



Subject card

Subject name and code	Complex concrete structures, PG_00041056						
Field of study	Civil Engineering						
Date of commencement of studies	October 2023		Academic year of realisation of subject		2023/2024		
Education level	second-cycle studies		Subject group		Obligatory subject group in the field of study Subject group related to scientific research in the field of study		
Mode of study	Full-time studies		Mode of delivery		at the university		
Year of study	1		Language of instruction		English		
Semester of study	1		ECTS credits		4.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Department of Concrete Structures -> Faculty of Civil and Environmental Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Patryk Ziółkowski				
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	15.0	0.0	15.0	0.0	60
	E-learning hours included: 0.0						
Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours		Self-study	SUM
	Number of study hours	60		5.0		35.0	100
Subject objectives	The student knows the mechanical properties of concrete and steel. On the model adopted in the European standard, the student can determine the load-bearing capacity of the beams and cross-reinforced slabs. Student can dimension reinforcement for bending and shear and construct it. The student understands the necessity to calculate the serviceability limit state in reinforced concrete structures. The student also knows the dimensioning rules of reinforced concrete stairs, reinforced concrete deep-beams, reinforced concrete retaining walls, and reinforced concrete foundation slabs.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K7_W04] has knowledge on advanced strength of materials, modeling and optimisation of materials and constructions; has knowledge of fundamentals of Finite Element Method and general nonlinear analysis of engineering constructions and systems		The student knows the principles of designing selected elements of reinforced concrete structures.		[SW3] Assessment of knowledge contained in written work and projects		
	[K7_W09] knows advanced methods of building physics with applications in heat and moisture migration in buildings, energy demand for buildings and its acoustics		The student knows the principles of designing selected elements of reinforced concrete structures.		[SW3] Assessment of knowledge contained in written work and projects		
	[K7_U02] can design and dimension complex steel, concrete (including reinforced), wood and masonry constructions and its details		The student knows the principles of designing selected elements of reinforced concrete structures.		[SU2] Assessment of ability to analyse information		
	[K7_W02] knows principles of analysis, design and dimensioning of complex constructions and its elements		The student knows the principles of designing selected elements of reinforced concrete structures.		[SW3] Assessment of knowledge contained in written work and projects		
	[K7_K01] is aware of necessity of professional competences improvement; obeys the professional ethics code		The student knows the principles of designing selected elements of reinforced concrete structures.		[SK2] Assessment of progress of work [SK1] Assessment of group work skills		

Subject contents	As part of this course, the following issues in the field of concrete structures will be discussed: <ul style="list-style-type: none">• Mechanical properties of concrete and reinforcing steel;• Calculation of reinforced concrete cross-sections - bending;• Calculation of reinforced concrete cross-sections - shear;• Serviceability limit state in reinforced concrete structures;• Reinforced concrete slabs, one-way and cross-reinforced;• Reinforced concrete stairs;• Reinforced concrete deep beams;• Reinforced concrete retaining walls;• Reinforced concrete foundation slabs;• Concrete structures of the future - current and future trends.		
Prerequisites and co-requisites	No prerequisites.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Semester project with oral defense	60.0%	40.0%
	Test	60.0%	60.0%
Recommended reading	Basic literature	<ul style="list-style-type: none">• M. Knauff, Calculation of reinforced concrete structures according to Eurocode 2, PWN Warsaw 2012;• W. Starosolski, Reinforced concrete structures according to Eurocode 2 and related standards, volume 1,2,3 Wydawnictwo Naukowe PWN, Warsaw 2011-2012;• Concrete, reinforced and prestressed concrete structures, Scientific commentary to the PN-B-03264 standard, t.I and II, ITB Warsaw 2005;• Basics of designing reinforced concrete and prestressed structures according to Eurocode 2 - collective work edited by M. Knauff, Dolnośląskie Wydawnictwo Edukacyjne, 2006;• A. Łapko, B.Ch. Jensen, Design basics and calculation algorithms for reinforced concrete structures, Arkady 2005;• Reinforced concrete European standard EN-1992-1-1: 2004, and Polish version PN-EN-1992-1-1: 2008, Design of concrete structures. General rules and rules for buildings.	
	Supplementary literature	<ul style="list-style-type: none">• J. Kobiak W. Stachurski, Reinforced concrete structures, vol. 1, Arkady, Warsaw 1984;• J.Kobiak W. Stachurski, Reinforced concrete structures, vol. 2, Arkady, Warsaw 1987;• J.Kobiak W. Stachurski, Reinforced concrete structures, vol. 3, Arkady, Warsaw 1989;• T. Godycki-Ćwirko, Mechanika concrete, Arkady, Warsaw 1982;• T. Godycki-Ćwirko, Cutting in reinforced concrete, Arkady, Warsaw 1968;• W. Starosolski, Computer modeling of concrete engineering systems - selected issues, Wydawnictwo Politechniki Śląskiej, Gliwice 2009, volume I and II;• A. Ajdukiewicz, W. Starosolski, Reinforced concrete plate and column structures, Arkady, Warsaw 1981;• A. Ajdukiewicz, Eurocode 2 - Handy guide for designers of reinforced concrete structures, Association of Cement Producers - Polish Cement, Kraków 2009;• K. Nagrodzka-Godycka, Testing the properties of concrete and reinforced concrete in laboratory conditions, Arkady, Warsaw 1999;• Ł. Drobiec, R. Jasiński, A. Piekarczyk - Diagnostics of Reinforced Concrete Structures, Methodology, Field tests, laboratory tests of concrete and steel, Polish Scientific Publishers PWN, vol. 1, 2010;• PN-B-03264: 2002, Concrete, reinforced and prestressed structures.	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	<ul style="list-style-type: none">• Explain the term: double-reinforced cross-section.• Explain the consequences of concrete shrinkage in reinforced and prestressed concrete structures.• Describe the general characteristics of reinforced concrete slabs one-way and cross-reinforced - explain essential differences.• For cross-reinforced slabs, sketch the static diagrams for the design of the support beams. What condition must the spans mentioned above meet to treat the concrete slab as working in two directions?• Influence of the ratio of height to the cross-sectional dimension of a concrete sample on its compressive strength.• What is the guaranteed strength of concrete? At what confidence level it is determined?• Describe the concept of mean, characteristic and computational strength of concrete in compression and tensile strength.		
Work placement	Not applicable		