GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Modelling of engineering structures, PG_00044257		
Field of study	Civil Engineering		
Date of commencement of studies	October 2021	Academic year of realisation of subject	2024/2025
Education level	first-cycle studies	Subject group	Optional subject group
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	4	Language of instruction	Polish
Semester of study	7	ECTS credits	5.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Structural Mechanics Department -> Faculty of Civil and Environmental Engineering		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Izabela Lubowiecka	
	Teachers	dr inż. Marcin Krajewski dr hab. inż. Izabela Lubowiecka	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	15.0	15.0	0.0	0.0	60

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	60	5.0	60.0	125

Subject objectives

The aim of the course is to familiarize the student with the issues of building a numerical model of a structure using commercial software, the definition of a model based on structure mechanics in a matrix approach, and the basics of matrix analysis of structures, with particular emphasis on stability issues. Computer programs for the numerical analysis of structures in the field of first- and second-order statics and stability will be presented. The student is to independently perform calculations of the bar model of a civil engineering structure.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U02] is able to define basic calculation models used in computer calculations	Student defines the models of engineering structures with various types of bar elements using commercial software or defines the models using matrix approach in structural mechanics with implementation in MATLAB environment. The student models bar structures taking into account second-order effects, elastic soil and stability.	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools
[K6_W11] Knows selected software supporting the calculation and design of construction as well as construction management	Student fluently uses engineering software in the scope of structural analysis, demonstrating knowledge in the field of organisation of construction works.	[SW1] Assessment of factual knowledge
[K6_U17] has specialized skills in civil engineering within offered specialization	Student knows how to use a wide range of engineering knowledge covered by the scope of separate subjects, combining them freely in the solution of a given task.	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools
[K6_W16] Has deeper and adequate knowlege of civil engineering, within offered specialization	Student is able to use an extensive knowledge in the field of civil engineering, when solving complex tasks requiring information covered by the scope of various courses.	[SW1] Assessment of factual knowledge

<table>
<tr><td>Subject contents</td><td>Matrix analysis of structures. Modification and condensation of stiffness matrix. Geometric matrix and its application to stability problems and static analysis with the second order effects. The influence of elastic supports. Stiffness matrix of a beam on a Winkler-type elastic foundation. Elements with semi-rigid connections. Basics of nonlinear static analysis. Application of structural analysis software to static problems. Selected examples of modeling of engineering structures.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>Knowledge within the scope of the following subjects is needed:

Structural mechanics
Strength of Materials
Computational Mechanics</td></tr>
<tr><td>Assessment methods and criteria</td><td>
<table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>two tests</td><td>60.0%</td><td>70.0%</td></tr>
<tr><td>five laboratory projects</td><td>60.0%</td><td>30.0%</td></tr>
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<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>1. Guminiak M., Rakowski J.: Mechanika konstrukcji prętowych w ujęciu macierzowym, Wydawnictwo Politechniki Poznańskiej, Poznań, 2012.
2. Weiss G., Giżejowski M., Stateczność konstrukcji metalowych układy prętowe. Warszawa Arkady 1991.
3. G. Rakowski (red.): Mechanika Budowli z elementami ujęcia komputerowego, Arkady, Warszawa, 1991.
4. Z. Kacprzyk, P. Czumaj, S. Dudziak.: Modelowanie konstrukcji budowlanych.</td></tr>
<tr><td>Supplementary literature</td><td>1. Timoshenko S. P., Gere J. M.: Teoria stateczności sprężystej. Arkady, 1963
2. Waszczyszyn Z., Cichoń C., Radwańska M.: Stability of structures by finite element methods. Elsevier, Amsterdam,1994</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:
Modelowanie Konstrukcji Inżynierskich - 2024/25 - Moodle ID: 42281
https://enauczanie.pg.edu.pl/moodle/course/view.php?id=42281</td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td>Calculation of forces and displacements or buckling load of beams and frames using matrix mechanics approach.</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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