A_U02

KN_U08	is able to select and use available materials, means and methods of work in order to design and effectively implement pedagogical (educational, caring and teaching) activities; uses modern technologies (ICT) in teaching work	S1A_U02, S1A_U03, S1A_U05, S1A_U06
KN_U09	is able to manage education and upbringing processes	S1A_U06, S1A_U07, S1A_U08
KN_U10	is able to animate work on the development of participants in pedagogical processes and support their independence in gaining knowledge, as well as inspire them to work for lifelong learning	S1A_U06, S1A_U07
KN_U11	is able to work with students, including those with special educational needs and abilities	S1A_U06, S1A_U07
KN_U12	is able to use ethical norms and principles in the activity	S1A_U08
KN_U13	is able to work in a team with different roles; is able to undertake and assign tasks; has basic organisational skills which enable them to carry out pedagogical (educational, caring and teaching) activities	H1A_U05, S1A_U03, S1A_U04, S1A_U05
KN_U14	is able to analyse their own pedagogical activities (educational, caring, teaching) and indicate possible areas for modification in a future action	S1A_U06
KN_U15	is able to design a plan for their own professional development	S1A_U08
KN_U16	has developed proper habits for using the speech organ	T1A_U03, T1A_U04
<b>SOCIAL COMPETENCES</b>		
KN_K01	is aware of their level of knowledge and skills; understands the need for continuous professional and personal development; self-assesses their own competences and improves skills during practical activities	H1A_K01, S1A_K01
KN_K02	is convinced of the sense, value and need to undertake pedagogical activities in the social environment; is ready to take professional challenges; is active; undertakes the challenge and is characterized by perseverance in the implementation of individual and team professional activities resulting from the role of the teacher	H1A_K02, H1A_K03, S1A_K02, S1A_K03
KN_K03	is aware of the need for individualised pedagogical activities for students with special educational needs	H1A_K04, S1A_K04
KN_K04	is convinced of the importance of professional behaviour, reflection on ethical issues and observance of the rules of professional ethics; shows the characteristics of a reflective practitioner	H1A_K02, H1A_K03, H1A_K04, S1A_K02, S1A_K03, S1A_K04
KN_K05	is aware of the ethical dimension of diagnosing and evaluating students	H1A_K03, H1A_K04, S1A_K03, S1A_K04
KN_K06	is able to communicate in the working environment, both with persons who are the subjects of the pedagogical activity and with other persons who cooperate in the teaching and educational process and with specialists who support this process	H1A_K02, S1A_K02, S1A_K03, S1A_K05
KN_K07	prepares responsibly for their work, designs and carries out pedagogical activities	S1A_K05
KN_K08	is capable of taking individual and team action to improve the quality of school work	S1A_K06, S1A_K07