CZESTOCHOWA UNIWERSITY OF TECHNOLOGY
FACULTY OF CIVIL ENGINEERING
DEPARTMENT OF BUILDING AND ENGINEERING STRUCTURES
CARD OF DESCRIPTION COURSE

Name of course						Code of course	Year / Semester	
Bridge structures ***Konstrukcje mostowe***						**WB_BUD_D_II_KMO_01_KBI**	**I**	**1**
Type of course						**Level of qualification**	**ECTS**	
Lecture	**Practice**	**Laboratory**	**Design**	**Seminar**	**Exam**	Stationary second cycle programme		
2	**-**	**-**	**1**	**-**	**E**	**S2**	**3**	
Specialities:						**Type of course:**		
• **Building and Engineering Structures**						**choose**		
Unit administrating study:						***DEPARTMENT OF BUILDING AND ENGINEERING STRUCTURES***		
						Room 94	***tel./fax: +48 (34) 325 09 24***	
Study language:						**Polish / English**		
Person leading of course:						**Dr Eng. Roman GĄĆKOWSKI**	**rgack@wp.pl**	

I. CARD OF COURSE	
OBJECTIVE OF THE SUBJECT	
C1	Understanding the essence of bridge structures as engineering.
C2	Acquires the design skills and calculation of bearing capacity of advanced cross sections bridge elements by ULS and SLS.
C3	Design of bridge structures using the acquired knowledge in the field of bridge engineering with a full-time first degree.
PREREQUISITES FOR KNOWLEDGE, SKILLS AND OTHER COMPETENCE	
1	Basic knowledge of concrete technology, properties of physical, chemical, mechanical, concrete and reinforcing steel.
2	Basic knowledge of theoretical mechanics and strength of materials and the ability of calculating the ratios of strength sections.
3	Messages from structural mechanics and ability to solve advanced static systems.
4	Knowledge of concrete structures, Mechanics of soil, Fundamentals of bridge structures.
5	Ability to use standard EC0, EC1, EC2 and professional literature.
6	Knowledge of and ability to use the software for the calculation of static and strength of engineering structures.
LEARNING OUTCOMES	
EK1	has an orderly, theoretically founded general knowledge necessary to understand advanced work of bridge construction.
EK2	has a detailed knowledge useful for solving advanced engineering tasks in the field of bridge construction.
General skills	
EK3	the student is able obtain information from the literature and other materials, including catalogs of manufacturers of components for bridge structures in the Polish and English language.
EK4	the student able to individually solve advanced tasks.
Fundamental engineering skills	
EK5	the student able to use computer programs to perform advanced calculation models of bridge structures.
Skills directly related to solving an engineering tasks	
EK6	the student able to correct an analysis advanced work of bridge structures and on this fundamentals to determine the scope of the calculation.
Competence of personal and social	
EK7	the student able to think and act creatively and systematically doing the design of a bridge structures.

CONTENTS OF COURSE		
Form of teaching – Lectures		**Number of hours**
W01	General information about geometry of bridges	4
W02		
W03	Definitions and descriptions	4
W04		
W05	Bridge category	2
W06	Static system and different types of structures	2
W07	Elements of bridge	2
W08	Structure components. Bearings of bridge	4
W09		
W10	Structure components. Joints of bridge	4
W11		
W12	Bridge deck surfacing. Drainage and Parapets	4
W13		
W14	Piers and Columns of bridge	2
W15	Abutments and Retaining Structures	2
	TOTAL:	**30**

Form of teaching – Design		**Number of hours**
Pr01	Introduction to use of standards and regulations.	1
Pr02	Edition theme of the design. The work schedule.	1
Pr03	Summary of loads. Finding the element dimensions of bridge.	2
Pr04		
Pr 05	The construction of calculation models. Static calculations of the bridge.	3
Pr 06		
Pr 07		
Pr 08	Strength calculation of bridge elements based on static calculations.	2
Pr 09		
Pr 10	Calculation of bearings and expansion joints of bridges.	1
Pr 11	The preparation of complete documentation of the design descriptive.	2
Pr 12		
Pr 13	Preparation of complete technical drawings of the design.	2
Pr 14		
Pr 15	Assessment of the design.	1
	TOTAL:	**15**

TOOLS OF TEACHING	
1.	Lecture: presentation of multimedia content lectures.
2.	Design: multimedia presentation, discussion.
3.	Materials Copyright lecturers. Consultation.
4.	Literature.
5.	Standards of work bridge structures EC0, EC1, EC2
6.	Software for the calculation of static and strength of engineering structures.

METHODS OF ASSESSMENT: (F - FORMATIVE; P - SUMMARY)	
F1	Assessment independently prepare for classes.
F2	Assessment of the implementation of the design outside the classroom.
P1	Assessment develop a calculation model of the bridge.
P2	Assessment of analysis results of calculations internal forces and combinatorics of loads.
P3	Assessment of the implementation documentation descriptive and graphic of the bridge.

WORKLOAD OF STUDENT			
O.n.	**Activity**	**Average number of hours/ECTS to complete the activity**	
		[hours.]	**[ECTS]**
1.	Hours of classes organized by the universities - **Lectures**.	**30**	**3**
2.	Contact hours of teacher connected with lectures.	10	
3.	Introduction to with the indicated literature.	10	
4.	Hours of classes organized by the universities - **Design**.	**15**	
5.	Contact hours of teacher connected with design.	10	
6.	Implementation of the design.	15	
	TOTAL:	**90**	

BASIC AND SUPPLEMENTARY LITERATURE	
1.	Athanasopoulou A., Poljansek M., Pinto A., Tsionis G., Denton S.: *Bridge Design to Eurocodes.* European Commission Joint Research Centre. European Union. Luxembourg 2012.
2.	Biliszczuk J.: Mosty podwieszone. Projektowanie i realizacja. Arkady. Warszawa 2005.
3.	Furtak K., Śliwiński J.: *Materiały budowlane w mostownictwie*. WKŁ. Warszawa 2003.
4.	Gąćkowski R.: *Tablice i algorytmy do wymiarowania zginanych elementów żelbetowych*. Wyd. Verlag Dashofer. Warszawa 2013.
5.	Knauff M.: *Obliczanie konstrukcji żelbetowych według eurokodu 2.* PWN. Warszawa 2012.
6.	Łucyk-Ossowska J., Radomski W.: *Urządzenia dylatacyjne w mostowych obiektach drogowych*. WKŁ. Warszawa 2011.
7.	Madaj A., Wołowicki W.: *Projektowanie mostów betonowych.* WKŁ. Warszawa 2010.
8.	Machelski Cz.: *Obliczenia mostów z betonowych belek prefabrykowanych*. DWE. Wrocław 2010.
9.	Swart J.P.: *Glossary & Terms in Bridge Engineering*. Published by: J.p. Swart on 23 Octobr 2011.
10.	Wai-Fah Chen, Lian Duan,: *Bridge engineering Substructure design.* CRC Press. Boca Raton London, New York, Washington. Taylor & Francis Group, LLC. 2003
11.	Dziennik Ustaw Nr 63 Poz. 735. *Rozporządzenie Ministra Transportu i Gospodarki Morskiej z dnia 30 maja 2000 r. w sprawie warunków technicznych, jakim powinny odpowiadać drogowe obiekty inżynierskie i ich usytuowanie.*
12.	Dziennik Ustaw Nr 43 Poz. 430. *Rozporządzenie Ministra Transportu i Gospodarki Morskiej z dnia 2 marca 1999 r. w sprawie warunków technicznych, jakim powinny odpowiadać drogi publiczne i ich usytuowanie.*
13.	PN-85/S-10030. *Obiekty mostowe. Obciążenia.*
14.	PN-91/S-10042. *Obiekty mostowe. Konstrukcje betonowe, żelbetowe i sprężone. Projektowanie.*
15.	PN-S-10040/1999, *Obiekty mostowe. Konstrukcje betonowe, żelbetowe i sprężone. Wymagania i badania.*
16.	EN 1990:2002 + A1:2005. Eurocode. *Basis of structural design.* CEN. April 2002.
17.	EN 1991:2002. Eurocode 1*: Actions on structures.* Part 1-1: General actions. Densities, self-weight, imposed loads for buildings. March 2009.
18.	EN 1991:2005. Eurocode 1. *Actions on structures.* Part 1-4: General actions. Wind actions. January 2010.
19.	EN 1991:2003. Eurocode 1: *Actions on structures.* Part 2: Traffic loads on bridges. February 2010
20.	EN 1992:2004. Eurocode 2: *Design of concrete structures.* Part 1-1: General rules and rules for buildings. January 2008.
21.	EN 1992:2005. Eurocode 2. *Design of concrete structures.* Part 2: Concrete bridges. Design and detailing rules. July 2008.
22.	EN 1993:2005. Eurocode 3. *Design of steel structures.* Part 1-1: General rules and rules for buildings. April 2009.
23.	EN 1993:2006. Eurocode 3. *Design of steel structures.* Part 2: Steel bridges. July 2009.
24.	EN 1994:2005. Eurocode 4. *Design of composite steel and concrete structures.* Part 2: General rules and rules for bridges. July 2008.
25.	EN 1995:2004 + A1:2008. Eurocode 5. *Design of timber structures.* Part 1-1. General. Common rules and rules for buildings. June 2006.
26.	EN 1995:2004. Eurocode 5. *Design of timber structures.* Part 2. Design of timber structures bridges.

MATRIX OF IMPLEMENTATION EFFECTS OF EDUCATION FOR DIRECTION					
The effect of learning	**The reference given effect to the effects defined for the entire program (PEK)**	**Objectives of the course**	**Program content**	**Tools of teaching**	**Method for assessing**
EK1	KBI_W02, KBI_W03	C1, C2, C3	W01÷W06, W08÷W09 Pr01÷Pr03	1, 2, 3, 4	F1, F2, P3
EK2	KBI_W04	C1, C2, C3	W07÷W15, Pr01÷Pr03	1, 2, 3, 4	F1, F2, P3
EK3	KBI_U01	C1, C2, C3	W01÷W02, W05÷W15, Pr01÷Pr10, Pr14÷Pr15	1, 2, 3, 4	F1, F2, P1, P2
EK4	KBI_U03	C2, C3	Pr03÷Pr05, Pr07, Pr09	2, 3, 4, 5	P1, P2, P3
EK5	KBI_U04	C2, C3	Pr05÷Pr12	2, 3, 4, 5	P2, P3
EK6	KBI_U04	C2, C3	Pr05÷Pr12	2, 3, 4, 5	P2, P3
EK7	KBI_K01, KBI_K02	C2, C3	Pr02÷Pr04, Pr11÷Pr15	2, 3, 4, 5	P1, P2, P3

II. METHODS OF ASSESSMENT – DETAILS	
MARKS	**LEARNING OUTCOME**
	EK-01
2,0	The student knows only the basic terms relating to bridges and has a cursory knowledge of dimensioning of bridge structures.
3,0	The student completed the knowledge of new terminology and symbols for the construction of bridges and general knowledge of advanced methods for modeling bridge structures.
3,5	The student can explain in further detail the work of any of the bridges and the loads acting on them. He knows the advanced part modeling bridge structures.
4,0	The student can explain in further detail the work of any of the bridges and the loads acting on them. He knows the advanced methods of modeling design.
4,5	The student is able to partially put into practice designed bridge structures using advanced computational methods and partly to identify environmental hazards, know methods to prevent their effects.
5,0	The student is able to use it in practice bridges designed using advanced computational methods and identify environmental hazards, know methods to prevent their effects.
	EK-02
2,0	The student knows the principles of modeling and briefly the work of individual elements of bridge structures.
3,0	The student knows the principles of modeling and operation of components of bridges but has trouble with their interpretation, knows the rules of dimensioning briefly in bridge structures.
3,5	Can partially correctly perform and interpret advanced computational models of bridge structures and to determine their application, knows the rules of dimensioning individual components of bridges.
4,0	Able to properly perform and interpret advanced computational models of bridge structures and to determine their application, knows the rules of dimensioning individual components of bridges.
4,5	The student knows the partially advanced principles and objectives of the calculation of bridge structures by ULS and SLS, and understand their importance.
5,0	Advanced student knows in detail the principles and objectives of bridge structures by calculating the ULS and SLS, and understand their importance.
	EK-03
2,0	The student knows the basic sources of literature needed for the design of bridges.
3,0	The student knows the applicable standards and can use them in the design (EC0, EC1, EC2).
3,5	The student is able to partially take advantage of all standards and link them throughout the process of design of bridges (EC0, EC1, EC2).
4,0	The student is able to use all of the standards and link them throughout the process of design of bridges (EC0, EC1, EC2).
4,5	Moreover the student completed message in the standards of knowledge given in the literature but can't fully exploit it.
5,0	Moreover the student completed message in the standards of knowledge given in the literature.

EK-04	
2,0	The student are unable to perform work on the design and don't know the advanced methods of calculation of bridge structures.
3,0	The student is able to provide a general outline of the design, requires the control to the design at the initial stage, he can partially perform advanced computational models of bridges.
3,5	The student is able to partially identify the issues made in implementing the design, but not able to use the recommendations of code. Able to perform partial advanced computational models.
4,0	Moreover the student is able to identify complex issues in implementing the design, but not able to use the recommendations of code. He can perform advanced computational models.
4,5	The student is able to identify the issues advanced in implementing the design, but it can't fully utilize the recommendations of code.
5,0	The student is able to identify the issues advanced in implementing the design and is able to use the recommendations of code.
EK-05	
2,0	The student isn't aware of what to create the correct procedures and computational models.
3,0	The student can build procedures and computational models but has difficulty in asking loads on structures.
3,5	The student is able to partially build procedures and computational models of the bridge structure. He can ask properly load on structures. Has difficulty in interpreting the results of static calculations.
4,0	The student can build procedures and computational models of the bridge structure. He can ask properly load on structures. Has difficulty in interpreting the results of static calculations.
4,5	The student can individually build advanced procedures and computational models, ask properly load but has trouble performing the correct analysis of the results of static.
5,0	The student can individually build advanced procedures and computational models, ask properly load and perform static analysis of the results.
EK-06	
2,0	The student doesn't understand the specifics of the construction of bridges.
3,0	The student is able to identify and understand some technical issues occurring in the design.
3,5	The student identifies and partially understand the technical issues occurring in the design.
4,0	The student identifies and understands the technical issues occurring in the design.
4,5	The student is able to partially fix addition compounds with the work of construction.
5,0	The student is able to establish relationships in addition to the work of construction.
EK-07	
2,0	The student performs tasks assigned to him carelessly without the commitment and with delay.
3,0	The student performs tasks with commitment, on time but the share classes is passive.
3,5	Moreover the student actively participates in the activities but it isn't creative.
4,0	Moreover the student takes an active part in the activities and partly creative.
4,5	Moreover the student takes an active part in classes and being creative.
5,0	Moreover the student shows creativity and originality.

III. OTHER USEFUL INFORMATIONS ABOUT THE COURSE	
1.	Information where the student can see the presentations to classes, support materials and literature:
	According to the type of materials - in the classes didactic, in the room of teacher, in the library of the university and faculty.
2.	Information on the place of event classes:
	Showcased at the Faculty of Civil Engineering, Faculty of Civil Engineering website.
3.	Information on the date of the course (day of week / time):
	Showcased at the Faculty of Civil Engineering, Faculty of Civil Engineering website.
4.	Information on the consultation (hours + location):
	The timetable posted on the door of Room 89 at the Faculty of Civil Engineering at. Academic 3 (third floor).

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DEPARTMENT OF BUILDING AND ENGINEERING STRUCTURES
CARD OF DESCRIPTION COURSE

Name of course						Code of course	Year / Semester	
Timber structures ***Konstrukcje drewniane***						**WB_BUD_D_II_KDR_02**	**I**	**2**
Type of course						**Level of qualification**	**ECTS**	
Lecture	**Practice**	**Laboratory**	**Design**	**Seminar**	**Exam**	Stationary second cycle programme		
1	**-**	**-**	**1**	**-**	**-**	**S2**	**2**	
Specialities:						**Type of course:**		
• **Building and Engineering Structures** • **Technology, Organization and Management in Construction** • **Architecture in Construction**						**obligatory**		
Unit administrating study:						***DEPARTMENT OF BUILDING AND ENGINEERING STRUCTURES***		
						Room 94	***tel./fax: +48 (34) 325 09 24***	
Study language:						**Polish / English**		
Person leading of course:						**Dr Eng. Roman GĄĆKOWSKI**	**rgack@wp.pl**	

I. CARD OF COURSE	
OBJECTIVE OF THE SUBJECT	
C1	Understanding the essence of timber structures as engineering.
C2	Acquires the design skills and calculation of bearing capacity of advanced cross sections timber elements by ULS and SLS.
C3	Design of timber structures using the acquired knowledge in the field of engineering with a full-time first degree.
PREREQUISITES FOR KNOWLEDGE, SKILLS AND OTHER COMPETENCE	
1	Basic knowledge of general construction and mechanics theory.
2	Basic knowledge of theoretical mechanics and strength of materials and the ability of calculating the ratios of strength sections.
3	Messages from structural mechanics and ability to solve advanced static systems.
4	Knowledge of mechanics and foundations soil timber structures.
5	Ability to use standard EC0, EC1, EC5 and professional literature.
6	Knowledge of and ability to use the software for the calculation of static and durability of building structures and engineering.
LEARNING OUTCOMES	
EK1	has an orderly, theoretically founded general knowledge necessary to understand advanced work of timber construction.
EK2	has a detailed knowledge useful for solving advanced engineering tasks in the field of timber construction.
General skills	
EK3	the student is able obtain information from the literature and other materials, including catalogs of manufacturers of components for timber structures in the Polish and English language.
EK4	the student able to individually solve advanced tasks.
Fundamental engineering skills	
EK5	the student able to use computer programs to perform advanced calculation models of timber structures.
Skills directly related to solving an engineering tasks	
EK6	the student able to correct an analysis advanced work of timber structures and on this fundamentals to determine the scope of the calculation.

Competence of personal and social	
EK7	the student able to think and act creatively and systematically doing the design of a timber structures.

CONTENTS OF COURSE		
Form of teaching – Lectures		**Number of hours**
W01	Basis of design timber structures.	1
W02	Material properties in timber structures.	1
W03	Ultimate limit states of timber structures.	1
W04	Serviceability limit states of timber structures.	1
W05	Single and double tapered beams of timber structures.	1
W06	Components of timber structures.	1
W07	Assemblies and frames of timber structures.	1
W08	Joints of timber structures.	2
W09		
W10	Mechanically jointed beams. Built-up columns.	1
W11	Design of bridges.	2
W12		
W13	Joints of timber bridges structures.	1
W14	Worked examples of timber structures.	2
W15		
	TOTAL:	**15**

Form of teaching – Design		Number of hours
Pr01	Introduction to use of standards and regulations.	1
Pr02	Edition theme of the design. The work schedule.	1
Pr03	Summary of loads. Finding the element dimensions of timber structures.	2
Pr04		
Pr 05	The construction of calculation models. Static calculations.	3
Pr 06		
Pr 07		
Pr 08	Strength calculation of timber elements based on static calculations.	2
Pr 09		
Pr 10	Calculation of bearings and expansion joints of timber structures.	1
Pr 11	The preparation of complete documentation of the design descriptive.	2
Pr 12		
Pr 13	Preparation of complete technical drawings of the design.	2
Pr 14		
Pr 15	Assessment of the design.	1
	TOTAL:	**15**

TOOLS OF TEACHING	
1.	Lecture: presentation of multimedia content lectures.
2.	Design: multimedia presentation, discussion.
3.	Materials copyright lecturers. Consultation. Literature. Standards of work timber structures EC0, EC1, EC5
4.	Software for the calculation of static and strength of engineering structures.

METHODS OF ASSESSMENT: (F - FORMATIVE; P - SUMMARY)	
F1	Assessment independently prepare for classes.
F2	Assessment of the implementation of the design outside the classroom.
P1	Assessment develop a calculation model of the timber structures.
P2	Assessment of analysis results of calculations internal forces and combinatory of loads.

P3	Assessment of the implementation documentation descriptive and graphic of the timber structures.

WORKLOAD OF STUDENT			
O.n.	**Activity**	**Average number of hours/ECTS to complete the activity**	
		[hours.]	**[ECTS]**
1.	Hours of classes organized by the universities - **Lectures**.	**15**	**2**
2.	Contact hours of teacher connected with lectures.	5	
3.	Introduction to with the indicated literature.	5	
4.	Hours of classes organized by the universities - **Design**.	**15**	
5.	Contact hours of teacher connected with design.	10	
6.	Implementation of the design.	10	
	TOTAL:	**60**	

BASIC AND SUPPLEMENTARY LITERATURE	
1.	Kotwica J.: *Konstrukcje drewniane w budownictwie tradycyjnym*. Arkady. Warszawa 2006.
2.	Larsen H., Vahik E.: *Practical design of timber structures to Eurocode 5*. Thomas Telford Limited. London 2009.
3.	Leonardo da Vinci Pilot Projects*. Educational Materials for Designing and Testing of Timber Structures* – TEMTIS. Handbook 1 – Timber Structures. September 2008
4.	Leonardo da Vinci Pilot Projects. *Educational Materials for Designing and Testing of Timber Structures* – TEMTIS. Handbook 2 – Timber Structures according to EC 5. October 2008
5.	Mielczarek Z.: *Budownictwo drewniane*. Arkady. Warszawa 1994.
6.	Neuhaus H.: *Budownictwo drewniane*. PWT. Rzeszów 2008.
7.	Nożyński W.: *Przykłady obliczeń konstrukcji budowlanych z drewna*. WSiP. Warszawa 1994.
8.	Porteous J., Ross P.: *Designers' Guide to Eurocode 5: Design of Timber Buildings. EN 1995-1-1.* Series editor Haig Gulvanessian CBE. Thomas Telford Limited. London 2013.
9.	PN-EN 1995-1-1 kwiecień 2010. Eurokod 5. Projektowanie konstrukcji drewnianych. Część 1-1: Postanowienia ogólne. Reguły ogólne i reguły dotyczące budynków.
10.	PN-EN 338 styczeń 1999. Drewno konstrukcyjne. Klasy wytrzymałości.
11.	PN-EN 1194 listopad 2000. Konstrukcje drewniane. Drewno klejone warstwowo. Klasy wytrzymałości i określenie wartości charakterystycznych.
12.	EN 1995-1-1: Eurocode 5: *Design of timber structures – Part 1-1: General – Common rules and rules for buildings.*

MATRIX OF IMPLEMENTATION EFFECTS OF EDUCATION FOR DIRECTION					
The effect of learning	**The reference given effect to the effects defined for the entire program (PEK)**	**Objectives of the course**	**Program content**	**Tools of teaching**	**Method for assessing**
EK1	KBI_W02	C1, C2, C3	W01÷W06, W08÷W09 Pr01÷Pr03	1, 2, 3	F1, F2, P3
EK2	K_W07, K_W13	C1, C2, C3	W07÷W15, Pr01÷Pr03	1, 2, 3	F1, F2, P3
EK3	K_U02, K_U03	C1, C2, C3	W01÷W02, W05÷W15, Pr01÷Pr10, Pr14÷Pr15	1, 2, 3	F1, F2, P1, P2
EK4	K_U07, K_U18	C2, C3	Pr03÷Pr05, Pr07, Pr09	2, 3, 4	P1, P2, P3
EK5	K_K01	C2, C3	Pr05÷Pr12	2, 3, 4	P2, P3
EK6	K_K07	C2, C3	Pr05÷Pr12	2, 3, 4	P2, P3
EK7	K_K08	C2, C3	Pr02÷Pr04, Pr11÷Pr15	2, 3, 4	P1, P2, P3

II. METHODS OF ASSESSMENT – DETAILS	
MARKS	**LEARNING OUTCOME**
	EK-01
2,0	The student knows only the basic terms relating to timber and has a cursory knowledge of dimensioning of timber structures.

3,0	The student completed the knowledge of new terminology and symbols for the construction of timber and general knowledge of advanced methods for modeling timber structures.
3,5	The student can explain in further detail the work of any of the timber structures and the loads acting on them. He knows the advanced part modeling timber structures.
4,0	The student can explain in further detail the work of any of the timber structures and the loads acting on them. He knows the advanced methods of modeling design.
4,5	The student is able to partially put into practice designed timber structures using advanced computational methods and partly to identify environmental hazards, know methods to prevent their effects.
5,0	The student is able to use it in practice timber designed using advanced computational methods and identify environmental hazards, know methods to prevent their effects.
EK-02	
2,0	The student knows the principles of modeling and briefly the work of individual elements of timber structures.
3,0	The student knows the principles of modeling and operation of components of timber structures but has trouble with their interpretation, knows the rules of dimensioning briefly in timber structures.
3,5	Can partially correctly perform and interpret advanced computational models of timber structures and to determine their application, knows the rules of dimensioning individual components of timber structures.
4,0	Able to properly perform and interpret advanced computational models of timber structures and to determine their application, knows the rules of dimensioning individual components of timber structures.
4,5	The student knows the partially advanced principles and objectives of the calculation of timber structures by ULS and SLS, and understand their importance.
5,0	Advanced student knows in detail the principles and objectives of timber structures by calculating the ULS and SLS, and understand their importance.
EK-03	
2,0	The student knows the basic sources of literature needed for the design of timber structures.
3,0	The student knows the applicable standards and can use them in the design (EC0, EC1, EC5).
3,5	The student is able to partially take advantage of all standards and link them throughout the process of design of timber structures (EC0, EC1, EC5).
4,0	The student is able to use all of the standards and link them throughout the process of design of timber structures (EC0, EC1, EC5).
4,5	Moreover the student completed message in the standards of knowledge given in the literature but can't fully exploit it.
5,0	Moreover the student completed message in the standards of knowledge given in the literature.
EK-04	
2,0	The student are unable to perform work on the design and don't know the advanced methods of calculation of timber structures.
3,0	The student is able to provide a general outline of the design, requires the control to the design at the initial stage, he can partially perform advanced computational models of timber structures.
3,5	The student is able to partially identify the issues made in implementing the design, but not able to use the recommendations of code. Able to perform partial advanced computational models.
4,0	Moreover the student is able to identify complex issues in implementing the design, but not able to use the recommendations of code. He can perform advanced computational models.
4,5	The student is able to identify the issues advanced in implementing the design, but it can't fully utilize the recommendations of code.
5,0	The student is able to identify the issues advanced in implementing the design and is able to use the recommendations of code.
EK-05	
2,0	The student isn't aware of what to create the correct procedures and computational models.
3,0	The student can build procedures and computational models but has difficulty in asking loads on structures.
3,5	The student is able to partially build procedures and computational models of the timber structure. He can ask properly load on structures. Has difficulty in interpreting the results of static calculations.
4,0	The student can build procedures and computational models of the timber structure. He can ask

	properly load on structures. Has difficulty in interpreting the results of static calculations.
4,5	The student can individually build advanced procedures and computational models, ask properly load but has trouble performing the correct analysis of the results of static.
5,0	The student can individually build advanced procedures and computational models, ask properly load and perform static analysis of the results.
EK-06	
2,0	The student doesn't understand the specifics of the construction of timber structures.
3,0	The student is able to identify and understand some technical issues occurring in the design.
3,5	The student identifies and partially understand the technical issues occurring in the design.
4,0	The student identifies and understands the technical issues occurring in the design.
4,5	The student is able to partially fix addition compounds with the work of construction.
5,0	The student is able to establish relationships in addition to the work of construction.
EK-07	
2,0	The student performs tasks assigned to him carelessly without the commitment and with delay.
3,0	The student performs tasks with commitment, on time but the share classes is passive.
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III. OTHER USEFUL INFORMATIONS ABOUT THE COURSE	
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2.	Information on the place of event classes:
	Showcased at the Faculty of Civil Engineering, Faculty of Civil Engineering website.
3.	Information on the date of the course (day of week / time):
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CZESTOCHOWA UNIWERSITY OF TECHNOLOGY
FACULTY OF CIVIL ENGINEERING
DEPARTMENT OF BUILDING AND ENGINEERING STRUCTURES
CARD OF DESCRIPTION COURSE

Name of course						Code of course	Year / Semester	
Prestressed structures ***Konstrukcje sprężone***						**WB_BUD_D_II_KSP_02_KBI**	**I**	**2**
Type of course						**Level of qualification**	**ECTS**	
Lecture	**Practice**	**Laboratory**	**Design**	**Seminar**	**Exam**	Stationary second cycle programme		
2	**2**	**-**	**-**	**-**	**E**	**S2**	**4**	
Specialities:						**Type of course:**		
• **Building and Engineering Structures**						**choose**		
Unit administrating study:						***DEPARTMENT OF BUILDING AND ENGINEERING STRUCTURES***		
						Room 94	***tel./fax: +48 (34) 325 09 24***	
Study language:						**Polish / English**		
Person leading of course:						**Dr Eng. Roman GĄĆKOWSKI**	**rgack@wp.pl**	

I. CARD OF COURSE	
OBJECTIVE OF THE SUBJECT	
C1	Understanding the essence of prestressed structures as engineering.
C2	Acquires the design skills and calculation of bearing capacity of advanced cross sections prestressed elements by ULS and SLS.
C3	Design of prestressed structures using the acquired knowledge in the field of engineering with a full-time first degree.
PREREQUISITES FOR KNOWLEDGE, SKILLS AND OTHER COMPETENCE	
1	Basic knowledge of concrete technology, properties of physical, chemical, mechanical, concrete and reinforcing steel.
2	Basic knowledge of theoretical mechanics and strength of materials and the ability of calculating the ratios of strength sections.
3	Messages from structural mechanics and ability to solve advanced static systems.
4	Knowledge of mechanics and foundations soil prestressed structures.
5	Ability to use standard EC0, EC1, EC2 and professional literature.
6	Knowledge of and ability to use the software for the calculation of static and durability of building structures and engineering.
LEARNING OUTCOMES	
EK1	has an orderly, theoretically founded general knowledge necessary to understand advanced work of prestressed construction.
EK2	has a detailed knowledge useful for solving advanced engineering tasks in the field of prestressed construction.
General skills	
EK3	the student is able obtain information from the literature and other materials, including catalogs of manufacturers of components for prestressed structures in the Polish and English language.
EK4	the student able to individually solve advanced tasks.
Fundamental engineering skills	
EK5	the student able to use computer programs to perform advanced calculation models of prestressed structures.
Skills directly related to solving an engineering tasks	
EK6	the student able to correct an analysis advanced work of prestressed structures and on this fundamentals to determine the scope of the calculation.
Competence of personal and social	
EK7	the student able to think and act creatively and systematically doing the design of a prestressed structures.

CONTENTS OF COURSE		
Form of teaching – Lectures		**Number of hours**
W01	General news and history of prestressed structures	2
W02	Compression technologies of prestressed structures	2
W03	Guidelines for the design of post-tensioning bars. Basic dimensioning	4
W04		
W05	Bending beam post-tensioning. Sizing anchorage zone and pressure	4
W06		
W07	Preliminary design for flexure	2
W08	Loss of Prestress Force	4
W09		
W10	Composite Beams	2
W11	Design for Ultimate Strength in Flexure	4
W12		
W13	Design for Ultimate Strength in Shear	4
W14		
W15	End Block Design	2
	TOTAL:	**30**

Form of teaching – Practice		**Number of hours**
Pr01	Introduction to use of standards and regulations.	2
Pr02	Edition theme of the design. The work schedule.	2
Pr03	Summary of loads. Finding the element dimensions of prestressed structures.	4
Pr04		
Pr 05	The construction of calculation models. Static calculations.	6
Pr 06		
Pr 07		
Pr 08	Strength calculation of prestressed elements based on static calculations.	4
Pr 09		
Pr 10	Calculation of bearings and expansion joints of prestressed structures.	2
Pr 11	The preparation of complete documentation of the design descriptive.	4
Pr 12		
Pr 13	Preparation of complete technical drawings of the design.	4
Pr 14		
Pr 15	Assessment of the design.	2
	TOTAL:	**30**

TOOLS OF TEACHING	
1.	Lecture: presentation of multimedia content lectures.
2.	Design: multimedia presentation, discussion.
3.	Materials copyright lecturers. Consultation.
4.	Literature. Standards of work timber structures EC0, EC1, EC2
5.	Software for the calculation of static and strength of engineering structures.

METHODS OF ASSESSMENT: (F - FORMATIVE; P - SUMMARY)	
F1	Assessment independently prepare for classes.
F2	Assessment of the implementation of the design outside the classroom.
P1	Assessment develop a calculation model of the prestressed structures.
P2	Assessment of analysis results of calculations internal forces and combinatory of loads.
P3	Assessment of the implementation documentation descriptive and graphic of the prestressed structures.

WORKLOAD OF STUDENT			
O.n.	**Activity**	**Average number of hours/ECTS to complete the activity**	
		[hours.]	**[ECTS]**
1.	Hours of classes organized by the universities - **Lectures**.	**30**	**4**
2.	Contact hours of teacher connected with lectures.	10	
3.	Introduction to with the indicated literature.	10	
4.	Hours of classes organized by the universities - **Practice**.	**30**	
5.	Contact hours of teacher connected with design.	20	
6.	Implementation of the design.	20	
	TOTAL:	**120**	

BASIC AND SUPPLEMENTARY LITERATURE	
1.	Ajdukiewicz A., Mames J.: Konstrukcje z betonu sprężonego. Polski Cement. Kraków 2004.
2.	Gąćkowski R.: *Tablice i algorytmy do wymiarowania zginanych elementów żelbetowych*. Wyd. Verlag Dashofer. Warszawa 2013.
3.	Knauff M.: *Obliczanie konstrukcji żelbetowych według eurokodu 2.* PWN. Warszawa 2012.
4.	Machelski Cz.: *Obliczenia mostów z betonowych belek prefabrykowanych*. DWE. Wrocław 2010.
5.	Nawy Edward G.: Prestressed Concrete a fundamental approach. Pearson Education. New Jersey 2003.
6.	Sekcja Konstrukcji Betonowych KILiW PAN: Podstawy projektowania konstrukcji żelbetowych i sprężonych według Eurokodu 2. DWE. Wrocław 2006.
7.	Swart J.P.: *Glossary & Terms in Bridge Engineering*. Published by: J.p. Swart on 23 Octobr 2011.
8.	Wai-Fah Chen, Lian Duan,: *Bridge engineering Substructure design.* CRC Press. Boca Raton London, New York, Washington. Taylor & Francis Group, LLC. 2003
9.	Dziennik Ustaw Nr 63 Poz. 735. *Rozporządzenie Ministra Transportu i Gospodarki Morskiej z dnia 30 maja 2000 r. w sprawie warunków technicznych, jakim powinny odpowiadać drogowe obiekty inżynierskie i ich usytuowanie.*
10.	Dziennik Ustaw Nr 43 Poz. 430. *Rozporządzenie Ministra Transportu i Gospodarki Morskiej z dnia 2 marca 1999 r. w sprawie warunków technicznych, jakim powinny odpowiadać drogi publiczne i ich usytuowanie.*
11.	PN-85/S-10030. *Obiekty mostowe. Obciążenia.*
12.	PN-91/S-10042. *Obiekty mostowe. Konstrukcje betonowe, żelbetowe i sprężone. Projektowanie.*
13.	PN-S-10040/1999, *Obiekty mostowe. Konstrukcje betonowe, żelbetowe i sprężone. Wymagania i badania.*
14.	EN 1991:2002. Eurocode 1*: Actions on structures.* Part 1-1: General actions. Densities, self-weight, imposed loads for buildings. March 2009.
15.	EN 1991:2005. Eurocode 1. *Actions on structures.* Part 1-4: General actions. Wind actions. January 2010.
16.	EN 1991:2003. Eurocode 1: *Actions on structures.* Part 2: Traffic loads on bridges. February 2010
17.	EN 1992:2004. Eurocode 2: *Design of concrete structures.* Part 1-1: General rules and rules for buildings. January 2008.
18.	EN 1992:2005. Eurocode 2. *Design of concrete structures.* Part 2: Concrete bridges. Design and detailing rules. July 2008.

MATRIX OF IMPLEMENTATION EFFECTS OF EDUCATION FOR DIRECTION					
The effect of learning	**The reference given effect to the effects defined for the entire program (PEK)**	**Objectives of the course**	**Program content**	**Tools of teaching**	**Method for assessing**
EK1	KBI_W02, KBI_W03	C1, C2, C3	W01÷W06, W11÷W15 Cw01÷ Cw04	1, 2, 3, 4	F1, F2, P3
EK2	KBI_W04	C1, C2, C3	W07÷W12 Cw01÷ Cw04	1, 2, 3, 4	F1, F2, P3
EK3	KBI_U01	C1, C2	W01÷W04, W12÷W15 Cw01÷ Cw04	1, 2, 3, 4	F1, F2, P1, P2
EK4	KBI_U03	C2, C3	Cw03÷ Cw06, Cw11, Cw12	2, 3, 4, 5	P1, P2

EK5	KBI_U04	C2, C3	Cw07÷ Cw11	2, 3, 4, 5	P2, P3
EK6	KBI_U04	C2, C3	Cw05÷ Cw11	2, 3, 4, 5	P2, P3
EK7	KBI_K01, KBI_K02	C2, C3	Cw03÷ Cw07 Cw11÷ Cw15	2, 3, 4, 5	P1, P2, P3

II. METHODS OF ASSESSMENT – DETAILS	
MARKS	**LEARNING OUTCOME**
	EK-01
2,0	The student knows only the basic terms relating to prestressed and has a cursory knowledge of dimensioning of prestressed structures.
3,0	The student completed the knowledge of new terminology and symbols for the construction of prestressed and general knowledge of advanced methods for modeling prestressed structures.
3,5	The student can explain in further detail the work of any of the prestressed structures and the loads acting on them. He knows the advanced part modeling prestressed structures.
4,0	The student can explain in further detail the work of any of the prestressed structures and the loads acting on them. He knows the advanced methods of modeling design.
4,5	The student is able to partially put into practice designed prestressed structures using advanced computational methods and partly to identify environmental hazards, know methods to prevent their effects.
5,0	The student is able to use it in practice prestressed designed using advanced computational methods and identify environmental hazards, know methods to prevent their effects.
	EK-02
2,0	The student knows the principles of modeling and briefly the work of individual elements of prestressed structures.
3,0	The student knows the principles of modeling and operation of components of prestressed structures but has trouble with their interpretation, knows the rules of dimensioning briefly in prestressed structures.
3,5	Can partially correctly perform and interpret advanced computational models of prestressed structures and to determine their application, knows the rules of dimensioning individual components of prestressed structures.
4,0	Able to properly perform and interpret advanced computational models of prestressed structures and to determine their application, knows the rules of dimensioning individual components of prestressed structures.
4,5	The student knows the partially advanced principles and objectives of the calculation of prestressed structures by ULS and SLS, and understand their importance.
5,0	Advanced student knows in detail the principles and objectives of prestressed structures by calculating the ULS and SLS, and understand their importance.
	EK-03
2,0	The student knows the basic sources of literature needed for the design of prestressed structures.
3,0	The student knows the applicable standards and can use them in the design (EC0, EC1, EC2).
3,5	The student is able to partially take advantage of all standards and link them throughout the process of design of prestressed structures (EC0, EC1, EC2).
4,0	The student is able to use all of the standards and link them throughout the process of design of prestressed structures (EC0, EC1, EC2).
4,5	Moreover the student completed message in the standards of knowledge given in the literature but can't fully exploit it.
5,0	Moreover the student completed message in the standards of knowledge given in the literature.
	EK-04
2,0	The student are unable to perform work on the design and don't know the advanced methods of calculation of prestressed structures.
3,0	The student is able to provide a general outline of the design, requires the control to the design at the initial stage, he can partially perform advanced computational models of prestressed structures.
3,5	The student is able to partially identify the issues made in implementing the design, but not able to use the recommendations of code. Able to perform partial advanced computational models.
4,0	Moreover the student is able to identify complex issues in implementing the design, but not able to use the recommendations of code. He can perform advanced computational models.

4,5	The student is able to identify the issues advanced in implementing the design, but it can't fully utilize the recommendations of code.
5,0	The student is able to identify the issues advanced in implementing the design and is able to use the recommendations of code.
EK-05	
2,0	The student isn't aware of what to create the correct procedures and computational models.
3,0	The student can build procedures and computational models but has difficulty in asking loads on structures.
3,5	The student is able to partially build procedures and computational models of the prestressed structure. He can ask properly load on structures. Has difficulty in interpreting the results of static calculations.
4,0	The student can build procedures and computational models of the prestressed structure. He can ask properly load on structures. Has difficulty in interpreting the results of static calculations.
4,5	The student can individually build advanced procedures and computational models, ask properly load but has trouble performing the correct analysis of the results of static.
5,0	The student can individually build advanced procedures and computational models, ask properly load and perform static analysis of the results.
EK-06	
2,0	The student doesn't understand the specifics of the construction of prestressed structures.
3,0	The student is able to identify and understand some technical issues occurring in the design.
3,5	The student identifies and partially understand the technical issues occurring in the design.
4,0	The student identifies and understands the technical issues occurring in the design.
4,5	The student is able to partially fix addition compounds with the work of construction.
5,0	The student is able to establish relationships in addition to the work of construction.
EK-07	
2,0	The student performs tasks assigned to him carelessly without the commitment and with delay.
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