



Subject card

Subject name and code	Concrete Structures I, PG_00044195						
Field of study	Civil Engineering						
Date of commencement of studies	October 2021	Academic year of realisation of subject			2023/2024		
Education level	first-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	3	Language of instruction			Polish		
Semester of study	5	ECTS credits			4.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Department of Concrete Structures -> Faculty of Civil and Environmental Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Jerzy Bobiński					
	Teachers	mgr inż. Beniamin Kondys dr inż. Anna Kopańska dr hab. inż. Jerzy Bobiński mgr inż. Marcin Burdziński					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	30.0	0.0	0.0	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	7.0		33.0		100
Subject objectives	Understanding the mechanical properties of concrete and steel and the adhesion mechanism as the basis for the cooperation of these materials. Acquiring the ability to dimension bending elements and determine their load capacity. Mastering the knowledge on the calculation of crack width and deflection values. Understanding the mechanisms of destroying stocky and slender reinforced concrete columns. Acquiring the skill of dimensioning reinforced concrete columns and determining their load capacity.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K6_W06] knows the rules of constructing and dimensioning of building elements of: steel, reinforced concrete, wood, masonry.	Student can design reinforced concrete sections subjected to bending and compression					
	[K6_U06] can design steel, concrete (including reinforced), wood and masonry constructions and its elements	Student knows principles of determination of loads acting on a structure					
	[K6_U03] can analyze simple rod constructions in scope of: calculations of constructions statically determined and undetermined; determining of modal frequencies; calculations of linear stability and bearing capacity in critical and boundary states	Student can design RC elements according to Eurocode 2					

Subject contents	Concrete structures - introduction; history of reinforced concrete, types of concrete structures, examples of implementation. Properties of concrete; compressive and tensile strength in uniaxial and biaxial stresses. Concrete deformability, modulus of elasticity, Poisson's ratio, thermal deformation coefficient. Rheological properties of concrete; shrinkage and creep. Properties of reinforcing steel. Adhesion between steel and concrete. Anchorage length. Deformations and stresses according to the linear theory of reinforced concrete in a bending section. Stiffness in phase I. Cracking moment. The ultimate limit state of a bent reinforced concrete section. Mechanisms of failure of a bending reinforced concrete section; limit degree of reinforcement. Design of single and double reinforced rectangular and T-shaped bending sections. Resistance of the bending rectangular and T-section. Serviceability limit state; cracks and deflections in bending reinforced concrete elements. Eccentric compression. Ultimate limit state of an eccentrically compressed reinforced concrete cross-section, interactive diagram. Eccentrically compressed reinforced concrete columns; design length, critical force, second order effects, types of eccentricities, failure mechanisms. Column dimensioning procedures. The resistance of a column bent in a diagonal plane. Stretching. Principles of reinforcement of one-way reinforced slabs and beams.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	exam	50.0%	67.0%
	exercise	50.0%	33.0%
Recommended reading	Basic literature	<ul style="list-style-type: none"> • M. Knauff, Obliczanie konstrukcji żelbetowych według Eurokodu 2. PWN, Warszawa 2012 • M. Knauff i inni., Tablice i wzory do projektowania konstrukcji żelbetowych z przykładami obliczeń. PWN, Warszawa 2013 • J. Pędziwiatr, Wstęp do projektowania konstrukcji żelbetowych wg PN-EN 1992-1-1:2008 • Podstawy projektowania i algorytmy obliczeń konstrukcji żelbetowych / Andrzej Łapko, Bjarne Christian Jensen. - Warszawa : Arkady, 2006 • Konstrukcje żelbetowe według Eurokodu 2 i norm związanych. 1 / Włodzimierz Starosolski. - Wyd. 13. - Warszawa : Wydaw. Naukowe PWN, 2011 • Konstrukcje żelbetowe według Eurokodu 2 i norm związanych. 2 / Włodzimierz Starosolski. - Wyd. 13 zm. - Warszawa : Wydaw. Naukowe PWN, 2011 • Wstęp do projektowania konstrukcji żelbetowych wg PN-EN 1992-1-1:2008 / Janusz Pędziwiatr. - Wrocław : Dolnośląskie Wydaw. Edukacyjne, 2010. • Konstrukcje żelbetowe : atlas rysunków / red. nauk. Adam Zybura ; [aut. Katarzyna Domagała et al.]. - Warszawa : Wydaw. Naukowe PWN, 2009. • Zeszyty Edukacyjne Buildera. Zeszyt 2, Projektowanie konstrukcji żelbetowych / Andrzej Łapko. - Warszawa : PWB MEDIA, 2011 • Reinforced concrete design to Eurocode 2 / Bill Mosley, John Bungey, Ray Husle. - 6th ed. - Houndmills, Basingstoke, Hampshire ; New York, NY : Palgrave MacMillan, 2007. • Normy żelbetowe: PN-B-03264:2002, PN-EN-1992-1-1 	
	Supplementary literature	<ul style="list-style-type: none"> • Podstawy projektowania konstrukcji żelbetowych i sprężonych według Eurokodu 2, praca zbiorowa. Dolnośląskie Wydawnictwo Edukacyjne, Wrocław 2006. • Konstrukcje betonowe, żelbetowe i sprężone komentarz do normy PN-B-03264:2002, Wyd. ITB, Warszawa 2005 • K.Grabiec, <i>Konstrukcje betonowe. Przykłady obliczeń statycznych</i>, Wydawnictwo Naukowe PWN, Warszawa 1998 	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		