GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	FEM in the Mechanics of thin-walled shell structure, PG_00057226		
Field of study	Ocean Engineering		
Date of commencement of studies	February 2023	Academic year of realisation of subject	2023/2024
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	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Theory and Ship Design -> Faculty of Mechanical Engineering and Ship Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Maciej Kahsin	
	Teachers	dr inż. Maciej Kahsin	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	30.0	0.0	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	25.0	75

Subject objectives

The aim of subject is to provide student with the essential knowledge of CAE approach to analysis of tin-walled structures.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U07] in compliance with a formulated specification and with the aid of appropriate tools and methods, is able to complete an advanced engineering task within the range of design, construction and operation of ocean technology objects and systems	Student understands differences emerging from choice of discretization method, student is able to appropriately assign type of analysis to specific problem.	[SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools
[K7_W06] has an organized, widened knowledge on engineering methods and design tools allowing the conducting of advanced projects within the construction and operation of ocean technology objects and systems	Student understands mathematical formulation of FEM.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
[K7_W05] has an organized, widened knowledge on design, construction and operation of ocean technology objects and systems	Student is able to prepare computational model, prepare data, and execute analyses concerning: structural strength, buckling, modal analysis with use of 1D and 2D elements.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects

Subject contents

FE stiffness matrixs formulation basing on load/deformation relations. Introduction to residual methods. FEs equilibrium equations. Rayleigh Ritz metod. General FE stiffness matrix formulation. Derivation of interpolating function. FE approach in modelling plain stress/strain state. Geometry discretization. Typical 2D finite elements survey. FEs thick vs. tin plate formulation.

Prerequisites and co-requisites

Mechanics, Strenght of Materials, Mathematics, Numerical Methods.

<table>
<tr><td>Assessment methods and criteria</td><td colspan="2"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>Project</td><td>70.0%</td><td>75.0%</td></tr>
<tr><td>Raports</td><td>50.0%</td><td>25.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>1) J. Reddy: An Introduction to The Finite Element Method, McGraw-Hill, New York, 2005

2) D. Chapelle, K. Bathe: The Finite Element Analysis of Shells Fundamentals, Springer-Verlag Berlin Heidelberg 2011</td></tr>
<tr><td>Supplementary literature</td><td>1) J. Blaauwendraad: Plates and FEM Surprises and Pitfalls, Springer 2010</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">Structural study of offshore platform in case of: stresses, strains, buckling, free vibrations analyses.</td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
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