GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00057296		
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	Part-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	Institute of Ocean Engineering and Ship Technology -> 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	9.0	0.0	18.0	0.0	0.0	27

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	27	5.0	43.0	75

Subject objectives

Providing knowledge on defining and solving tasks in the field of statics, dynamics (eigenfrequencies) and stability of flat and spatial bar and surface systems using the FEMAP NX / NASTRAN computer system implementing the FEM algorithms

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	The student is able to recognize and formulate static and dynamic problems using commercial programs on the example of FEMAP + NX / NASTRAN	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject
[K7_W05] has an organized, widened knowledge on design, construction and operation of ocean technology objects and systems	The student acquires skills in modeling bar and surface structures in accordance with FEM procedures	[SW3] Assessment of knowledge contained in written work and projects
[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	The student can define concepts and physical parameters (using mathematical methods) related to statics, dynamics, and stability of bar and surface structures; formulate and solve tasks following the FEM; use the FEMAP + NX / NASTRAN computer system to solve numerical tasks	[SW3] Assessment of knowledge contained in written work and projects

Subject contents

The general picture of FEM - types of analyzes, the idea of discretization, the concept of finite element, the construction of global equations of equilibrium, the principle of virtual work in matrix notation, the literature on the subject; Basic MES equations (statics, dynamics) - MES algorithm in linear mechanics, linear equations of thin plate theory, simplifying assumptions (Kirchhoff-Love hypothesis); discretization of the surface system, dynamic equation of discretized motion, discussion of the generalized eigenvalue problem, calculation of free vibrations and bifurcation stability

Prerequisites and co-requisites

Completed engineering course in higher mathematics and subjects such as Technical Mechanics, Strength of Materials.

<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>Report in the form of a publication on a selected topic</td><td>60.0%</td><td>40.0%</td></tr>
<tr><td>two numerical tasks</td><td>60.0%</td><td>60.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>Bathe K.J.: Finite Element Procedures. Prentice-Hall, 1996

Moaveni S.: The Finite Element Method. Theory and Application with ANSYS. Prentice-Hall, 1999</td></tr>
<tr><td>Supplementary literature</td><td>Zienkiewicz O. C., Taylor R. L.: The Finite Element Method. 5th Edition, Vol. 1,2,3, BH, 2000

Zienkiewicz O. C., Taylor R. L.: The Finite Element Method. 6th Edition, Elsevier, 2005

Marti P.: Theory of structures, fundamentals, framed structures, plates and shells. Wilhelm Ernst & Sons, Berlin, 2013</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">Explain the meaning of the Bernoulli and Kirchhoff-Love hypotheses, give formulas for disk and plate stiffness, explain what are the unfavorable ES shapes

Perform comparative static calculations using the FEMAP FEM system and assuming first the given model of the bar structure, and then the surface structure</td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
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