Subject card

Subject name and code	STRUCTURAL DESIGN and MECHANICS II, PG_00052611						
Field of study	Architecture						
Date of commencement of studies	October 2020		Academic year of realisation of subject		2021/2022		
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	2		Language of instruction		Polish		
Semester of study	3		ECTS credits		3.0		
Learning profile	general academic profile		Assessment form		exam		
Conducting unit	Department of Technical Fundamentals of Architecture Design -> Faculty of Architecture						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Monika Zielińska				
	Teachers		dr inż. Monika Zielińska				

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	30.0	0.0	0.0	0.0	45
	E-learning hours included: 0.0						
	Address on the e-learning platform: https://enauczanie.pg.edu.pl/moodle/course/view.php?id=19025 Adresy na platformie eNauczanie:						

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	45	6.0	24.0	75

Subject objectives	Extending the student's knowledge of building mechanics necessary to understand objects in the field of building construction. The ability to identify endurance cases. Dimensioning of bar cross-sections in terms of strength and stiffness conditions.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_U01] is able to use the experience gained during studies to critically analyze the conditions and formulate conclusions for design in an interdisciplinary context	The student understands the principles of designing architectural objects depending on the static scheme of the structure and the way it is loaded. Student determines cross-sections and spans structural elements for architectural design.	[SU4] Assessment of ability to use methods and tools
	[K6_W01] knows and understands construction problems, building and engineering issues related to building design; principles, solutions, constructions and building materials used in simple engineering tasks in the field of architectural and urban design	The student acquires the knowledge necessary to understand other technical subjects, such as general construction or construction installations, needed for independent use in the scope of qualifications received by the architect.	[SW1] Assessment of factual knowledge

Subject contents	LECTURES: Stress state, extreme stress values, Mohr's circle. Relations between stresses and internal forces. State of deformation. Relations between stresses and strains. Structure dimensioning: dimensioning conditions, structure design methods. Axial stretching and compression. Connections of structural elements, technical shear. Geometric characteristics of plane figures: static moments and center of gravity, moments of inertia of plane figures, main axes and moments of inertia. Simple bending, diagonal bending, bending with shear, complex beams. Free twisting. Compression - eccentric tension, cross-section core. Deflection line of bending beams - Euler's equation. Stability of bar systems. Limit load capacity of bar systems (axial tension-compression of bars, bending bars). Static and kinematic analysis of bar systems. The principle of virtual work. Displacements of rod systems. Statically indeterminate bar systems - force method. Symmetrical bar systems: symmetrical and asymmetrical load. EXERCISES: Stretching, axial compression. Connections of structural elements. Technical shear. Static and inertia moments, strength index. Simple bending. Diagonal bending. Bending with shear. Eccentric compression. Section core. Euler's method. Displacements (the principle of virtual work). The method of forces in simple statically indeterminate systems. Ultimate load capacity.
Prerequisites and co-requisites	Basic elements of algebra and vector analysis, differential dependencies and calculus. The ability to determine internal forces in simple, statically determinate bar systems.

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Two tests (1.5 hours each) and 1 hour written exam.	55.0%	100.0%

Recommended reading	Basic literature	Kolendowicz T.: Building mechanics for architects (in Polish). Arkady, Warszawa, 1993.
		Przewłócki J., Górski J.: Basics of building mechanics (in Polish). Arkady, Warszawa, 2012.
	Supplementary literature	Bielewicz E.: Strength of materials (in Polish). Wyd. P.G., Gdańsk, 2006.
		Pyrak S., Szulborski K.: Structural mechanics. Calculation examples. (in Polish) Arkady, Warszawa, 2001.
	eResources addresses	

Example issues/ example questions/ tasks being completed	Determine the diagrams of normal and tangential stresses in the most unfavorable cross-section.
	Determine the limit (plastic) load for a simply supported beam.
	Sketch the normal stress distribution in the base of a column under compression by force P.

Work placement	Not applicable