Bridge structures

Field of study (Kierunek):

Civil Engineering (Budownictwo)

Subject Description Card (Karta Opisu Przedmiotu)

ISCED 2013-F Field of study: Building and civil engineering (code: 0732)

Name of the subject						Subject code	Semester
Bridge structures *Konstrukcje mostowe*							*Autumn*
Subject		**Profile**				**Level of education**	
Facultative		**General academic**				**Full-time**	
Type of classes							**ECTS**
Lecture	**Practice**	**Laboratory**	**Project**	**Seminar**	**Exam**		
30	**-**	**-**	**30**	**-**	**YES**		**6**
Faculty conducting subject:	***Faculty of Civil Engineering*** ***Tel: +48 (34) 325 09 04***						
Teachers conducting subject:	***PhD. Eng. Roman Gąćkowski*** mail: roman.gackowski@pcz.pl						

I. Card subject	
PURPOSE 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.
PRELIMINARY REQUIREMENTS 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:	
Knowledge: the graduate knows and understands	
EK1	advanced work of bridge construction.
EK2	has a detailed knowledge useful for how to solv advanced engineering tasks in the field of bridge construction.
Skills: the gracuate can	
EK3	obtain information from the literature and other materials, including catalogs of manufacturers of components for bridge structures in the Polish and English language.

EK4	individually solve advanced tasks; use computer programs to perform advanced calculation models of bridge structures; correct an analysis advanced work of bridge structures and on this fundamentals to determine the scope of the calculation.

Social competence: yhe student is ready to	
EK5	think and act creatively and systematically doing the design of a bridge structures.

PROGRAM CONTENT		
Type of classes – Lecture		**Number of hours**
W01	General rules for the bridge structures.	2
W02	Materials for the construction of bridges.	2
W03	Light of the bridges. Design using computer methods.	2
W04	Designing communication of bridges.	2
W05	Formation of cross-sections and accessories of bridges.	2
W06	The loads acting on the bridges.	2
W07	Calculation models and dimensioning of bridges using computer methods.	2
W08	Abutments of bridge. Design using computer methods.	2
W09	Piers of bridge. Design using computer methods.	2
W10	Bearings of bridge. Design using computer methods.	2
W11	Expansion joint cover of bridge.	2
W12	Design and calculation of steel bridges using computer methods.	2
W13	Design and calculation of composite bridges using computer methods.	2
W14	Design and calculation of timber bridges using computer methods.	2
W15	Building and maintaining bridges.	2
	TOTAL:	**30**

Type of classes – Project		**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 bridge.	4
Pr04		
Pr 05	The construction of calculation models. Static calculations of the bridge.	6
Pr 06		
Pr 07		
Pr 08	Strength calculation of bridge elements based on static calculations.	4
Pr 09		
Pr 10	Calculation of bearings and expansion joints of bridges.	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**

BASIC AND AADDITIONAL LITERATURE	
Basic 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).*