GDAŃSK UNIVERSITY OF TECHNOLOGY

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 construtions 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

<table>
<tr><td>Subject contents</td><td>As part of this course, the following issues in the field of concrete structures will be discussed:

• 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.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>No prerequisites.</td></tr>
<tr><td>Assessment methods and criteria</td><td><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Semester project with oral defense</td><td>60.0%</td><td>40.0%</td></tr>
<tr><td>Test</td><td>60.0%</td><td>60.0%</td></tr>
</table></td></tr>
<tr><td>Recommended reading</td><td><table>
<tr><td>Basic literature</td><td>• 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.</td></tr>
<tr><td>Supplementary literature</td><td>• 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.</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr>
</table></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>• 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.</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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