GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Complex Concrete Structures I, PG_00073518		
Field of study	Civil Engineering		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2026/2027
Education level	second-cycle studies	Subject group	
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	1	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Engineering Structures -> Faculty of Civil and Environmental Engineering -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Anna Kopańska	
	Teachers	prof. dr hab. inż. Krystyna Nagrodzka-Godycka dr inż. Anna Kopańska	

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	0.0	15.0	0.0	30

E-learning hours included: 0.0

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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	30	0.0	0.0	30

Subject objectives

The student is able to design a reinforced concrete arch frame, a rectangular liquid-retaining tank founded on soil, and has become familiar with the design and dimensioning of reinforced concrete shear walls.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U06] develops innovative solutions to complex problems and designs advanced construction processes, systems and facilities	The student is able to develop designs of advanced reinforced concrete structures by selecting appropriate analytical models and structural solutions to satisfy strength, serviceability, and durability requirements.	[SU3] Assessment of ability to use knowledge gained from the subject [SU5] Assessment of ability to present the results of task [SU1] Assessment of task fulfilment
[K7_W06] demonstrates in-depth preparation for the design of advanced construction processes, systems and facilities, taking into account the technical, environmental, economic, legal and ethical contexts	The student is able to perform structural analysis and design selected advanced reinforced concrete structures, such as reinforced concrete arch frames, liquid-retaining tanks, and reinforced concrete deep beams, in accordance with applicable standards and the principles of structural design.	[SW3] Assessment of knowledge contained in written work and projects

Subject contents	Course content – lecture Advanced reinforced concrete structures. Arch and arch-frame structures: definitions, classification, structural systems, geometry, and loading conditions. Structural behaviour and analysis, design of reinforced concrete arches, detailing of reinforcement, ties, and springing beams. Reinforced concrete deep beams and wall beams: definitions, classification, applications, and behaviour in the elastic and cracked states. Stress distribution in wall beams, load-transfer mechanisms, and principles of design and reinforcement detailing. Reinforced concrete liquid-retaining structures: classification and applications, environmental and operational actions, structural analysis of walls and base slabs, design according to ultimate and serviceability limit states, crack-width control, and watertightness requirements. Principles of detailing advanced reinforced concrete structures in accordance with applicable design standards, durability requirements, and serviceability criteria. Course content – project Discussion of the principles for determining loads acting on arch structures, including permanent loads, imposed loads, snow loads, and wind loads, in accordance with relevant design standards. Discussion of the design principles for reinforced concrete arches subjected to eccentric compression. Analysis of the influence of arch geometry, member slenderness, and load eccentricity on the distribution of internal forces and stress states. Presentation of methods for accounting for second-order effects and procedures for stability assessment, including buckling phenomena. Discussion of the detailing and design of reinforcement in reinforced concrete arches in accordance with ultimate and serviceability limit state requirements. Presentation of issues related to the design and analysis of rectangular reinforced concrete liquid-retaining tanks. Discussion of the determination of hydrostatic pressure loads and their effects on the behaviour of walls, base slabs, and stiffening elements. Presentation of procedures for verifying the load-bearing capacity and serviceability performance of liquid-retaining structures. Discussion of the design principles for reinforced concrete deep beams. Presentation of methods for determining internal forces and stress distributions in deep beams.
Prerequisites and co-requisites	The student is able to design reinforced concrete members subjected to eccentric compression, as well as structural elements subjected to biaxial bending.
Assessment methods and criteria	

Subject passing criteria	Passing threshold	Percentage of the final grade
	60.0%	30.0%
	50.0%	70.0%

Recommended reading	Basic literature	W. Starosolski, Konstrukcje żelbetowe według Eurokodu 2 i norm związanych, t. 5 PWN, Warszawa 2024. W. Starosolski, Konstrukcje żelbetowe według Eurokodu 2 i norm związanych, t.4 PWN, Warszawa 2026. A. Halicka, D. Franczak, Projektowanie zbiorników żelbetowych, t.2, Wydawnictwo Naukowe PWN, Warszawa 2013. M. Knauff, Obliczanie Konstrukcji Żelbetowych według Eurokodu 2, Wydanie III poszerzone, PWN 2. J.Kobiak, W.Stachurski, Konstrukcje żelbetowe, t.3, Arkady, Warszawa 1989. J.Kobiak, W.Stachurski, Konstrukcje żelbetowe, t.4, Arkady, Warszawa 1991.

	Supplementary literature	Sekcja Konstrukcji Betonowych KILiW PAN, Podstawy projektowania konstrukcji żelbetowych i sprężonych według Eurokodu 2, DWE, Wrocław, 2006. T. Godycki-Ćwirko, Mechanika Betonu, Arkady, Warszawa, 1982. F. Leonhardt - R. Walther: Leonhardt F, Walther R. Wandartige Träger. Deutscher Ausschuss für Stahlbeton, nr 178 F. Leonhardt, E. Mönnig Vorlesungen über Massivbau. Zweiter Teil und Dritter Teil
	eResources addresses	
Example issues/ example questions/ tasks being completed		
Practical activites within the subject	Not applicable	

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