GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Finite Element Method I, PG_00072505		
Field of study	Civil Engineering		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2026/2027
Education level	second-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	1	Language of instruction	Polish
Semester of study	1	ECTS credits	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Mechanics of Materials and Structures -> Faculty of Civil and Environmental Engineering -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Wojciech Witkowski	
	Teachers	dr inż. Bartosz Sobczyk prof. dr hab. inż. Wojciech Witkowski dr hab. inż. Mikołaj Miśkiewicz dr inż. Łukasz Pyrzowski prof. dr hab. inż. Jacek Chróścielewski	

Lesson types

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	1.0	4.0	50

Subject objectives

Finite element method as a tool for solving boundary value problem in civil engineering

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_U05] evaluates and critically verifies documentation, results of calculations, tests, measurements and monitoring of advanced structures and buildings	student is able to select appropriate type of fem analysis for the given problem	[SU4] Assessment of ability to use methods and tools
[K7_W05] demonstrates knowledge of the principles of evaluation and verification of calculations, tests, measurements and monitoring of advanced structures and civil engineering works	student is able to use advanced fem codes	[SW1] Assessment of factual knowledge

Subject contents

Course content – lecture

strong and weak formulation of boundary value problem of linear continuum mechanics, fundamentals of finite element formulation, shell as assembly of flat elements, drilling degree of freedom problem, matrix formulation, interpolation, numerical integration, triangular and quadilateral element, evaluation of finite elements

Course content – laboratory

Abaqus - Introduction to the Modeling of Simple Engineering Structures
Sifistik - Introduction to the Modeling of Simple Engineering Structures

Prerequisites and co-requisites

structural mechanics, structural dynamics, strength of materials, theory of elasticity

<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>lecture</td><td>60.0%</td><td>30.0%</td></tr>
<tr><td>laboratory</td><td>60.0%</td><td>70.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>1. RAKOWSKI G., KACPRZYK Z.: Metoda elementów skończonych w mechanice konstrukcji. Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2005.
2. KLEIBER M (red).: Komputerowe metody mechaniki ciał stałych. Mechanika Techniczna t. XI. PWN, Warszawa 1995.
3. ZIENKIEWICZ O.C.: Metoda elementów skończonych. Arkady 1972.
4. ZIENKIEWICZ O.C., TAYLOR R.L., ZHU J.Z.: Finite Element Method: Volume 1- Its Basis & Fundamentals. Volume 2 - For Solid and Structural Mechanics. Butterworth Heinemann, London 2006.
5. BATHE K.-J.: Finite Element Procedures. Prentice Hall New Jersey 1996.</td></tr>
<tr><td>Supplementary literature</td><td>1. CHRÓŚCIELEWSKI J., MAKOWSKI J., PIETRASZKIEWICZ W.: Statyka i dynamika powłok wielopłatowych. Nieliniowa teoria i metoda elementów skończonych. PAN IPPT, Biblioteka Mechaniki Stosowanej Serii A, monografie, Warszawa 2004.
2. KREJA I.: Mechanika Ośrodków Ciągłych. Wydawnictwo CURE, Politechnika Gdańska, Gdańsk 2003.</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">1) Why is FEM an approximate method?
2) What is approximation and interpolation?
3) Describe spatial dimensionality classification of finite elements.
4) Describe what the shape functions are.
5) What is mesh convergence check.
6) Create a computational model of a shell or beam structure in FEM environbemnt using Abaqus or Sofisitk code and run static linear analysis under the given loads</td></tr>
<tr><td>Practical activites within the subject</td><td colspan="2">Not applicable</td></tr>
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