GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Structural Dynamics, PG_00043954		
Field of study	Civil Engineering		
Date of commencement of studies	October 2022	Academic year of realisation of subject	2024/2025
Education level	first-cycle studies	Subject group	
Mode of study	Full-time studies	Mode of delivery	at the university
Year of study	3	Language of instruction	Polish
Semester of study	5	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Katedra Wytrzymałości Materiałów -> Faculty of Civil and Environmental Engineering		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Magdalena Rucka	
	Teachers	dr inż. Tomasz Ferenc mgr inż. Błażej Meronk dr inż. Aleksandra Kuryłowicz-Cudowska dr inż. Dawid Bruski prof. dr hab. inż. Magdalena Rucka	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	15.0	15.0	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	0.0	0.0	45

Subject objectives	Solving structural dynamics problems using discrete models with single and n degrees of degrees of freedom.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_W01] Demonstrate knowledge and understanding of mathematics as well as sciences and engineering disciplines underlying civil engineering at a level necessary to achieve the other programme outcomes.	The student has knowledge of structural statics and strength of materials, describes the behaviour of structures under external dynamic loads and analyses the dynamic response of linear systems.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
[K6_W05] Demonstrate knowledge and understanding of research methods (obtaining information, simulations, experimental methods) in the field of civil engineering.	The student creates a dynamic model of plane frame and lattice systems. Determines the stiffness and compliance matrix of the system. Determines natural frequencies of frame and truss structures.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
[K6_U05] Conducts research (obtaining information, simulations, experimental methods) in the field of construction in order to solve specific tasks and report research results.	The student solves tasks and design issues. The student prepares a report on the calculations made. The student carries out experiments and analyses the results. Student prepares a report of vibration measurements.	[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information
[K6_U01] Apply knowledge and understanding of mathematics as well as sciences and engineering disciplines underlying civil engineering to solve engineering problems and issues.	The student uses knowledge of mathematics, physics, structural statics and strength of materials to solve problems in structural dynamics, including solving computational tasks	[SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools

Subject contents

Modelling of engineering structures. Forces acting on structures. Derivation of equations of motion.

Free vibration of systems with one degree of freedom.

Forced vibrations of systems with one degree of freedom (harmonic forcing, periodic forcing).

Forced oscillations of systems with one degree of freedom (impulse forcing and any function) as a function of time).

Free vibration of discrete systems with n degrees of freedom.

Forced vibration of discrete systems with n degrees of freedom.

Measurement and vibration reduction in engineering structures.

Prerequisites and co-requisites

Completion of the course Mathematics, Mechanics of Structures, Experimental Methods in Strength of Materials. Course of the Fundamentals of Computational Mechanics should be taken.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
project task	60.0%	20.0%
laboratory project	60.0%	10.0%
laboratory exercise reports	60.0%	20.0%
test	60.0%	50.0%

Recommended reading	Basic literature	Rucka M., Wilde K.: *Dynamika Budowli z przykładami w środowisku MATLAB®*. Wydawnictwo Politechniki Gdańskiej, Gdańsk 2014. Rucka M., Burzyński S., Sabik A.: *Macierzowa analiza konstrukcji prętowych w środowisku MATLAB®*. Wydawnictwo Politechniki Gdańskiej, Gdańsk 2018. Chmielewski T., Zembaty Z.: *Podstawy dynamiki budowli*. Arkady, 1998. Lewandowski R.: *Dynamika konstrukcji budowlanych*. Wydawnictwo Politechniki Poznańskiej 2006. Guminiak M., Rakowski J.: *Mechanika konstrukcji prętowych w ujęciu macierzowym*. Wydawnictwo Politechniki Poznańskiej, 2012. Branicki C., Wizmur M.: *Metody macierzowe w mechanice budowli i dynamika budowli*. Wydawnictwo Politechniki Gdańskiej. Gdańsk 1980. Chopra A.K.: *Dynamics of structures*. Upper Saddle River, New Jersey: Prentice Hall 2001.
	Supplementary literature	Clough R.W., Penzien J.: *Dynamics of structures*. McGraw-Hill Inc. 1993. Kucharski T.: *Systemy pomiarów drgań mechanicznych*. Wydawnictwa Naukowo-Techniczne Warszawa 2002. Śliwiński A.: *Ultradźwięki i ich zastosowania*. Wydawnictwa Naukowo-Techniczne Warszawa 2001.
	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	Calculate the natural frequency of a frame system with one dynamic degree of freedom. Determine the period of damped oscillation number from the recorded free vibration waveform. Determine the frequencies and natural frequencies of a frame system with n-dynamic degrees of freedom.	
Work placement	Not applicable	

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