GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Finite Element Modeling, PG_00062684		
Field of study	Naval Architecture and Offshore Structures		
Date of commencement of studies	February 2024	Academic year of realisation of subject	2024/2025
Education level	second-cycle studies	Subject group	Specialty 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	5.0
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 hab. inż. Beata Zima	
	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	45.0	0.0	75
	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	75	10.0	40.0	125

Subject objectives	Learning the basics of the Finite Element Method. Learning to use a selected software using FEM.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U02] Presents convincing and logically justified arguments regarding outcomes through critical analysis of information in diverse technical contexts and an approach to their interpretation	Student formulates computational models, prepares data, and performs stress, stability, and natural frequency calculations for truss, beam, and shell structures using FEM system.	[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information
[K7_W06] Capable of finding and utilizing credible sources of information crucial for analyzing issues within the field of study	Student knows and understands the differences between types of analyses conducted in FEM software.	[SW2] Assessment of knowledge contained in presentation [SW3] Assessment of knowledge contained in written work and projects
[K7_K01] Understands the need for lifelong learning, critically evaluate acquired knowledge, and comprehend the significance of knowledge in addressing cognitive and practical problems	Student understands the mathematical basics of analyses performed using FEM.	[SK1] Assessment of group work skills [SK3] Assessment of ability to organize work
[K7_W03] Demonstrates advanced skills in applying analytical methods and problem-solving techniques related to ocean engineering, using appropriate tools	Student comprehends the differences related to the choice of discretization method and can select the type of analysis according to the specifics of the problem.	[SW2] Assessment of knowledge contained in presentation
[K7_W02] Explains the essence and relationships of key components describing systems and processes in ocean engineering, utilizing current knowledge from major scientific fields related to the field of study	Student understands the idea of the finite element method.	[SW1] Assessment of factual knowledge [SW2] Assessment of knowledge contained in presentation
[K7_U01] Develops innovative strategies to solve complex and dynamic problems by synthesizing information from various sources and utilizing analytical, simulation, and experimental methods, considering environmental variability	Student correctly interprets the results of the FEM analyses.	[SU5] Assessment of ability to present the results of task [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information

Subject contents

Introduction, numerical methods in structural theory. Discussion of weight methods. Equations of static equilibrium in the FEM approach. Rayleigh-Ritz method. Derivation of stiffness matrix of finite element of arbitrary dimension. Construction of interpolating function. Description of FEM in the case of plane strain/ stress state. Discretization of geometric models. Discussion of typical two-dimensional FEM elements.

Project: Presentation of FEM software capabilities using a selected program and learning its basics. Application of FEM software to solve selected engineering problems

Prerequisites and co-requisites

Mechanics, Strength of Materials, Mathematics, Numerical methods

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Test from lectures content	50.0%	50.0%
Project	50.0%	50.0%

Recommended reading

Basic literature	KLEIBER M.: Wprowadzenie do metody elementów skończonych. Bibl. Mech. Stosowanej IPPT PAN, PWN Warszawa 1989. J. Reddy: An Introduction to The Finite Element Method, McGrawHill, New York, 2005
Supplementary literature	ZIENKIEWICZ O.C.: Finite element method.
eResources addresses	Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed

What is approximation and interpolation?

What are shape functions?

What types and how many degrees of freedom can be distinguished at a given node?

How is the convergence of the method investigated?

Work placement	Not applicable