

# I. EDUCATIONAL OUTCOMES

## for the field of study *civil engineering* 2<sup>nd</sup> level studies – general academic profile

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#### 1. The area descriptors taken into consideration in the description of the educational outcomes for the field of study

In the description of the field of study *civil engineering* for the second level of study all educational outcomes from the description of educational outcomes for the area of technical studies have been considered. The field of study *civil engineering* is uniquely matched to the area of education corresponding to technical sciences and the defined educational outcomes for the field of study fulfil all requirements set for this area, and it means that engineering competences correspond automatically to educational outcomes for the field of study. The description of qualifications for the second level of studies includes outcomes for both study levels.

A graduate of the second level of study must possess competences determined by educational outcomes listed below. However, it does not mean that all listed outcomes must be fulfilled as a result of the realization of the second level study programme; some of them might be achieved during the first level studies, as well as – within a limited scope – as a result of non formal education.

#### 2. Educational outcomes

##### 2.1. General educational outcomes

After completing the second level study of general-academic profile at the field of study *civil engineering* a graduate according to acquired knowledge, skills and competences is prepared to be able to make decisions concerning the proper selection of building materials to be used, the design of building objects and construction undertakings. A graduate knows current trends in designing and realizing construction undertakings. He applies health and safety rules at work.

A graduate is able to design building objects, knows principles of structural mechanics, is able to formulate, create and then apply appropriate calculation models of complex engineering structures. He is able to make and read technical drawings, recognize cartographic and geodesic elaborations and also administer construction

works. He is able to formulate and solve new engineering, technical and organizational problems related to civil engineering. A graduate make use of state of the art computer technologies supporting object design processes as well as construction undertakings. He is able to critically choose arguments supporting collective decisions regarding civil engineering tasks realization. A graduate is able to elaborate and alternatively publish reports regarding the development of works. He is able to work in a team and also supervise team work. He is responsible for wok safety of a supervised team. He is aware of the necessity of increasing professional and personal competences. He follows the code of ethics. He knows and applies building law and regulations. He possesses language skills in the area of scientific disciplines and fields of study adequate to the studied discipline according to CEFR requirements for at least B2+ level. He is prepared to continue education at third level study. Graduates are prepared to solve complex project, organizational, technological problems, elaborate and realize research programmes, undertake actions on the international scale, participate in marketing and promotion of building products, continue education and participate in research and activities directly related to civil engineering and building manufacturing, continuously increase qualifications and complement knowledge and also manage big teams. Graduates have possibilities to start work in construction-project offices, contracting companies, research institutes and research and development centers and also institutions dealing with advisory and knowledge promotion in the area of civil engineering.

Moreover, graduates of particular specializations obtain additional, broadened competences resulting from educational outcomes described for given specializations:

**Civil Engineering** specialization run in English enables a graduate gain extended knowledge and skills in the area of design and construction of different building objects such as composite reinforced concrete and steel structures, building structures, urban engineering objects, roads and highways, bridges, railway engineering objects.

Moreover the graduate possesses extended knowledge of hydraulics and computer aided engineering. Every graduate possesses extended own knowledge of chosen objects within the wide range of elective modules.

## 2.2. Specific educational outcomes

### Description of symbols used in shortcuts :

**K2** – educational outcomes for the field of study

**W** –category of knowledge (W)

**U** – category of skills (U)

**K** (after the underscore) – category of personal and social competences (KPS)

**K2S** – educational outcomes related to the specialisation

**\_CEB\_** – reference to the specialisations respectively: Civil Engineering

**P7\_** – characteristics of the Polish Qualifications Framework for the second degree, (universal (U), second degree, for the area of technical sciences (NT), including engineering competency (INZ))

## DESCRIPTION OF THE EDUCATIONAL OUTCOMES

## REFERENCE TABLE FOR FIELD OF STUDY OUTCOMES TO OUTCOMES IN THE AREA OF TECHNICAL SCIENCES

Educational outcomes for the field of study (K2_)	Description of the educational outcomes for the general academic profile. After completing the second level in the field of study <i>Civil Engineering</i> a graduate:	Characteristics of PRK
<b>KNOWLEDGE</b>		
K2_W01	possesses essential advanced knowledge in the area of chosen sections of mathematics and physics in the scope being the basis for the strength of materials, mechanics, including dynamics as well as the theory of structures.	P7U_W, P7S_WG_NT, P7S_WG_INZ
K2_W02	possesses broadened knowledge of advanced problems related to the strength of materials and materials modelling	P7U_W, P7S_WG, P7S_WG_NT, P7S_WG_INZ
K2_W03	possesses adequate, essential knowledge of theoretical basis of the finite element method and general principles of leading non linear calculations of engineering structures.	P7U_W, P7S_WG, P7S_WG_NT, P7S_WG_INZ
K2_W04	knows sufficiently well the basis of continuum mechanics; knows principles of analysis of statistics problems, stability of complex rod structures as well as plates, discs , coatings and solid structures and also the dynamics of these structures characterized by many dynamic degrees of freedom i.e. discrete or discretized systems.	P7U_W, P7S_WG, P7S_WG_NT, P7S_WG_INZ
K2_W05	possesses fundamental knowledge of theoretical basis of analysis and structure optimization as well as complex structural systems design	P7U_W, P7S_WG_NT, P7S_WG_INZ
K2_W06	knows standard, guidelines and regulations relevant to the building constructions design and their elements	P7U_W
K2_W07	knows principles of analysis, construction and dimensioning of complex building construction: steel and	P7U_W, P7S_WG,

	reinforced concrete	P7S_WG_NT, P7S_WG_INZ
K2_W08	knows principles of foundations of complex building constructions	P7U_W, P7S_WG, P7S_WG_NT, P7S_WG_INZ
K2_W09	knows classification and the range of applications of computer programs supporting the analysis and design of complex building constructions	P7U_W, P7S_WG, P7S_WG_NT, P7S_WG_INZ
K2_W10	knows currently used, modern building materials and basic components of technologies and their production	P7U_W, P7S_WK, P7S_WK_NT, P7S_WK_INZ
K2_W11	knows principles of creating quality management procedures of building undertakings; possesses knowledge of the way of complex building works realization as well as building objects; knows principles of normalization and standardization in civil engineering; possesses knowledge of cost effectiveness and realization time; knows programs useful in planning building undertakings	P7U_W, P7S_WG, P7S_WK, P7S_WG_NT, P7S_WK_NT, P7S_WG_INZ, P7S_WK_INZ
K2_W12	possesses grounded knowledge of running a business relevant to the construction industry; understands principles and basis of financial management of a company	P7U_W, P7S_WK, P7S_WK_NT, P7S_WK_INZ
K2_W13	possesses knowledge of the influence of implementation of construction projects on environment	P7U_W, P7S_WK, P7S_WK_NT, P7S_WK_INZ
K2_W14	knows construction law and the Occupational Health and Safety Act	P7U_W, P7S_WK, P7S_WK_NT, P7S_WK_INZ
K2_W15	knows patent law as well as intellectual property protection regulations and also code of ethics	P7U_W, P7S_WG, P7S_WK, P7S_WG_NT, P7S_WK_NT, P7S_WG_INZ, P7S_WK_INZ
	achieves outcomes in the category of KNOWLEDGE in one of the following specializations: <ul style="list-style-type: none"> <li>run in English language</li> </ul> - Civil Engineering (K2S_CEB_W) (appendix 9)	

<b>SKILLS</b>		
<b>K2_U01</b>	is able to use advanced specialized tools while searching internet databases and other resources for searching general information and related to widely considered civil engineering; is able to apply information technologies for communication and also is able to gain software supporting a designer job and also the person who organizes and administers building processes	<b>P7U_U, P7S_UW, P7S_UU, P7S_UW_NT02, P7S_UW_INZ02</b>
<b>K2_U02</b>	possesses language skills in fields of study related to the studied discipline according to CEFR requirements for at least B2+ level; possesses ability to communicate in foreign languages and knows elements of technical language in the area of civil engineering	<b>P7U_U, P7S_UK</b>
<b>K2_U03</b>	is able to establish directions of further education and follow the process of self-learning	<b>P7U_U, P7S_UK</b>
<b>K2_U04</b>	is able to make a classification of simple and complex building structures	<b>P7U_U, P7S_UW, P7S_UW_NT04, P7S_UW_INZ04</b>
<b>K2_U05</b>	is able to make assessment and any kind of loads combinations acting on building objects together with their adequate combinations	<b>P7U_U, P7S_UW, P7S_UW_NT03, P7S_UW_INZ03</b>
<b>K2_U06</b>	is able to carry out classical statistical analysis and stability analysis of the regimes of rods (trusses, frames and ties) statically determinate and indeterminate and also surface structures (discs, plates, membranes, shells and solid elements) and also dynamic analysis of these types of structures consisting of multiple degrees of freedom as discrete or discretized systems	<b>P7U_U, P7S_UW, P7S_UW_NT01, P7S_UW_INZ01</b>
<b>K2_U07</b>	is able, in the environment of finite element method, correctly define a calculation model and carry out an advanced analysis in the linear range of complex engineering structures and is also able to apply the techniques of non linear calculations at elementary level	<b>P7U_U, P7S_UW, P7S_UW_NT02, P7S_UW_INZ02</b>
<b>K2_U08</b>	is able to solve complex concepts in the area of chosen sections of mathematics, being the basis of advanced construction analysis methods; is able to choose tools (analytical or numerical) to solve engineering problems; is able to use chosen computer programs supporting modelling and design processes in civil engineering	<b>P7U_U, P7S_UW, P7S_UW_NT04, P7S_UW_INZ04</b>
<b>K2_U09</b>	is able to critically assess the results of numerical analysis of complex engineering structures	<b>P7U_U, P7S_UW_NT03, P7S_UW_INZ03</b>

<b>K2_U10</b>	is able to design complex foundations for building structures	<b>P7U_U, P7S_UW, P7S_UW_NT04, P7S_UW_INZ04</b>
<b>K2_U11</b>	is able to model and design complicated components and complex steel and reinforced concrete structures	<b>P7U_U, P7S_UW, P7S_UW_NT04, P7S_UW_INZ04</b>
<b>K2_U12</b>	is able to prepare a graphics project documentation in the environment of chosen graphics programs	<b>P7U_U, P7S_UW, P7S_UW_NT01, P7S_UW_INZ01</b>
<b>K2_U13</b>	is able to prepare the schedule of construction works and cost estimate of a construction undertaking and assess the efficiency of construction projects	<b>P7U_U, P7S_UO</b>
<b>K2_U14</b>	is able to assess threats related to construction projects implementation and implement adequate safety principles, is able to develop norms and standards of work and quality management procedures	<b>P7U_U, P7S_UW, P7S_UK, P7S_UO, P7S_UU, P7S_UW_NT03, P7S_UW_INZ03</b>
<b>K2_U15</b>	is able to plan and carry our laboratory experiments leading to quality assessment of applied materials and also the assessment of the strength of building structure elements	<b>P7U_U</b>
<b>K2_U16</b>	is able to, according to scientific principles, using scientific know-how to formulate and develop entry works of a research type leading to solving engineering problems as well as technological and organizational, in civil engineering	<b>P7U_U, P7S_UW, P7S_UU, P7S_UW_NT04, P7S_UW_INZ04</b>
<b>K2_U17</b>	is able to plan, prepare and carry out research and prepare elaborations which prepare him/her to take up research work	<b>P7U_U, P7S_UW, P7S_UU, P7S_UW_NT01, P7S_UW_INZ01</b>
	achieves outcomes in the category of <b>SKILLS</b> in one of the following specializations: <ul style="list-style-type: none"> <li>• run in English language</li> <li>- Civil Engineering (<b>K2S_CEB_W</b>) (appendix 9)</li> </ul>	

<b>SOCIAL COMPETENCES</b>		
<b>K2_K01</b>	is aware of continuous increase of professional and personal competences; in formal and informal learning completes and broadens knowledge of modern processes and technologies related to civil engineering	<b>P7U_K, P7S_KK</b>
<b>K2_K02</b>	realizes the significance and understands non-technical aspects and consequences of engineering activity and especially its influence on the natural environment and the related responsibility for decisions	<b>P7U_K, P7S_KK</b>
<b>K2_K03</b>	is able to work independently and cooperate in a group on given tasks is responsible for safety of his own work as well as his team	<b>P7U_K, P7S_KK, P7S_KO</b>
<b>K2_K04</b>	Realizes the significance of professional behaviour and obey the code of ethics; identifies correctly and solve dilemmas related to the profession; is able to set priorities which help in implementing a task set by himself or others	<b>P7U_K, P7S_KO, P7S_KR</b>
<b>K2_K05</b>	is able to think and act in a creative and entrepreneurial way	<b>P7U_K, P7S_KO</b>
<b>K2_K06</b>	realizes the social role of technical university graduates and especially understands the need to formulate information and share it with society, e.g. through mass media, in relation to achievements in environmental engineering and other aspects of engineering activity; makes attempts at sharing such information and opinions in an understandable way, justifying different points of view.	<b>P7U_K, P7S_KK, P7S_KO, P7S_KR</b>
<b>K2_K07</b>	is aware of the necessity of individual and team activities going far beyond an engineering activity	<b>P7U_K, P7S_KK, P7S_KO, P7S_KR</b>



**Appendix 9****Specific educational outcomes for *Civil Engineering* Specialization in the field of study *civil engineering***

<b>Educational outcomes for specialization</b>  <b>CEB (K2S_CEB )</b>	<b>Description of specialization educational outcomes for the general academic profile.</b> <b>After completing the second level study in the field of study <i>Civil Engineering</i>, specialization <i>Civil Engineering</i> a graduate gains additional educational outcomes:</b>	<b>Characteristics of PRK</b>
<b>KNOWLEDGE</b>		
<b>K2S_CEB_W16</b>	possesses deepened and broadened knowledge of analysis, dimensioning and construction of complex structures in general construction: metal and reinforced concrete (objects)	<b>P7U_W, P7S_WG, P7S_WG_NT, P7S_WG_INZ</b>
<b>K2S_CEB_W17</b>	possesses additional knowledge in the area of hydraulics	<b>P7U_W, P7S_WG, P7S_WG_NT, P7S_WG_INZ</b>
<b>K2S_CEB_W18</b>	possesses broadened knowledge of residential municipal structures	<b>P7U_W, P7S_WG, P7S_WG_NT, P7S_WG_INZ</b>

<b>K2S_CEB_W19</b>	possesses broadened knowledge of building roads, bridges and railways	<b>P7U_W, P7S_WG, P7S_WG_NT, P7S_WG_INZ</b>
<b>K2S_CEB_W20</b>	possesses developed knowledge of structures related to urban infrastructure	<b>P7U_W, P7S_WK, P7S_WK_NT, P7S_WK_INZ</b>
<b>K2S_CEB_W21</b>	possesses broadened knowledge of technologies of construction works	<b>P7U_W, P7S_WG, P7S_WK, P7S_WG_NT, P7S_WK_NT, P7S_WG_INZ, P7S_WK_INZ</b>
<b>K2S_CEB_W22</b>	possesses broadened knowledge of chosen elements of structures and building objects ( subjects from elective modules)	<b>P7U_W, P7S_WG, P7S_WG_NT, P7S_WG_INZ</b>

	SKILLS	
<b>K2S_CEB_U18</b>	possesses ability to analyse, dimension and construct complex building structures in general construction: steel and reinforced concrete (objects)	<b>P7U_U, P7S_UW, P7S_UW_NT01, P7S_UW_INZ01</b>
<b>K2S_CEB_U19</b>	is able to apply advanced computational techniques, including optimization ones, to model and calculate complex building structures	<b>P7U_U, P7S_UW, P7S_UW_NT01, P7S_UW_INZ01</b>
<b>K2S_CEB_U20</b>	is able to design chosen elements of geotechnical structures taking into consideration hydraulics problems	<b>P7U_U, P7S_UW, P7S_UW_NT01, P7S_UW_INZ01</b>
<b>K2S_CEB_U21</b>	is able to design and carry out research of components and materials used in general construction	<b>P7U_U, P7S_UW, P7S_UW_NT01, P7S_UW_INZ01</b>
<b>K2S_CEB_U22</b>	is able to design chosen components of objects in the field of road building, bridges and railways as well as urban infrastructure in relation to problems of general construction	<b>P7U_U, P7S_UW, P7S_UW_NT01, P7S_UW_INZ01</b>
<b>K2S_CEB_U23</b>	is able to formulate and possesses ability to solve tasks related to chosen theoretical issues as well as to design components, structures and objects in civil engineering ( <i>subjects from elective modules</i> )	<b>P7U_U, P7S_UW, P7S_UW_NT02, P7S_UW_INZ02</b>

