Subject card

Subject name and code	SURFACE STRUCTURES, PG_00042243
Field of study	Civil Engineering

Date of commencement of studies	February 2024	Academic year of realisation of subject	2024/2025
Education level	second-cycle studies	Subject group	Optional subject group 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	Polish
Semester of study	2	ECTS credits	4.0
Learning profile	general academic profile	Assessment form	exam

Conducting unit	Structural Mechanics Department -> Faculty of Civil and Environmental Engineering

Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Paweł Kłosowski
	Teachers	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	15.0	0.0	45
	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	45	5.0	50.0	100

Subject objectives	Giving the students knowledge on numerical technics used in calculations of structures (e.g. plates, shells, membranes) using the commecial software

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	Student creats FEM models, carry on calculations and is able to justify the results of calculations	[SW2] Assessment of knowledge contained in presentation
	[K7_W03] has knowledge of Continuum Mechanics, knows rules of static analysis, stability and dynamics of complex rod, shell and volume structures, both in linear and basic nonlinear regime	Student creats FEM models, carry on calculations and is able to justify the results of calculations	[SW2] Assessment of knowledge contained in presentation

Subject contents	PLate structures - theory and applications in FEM. Bending Shell Structures - linear and non-linear theories. Membrane structures - theory FEM modelling linear and non-linear calculations, construction problems. Net structures - theory and proper modelling in FEM, initial prestressing problems. Examples of famous surface structures
Prerequisites and co-requisites	Basis FEM knowledge

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	two projects	60.0%	100.0%

Recommended reading	Basic literature	1. Instrukcja programu Robot Millenium (Robobat- AutoDESK) (dostępny jako zbiór PDF). 2. Ambroziak A., Kłosowski P.: Autodesk Robot Structural Analysis – podstawy obliczeń. Wydawnictwo PG, 2010. 3. Girkmann K.: Dźwigary powierzchniowe. Warszawa: Arkady 1956. 4. Kłosowski P., Woznica K.: Nieliniowe lepkoplastyczne prawa konstytutywne w wybranych zastosowaniach analizy konstrukcji. Wydawnictwo Politechniki Gdańskiej, Gdańsk 2007.
	Supplementary literature	1. Zienkiewicz O. C., Taylor R. L. (2000): The Finite Element Method. Fifth Edition Vol. 1–5. Oxford: Butterworth–Heinemann. 2. Pałkowski Sz.: Konstrukcje cięgnowe. Wyd. Naukowo-Techniczne, Warszawa 1994. 3. Nowacki W. Dźwigary powierzchniowe. PWN, Warszawa 1979
	eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed	Design of a cable structure and comparison of different modelling cases in FEM
Work placement	Not applicable

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