Learning outcomes of the programme:

1.	**Field of study**	**Materials Science and Engineering**
2.	Academic year of entry	2017/2018 (summer term)
3.	Level of qualifications/degree	second-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
	KNOWLEDGE	
IM2A_W01	have extended and deepened knowledge of physics, including solid state physics, quantum mechanics, useful to understand physical phenomena having a significant influence on shaping and modelling the structure and properties of new engineering materials.	T2A_W01
IM2A_W02	have extended and deepened subject-matter knowledge about issues related to materials chemistry, phenomena and processing having a decisive influence on shaping properties of new engineering materials.	T2A_W01
IM2A_W03	have extended and deepened knowledge about typical numerical methods useful to formulate assumptions and to resolve complex tasks in materials engineering.	T2A_W01, T2A_W02, T2A_W07
IM2A_W04	have structured knowledge about computer networks architecture and detailed knowledge about the Unix operating system, necessary for computer modelling of engineering materials structure and properties.	T2A_W06, T2A_W07
IM2A_W05	have basic subject-matter knowledge about scientific experiments planning and experimental data handling for the needs of resolving complex engineering tasks from the field of materials engineering.	T2A_W07
IM2A_W06	have extended and deepened subject-matter knowledge about methods,manufacturing processes and processing of engineering materials, modification of the surface of engineering materials, used in technology and medicine.	T2A_W03, T2A_W07
IM2A_W07	have extended and deepened knowledge about engineering materials used in technology and medicine, about development trends and most recent achievements and about methods of their properties designing and shaping.	T2A_W05
IM2A_W08	have knowledge of implant and artificial organs used so far, have deepened knowledge about principles of their operation, application and existing limitations as well as know the methodology of medical implants designing, including dental implants and artificial organs.	T2A_W02, T2A_W06, T2A_W07
IM2A_W09	have knowledge about methods of tissue reconstruction, studying physiological, biological and physiochemical phenomena and processes in interactions on a biomaterial/living organism interface.	T2A_W02, T2A_W06, T2A_W07
IM2A_W10	have detailed knowledge about intelligent biomaterials, know phenomena classified as the shape memory effect, methods of their properties shaping, necessary to design and model simple medical implants.	T2A_W02, T2A_W06, T2A_W07
IM2A_W11	have ordered interdisciplinary knowledge about modern IT techniques, advanced technologies for functional materials manufacturing and characterising, necessary to design and model modern engineering materials of required properties.	T2A_W02, T2A_W06, T2A_W07
IM2A_W12	have theoretically supported and structured subject-matter knowledge about metallic glasses, nanocomposites, magnetic and non-magnetic nanomaterials and phase transitions in amorphous and nanocrystalline materials necessary to design, manufacture and process such materials.	T2A_W02, T2A_W04, T2A_W06, T2A_W07
IM2A_W13	have theoretically supported detailed knowledge about modern materials testing methods comprising electron microscopy, scanning probe microscopy techniques, nuclear spectroscopic techniques and advanced X-ray diffraction techniques useful to resolve complex engineering tasks.	T2A_W04, T2A_W06, T2A_W07
IM2A_W14	have structured and theoretically supported general knowledge covering elements of toxicology, biomaterials degradation and corrosion in a biological environment necessary to understand, explain and assess interactions between the biomaterial and the living organism environment.	T2A_W02, T2A_W03, T2A_W04
IM2A_W15	have consolidated and deepened knowledge about computer programming, programming languages structure; numerical methods; methods of classical molecular dynamics necessary for theoretical modelling of engineering materials.	T2A_W02, T2A_W03, T2A_W06, T2A_W07
IM2A_W16	have broadened knowledge about management, including quality management and running a business, know principles of individual entrepreneurship creation and development.	T2A_W09, T2A_W11
IM2A_W17	know and understand basic terms and rules from the field of intellectual property protection and copyright as well as the necessity to manage intellectual property resources, can use the patent legislation.	T2A_W10

IM2A_W18	have knowledge necessary to understand ethical, economic and ecological aspects of new materials designing and their manufacturing technology.	T2A_W02, T2A_W08
IM2A_W19	It has a deeper knowledge of selected scientific methods and know the discipline unrelated to the field of study	T2A_W08
SKILLS		
IM2A_U01	can gather information from literature, databases, standards and other available sources; can integrate the obtained information, interpret and critically evaluate it, draw conclusions as well as formulate and justify opinions at length	T2A_U01
IM2A_U02	can communicate using various techniques in the professional environment, also using a foreign language; can work independently and in a team; can evaluate the time necessary to carry out the assigned task	T2A_U02, T2A_U06
IM2A_U03	can prepare a scientific report on performance of an experiment, design or research task, containing discussion of obtained results	T2A_U03
IM2A_U04	can prepare and deliver a presentation on a design or research task implementation and to lead the discussion on the delivered presentation	T2A_U04
IM2A_U05	can determine directions of further learning and implement a self-education process	T2A_U05
IM2A_U06	can design, build and configure a local computer network under the Windows and Unix system as well as to use higher level languages codes and to design a simple program in at least two languages.	T2A_U07
IM2A_U07	can plan and carry out experiments, including measurements and computer simulations, interpret the obtained results and draw conclusions.	T2A_U08
IM2A_U08	can specify assumptions, possibilities and limitations of classical modelling methods for processes occurring in engineering materials, justify the choice of a model of a simple research problem resolution and to carry out its tests.	T2A_U09, T2A_U11
IM2A_U09	can describe a specific research problem in the form of mathematical equations, analyse equations describing material properties including the underlying assumptions.	T2A_U08, T2A_U09, T2A_U11
IM2A_U10	can evaluate materials based on their chemical properties as well as usefulness of selected processes of materials chemical production.	T2A_U12
IM2A_U11	can evaluate usefulness and possibility to use the existing and new technologies for engineering materials manufacturing and processing, can shape the materials surface structure to improve their properties, including the biocompatibility.	T2A_U10, T2A_U12
IM2A_U12	have preparation necessary to work in an industrial environment and know the safety rules.	T2A_U13
IM2A_U13	can perform a preliminary economic analysis of undertaken engineering activities.	T2A_U14
IM2A_U14	can critically analyse mechanisms of toxic and corrosive action, recognise a carcinogenic and allergic reaction of a living organism to an implant; can determine types of possible complications resulting from the use of biomaterials in a human organism as well as reasons for their origination and prevention methods.	T2A_U15
IM2A_U15	can creatively create independent solutions related to the process of medical products designing, intended for implants, artificial organs and instruments including proper determination of working conditions and selection of biomaterials showing a high corrosion resistance and biocompatibility, including designing and suggesting improvements to the existing solutions.	T2A_U16, T2A_U17, T2A_U19
IM2A_U16	can select a method for tissue reconstruction appropriate to the needs in medical applications and can identify interactions existing at the implant/living organism interface.	T2A_U17
IM2A_U17	can define and distinguish metallic glasses, nanocomposites, magnetic and non-magnetic nanomaterials and suggest techniques of their manufacturing.	T2A_U17
IM2A_U18	can evaluate usefulness and apply methods to shape the structure and properties of metallic glasses and nanomaterials as well as to make a proper selection of such materials for technical applications.	T2A_U18
IM2A_U19	can design engineering materials and forecast their properties taking into account the occurrence of phenomena in functional materials.	T2A_U19
IM2A_U20	know principles, ways and methods of running production and service activities, and also the organisation of production and service space. Can specify logistic parameters affecting the course of production processes and services. Know and understand HR management methods and instruments.	T2A_U13, T2A_U14
IM2A_U21	It has the ability deeper to analyze problems in the field of disciplines unrelated to the field of study	T2A_U08, T2A_U10
SOCIAL COMPETENCES		
IM2A_K01	are aware and know possibilities of further education (third level studies) - developing professional, personal and social competences	T2A_K01
IM2A_K02	are aware of importance and understand non-technical aspects and effects of engineering activities, including their influence on a human organism and environment and related responsibility for the taken decisions.	T2A_K02
IM2A_K03	are aware of responsibility for own work and readiness to submit to team work rules and to bear responsibility for tasks implemented together	T2A_K03, T2A_K04

IM2A_K04	are aware of individual research method limitations and see the need of a thorough scientific analysis of problems in the field of materials engineering	T2A_K04, T2A_K05, T2A_K06
IM2A_K05	can think and act in a creative and entrepreneurial way.	T2A_K06
IM2A_K06	are aware of the social role of university graduates and in particular understand the need to formulate and communicate to the society - inter alia through the mass media - the information and opinions on achievements of materials engineering and other aspects of materials engineer activity; undertake efforts to communicate this information in a widely understandable way, justifying various points of view.	T2A_K07
IM2A_K07	He understands the need for an interdisciplinary approach to problem solving, to integrate knowledge from different disciplines and importance of self-study.	T2A_K07