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	
Concrete structures I *Konstrukcje betonowe I*						**WB_BUD_D_I_KB1_05**	**III**	**5**
Type of course						Level of qualification	ECTS	
Lecture	Practice	Laboratory	Design	Seminar	Exam	Stationary first cycle programme		
2	**1**	**-**	**1**	**-**	**-**	**S1**	**6**	
Specialities:						**Type of course:**		
-						**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**	
						Dr Eng. Beata ORDON-BESKA	**beataordon@wp.pl**	

I. CARD OF COURSE	
OBJECTIVE OF THE SUBJECT	
C1	Understanding the essence of reinforced concrete structures as engineering.
C2	Acquiring the design skills and calculation of bearing capacity of basic scope cross sections reinforced concrete elements by ULS.
C3	Acquiring the design skills and calculation of bearing capacity of basic scope cross sections reinforced concrete elements by SLS.
PREREQUISITES FOR KNOWLEDGE, SKILLS AND OTHER COMPETENCE	
1	Basic knowledge of concrete technology, properties of physical, chemical, mechanical.
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 basic scope work of reinforced concrete structures.
EK2	has a detailed knowledge useful for solving basic scope engineering tasks in the field of reinforced concrete structures.
General skills	
EK3	the student is able obtain information from the literature and other materials, including catalogs of manufacturers of components for reinforced concrete structures in the Polish and English language.
Fundamental engineering skills	
EK4	the student able to individually solve advanced tasks.
Skills directly related to solving an engineering tasks	
EK5	the student able to choose the detailed computational procedures
EK6	the student able to correct an analysis advanced work of reinforced concrete 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 reinforced concrete structures.

CONTENTS OF COURSE

Form of teaching – Lectures		**Number of hours**
W01	General information about concrete structures	2
W02	Basis of design according to Eurocodes - Eurocode 0.	2
W03	Basis of design according to Eurocodes - Eurocode 1.	2
W04	Basis of design according to Eurocodes - Eurocode 2.	2
W05	The mechanical properties of the concrete.	2
W06	The mechanical properties of the reinforcement steel.	2
W07	The bond of concrete to steel.	2
W08	Durability of reinforced concrete structures.	2
W09	Work phases of reinforced concrete bending elements.	2
W10	Limit states structures - ULS and SLS.	2
W11	Calculation of bending reinforced concrete elements of rectangular cross-section.	2
W12	Calculation of bending reinforced concrete elements of T-section.	2
W13	Calculation of shear reinforced concrete.	2
W14	The serviceability limit states – control limit states of cracking.	2
W15	The serviceability limit states – control limit states of deflections.	2
	TOTAL:	**30**

Form of teaching – Practice		**Number of hours**
Cw01	Familiarization with the standard PN-EN 1992-1-1: 2008.	2
Cw02		
Cw03	Determining the strength of concrete and steel.	1
Cw04	Determining minimum concrete cover.	1
Cw05	Examples bending beams of rectangular section with single reinforced.	1
Cw06	Examples bending beams of rectangular section with double reinforced.	1
Cw07	Examples bending beams of T-section with single reinforced.	1
Cw08	Colloquium	2
Cw09		
Cw10	Examples calculation of shear reinforced concrete beam.	2
Cw11		
Cw12	Examples calculation of control limit states of cracking for beam.	2
Cw13		
Cw14	Examples calculation of control limit states of deflections for beam.	2
Cw15		
	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 for bending elements of reinforced concrete.	1
Pr04	Static calculations. Calculation of bending reinforced concrete elements of rectangular cross-section with single reinforced.	3
Pr 05		
Pr 06		
Pr 07	Static calculations. Calculation of bending reinforced concrete elements of rectangular cross-section with double reinforced.	3
Pr 08		

Pr 09		
Pr 10	Static calculations. Calculation of bending reinforced concrete elements of T-section with single reinforced.	3
Pr 11		
Pr 12		
Pr 13	The preparation of complete documentation of the design descriptive.	2
Pr 14		
Pr 15	Assessment of the design.	1
	TOTAL:	**15**

TOOLS OF TEACHING	
1.	Lecture: presentation of multimedia content lectures.
2.	Practice and design: multimedia presentation, discussion.
3.	Materials copyright lecturers. Consultation.
4.	Literature. Standards of work timber structures EC0, EC1, EC2

METHODS OF ASSESSMENT: (F - FORMATIVE; P - SUMMARY)	
F1	Assessment independently prepare for classes.
F2	Assessment of the implementation of the practice and design outside the classroom.
P1	Assessment develop a calculation model of the reinforced concrete 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 reinforced concrete 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**	**6**
2.	Contact hours of teacher connected with lectures.	20	
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 practice.	20	
6.	Hours of classes organized by the universities - **Design**.	**30**	
7.	Contact hours of teacher connected with design.	20	
8.	Prepare for the colloquium.	20	
	TOTAL:	**180**	

BASIC AND SUPPLEMENTARY LITERATURE	
1.	Beeby A.W., Narayanan R.S.: Designers' guide to Eurocode 2: Design of concrete structures. Designers' guide to EN1992-1-1 and EN1992-1-2. Eurocode 2: Design of concrete structures. Design of concrete structures. General rules and rules for buildings and structural fire design. *ICE Publishing. London 2013.*
2.	Gąćkowski R.: *Tablice i algorytmy do wymiarowania zginanych elementów żelbetowych*. VERLAG DASHÖFER, Warszawa 2013.
3.	Gulvanessian H., Calgaro J.A., Holický M.: *Designers' Guide to Eurocode: Basis of Structural Design, Second edition. EN 1990. ICE Publishing. London 2012.*
4.	Knauff M.: *Obliczanie konstrukcji żelbetowych według Eurokodu 2.* PWN. Warszawa 2012.
5.	Rawska-Skotniczny A.: Obciążenia budynków i konstrukcji budowlanych według Eurokodów. PWN, Warszawa 2013.
6.	Starosolski W.: *Konstrukcje żelbetowe według Eurokodu 2 i norm związanych. Tom 1*. PWN. Warszawa 2011.
7.	Sekcja Konstrukcji Betonowych KILiW PAN: *Podstawy projektowania konstrukcji żelbetowych i*

	sprężonych według Eurokodu 2. DWE. Wrocław 2006.
8.	Zybura A.: *Konstrukcje żelbetowe według Eurokodu 2. Atlas rysunków.* PWN. Warszawa 2010.
9.	EN 1990 - Eurocode*: Basis of structural design*.
10.	EN 1991:2002. Eurocode 1*: Actions on structures.* Part 1-1: General actions. Densities, self-weight, imposed loads for buildings. March 2009.
11.	EN 1991:2005. Eurocode 1. *Actions on structures.* Part 1-4: General actions. Wind actions. January 2010.
12.	EN 1991:2003. Eurocode 1: *Actions on structures.* Part 2: Traffic loads on bridges. February 2010.
13.	EN 1992:2004. Eurocode 2: *Design of concrete structures.* Part 1-1: General rules and rules for buildings. January 2008.
14.	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	K_W32	C1, C2, C3	W01÷W06, Cw1, Pr1	1, 2, 3, 4	F1, P3
EK2	K_W32, K_W33	C2, C3	W01, W02, W05, W06, W08, W13, Cw2, Cw3 Pr2, Pr3	1, 2, 3, 4	F1, P3
EK3	K_K01	C1, C2, C3	W01÷W15, Cw1÷Cw6, Cw8÷Cw14 Pr1÷Pr6, Pr8÷Pr14	1, 2, 3, 4	F1, P1, P2, P3
EK4	K_U20, K_W33	C1, C2, C3	W01, W02, W05÷W07, W13, Cw2, Cw3, Pr2, Pr3	1, 2, 3, 4	F1, P1, P2, P3
EK5	K_U20, K_W33	C2, C3	Cw4÷Cw6, Cw8÷Cw14 Pr4÷Pr6, Pr8÷Pr14	1, 2, 3, 4	F1, P1, P2
EK6	K_U20, K_W33	C2, C3	Cw3÷Cw6, Cw8÷Cw14 Pr3÷Pr6, Pr8÷Pr14	1, 2, 3, 4	F1, P1, P2
EK7	K_K02	C1, C2, C3	W01, W02, W07, Cw1, Pr1	1, 2, 3, 4	P3

II. METHODS OF ASSESSMENT – DETAILS

MARKS	LEARNING OUTCOME
	EK-01
2,0	The student knows only the basic terms relating to reinforced concrete and has a cursory knowledge of dimensioning of reinforced concrete structures.
3,0	The student completed the knowledge of new terminology and symbols for the construction of reinforced concrete and general knowledge of advanced methods for modeling reinforced concrete structures.
3,5	The student can explain in further detail the work of any of the reinforced concrete structures and the loads acting on them. He knows the advanced part modeling reinforced concrete structures.
4,0	The student can explain in further detail the work of any of the reinforced concrete 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 reinforced concrete 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 reinforced concrete 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 reinforced concrete structures.

3,0	The student knows the principles of modeling and operation of components of reinforced concrete structures but has trouble with their interpretation, knows the rules of dimensioning briefly in reinforced concrete structures.
3,5	Can partially correctly perform and interpret advanced computational models of reinforced concrete structures and to determine their application, knows the rules of dimensioning individual components of reinforced concrete structures.
4,0	Able to properly perform and interpret advanced computational models of reinforced concrete structures and to determine their application, knows the rules of dimensioning individual components of reinforced concrete structures.
4,5	The student knows the partially advanced principles and objectives of the calculation of reinforced concrete structures by ULS and SLS, and understand their importance.
5,0	Advanced student knows in detail the principles and objectives of reinforced concrete 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 reinforced concrete 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 reinforced concrete 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 reinforced concrete 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 reinforced concrete 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 reinforced concrete 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 reinforced concrete 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 reinforced concrete 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 reinforced concrete 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.
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).