



Subject card

Subject name and code	Identification methods in mechatronics, PG_00064796						
Field of study	Mechatronics						
Date of commencement of studies	February 2026		Academic year of realisation of subject		2026/2027		
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		2.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Institute of Mechanics and Machine Design -> Faculty of Mechanical Engineering and Ship Technology -> Wydziały Politechniki Gdańskiej						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Michał Mazur				
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	15.0	0.0	30
	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	30		4.0		16.0	50
Subject objectives	Overview of stages and selected methods of identification, model correlation, modal updating.						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K7_U02] formulates and tests hypotheses concerning problems od stationary and non-stationary mechatronic systems/processes, as well as simple research problems		Is able to verify the stationarity of the identified system.		[SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment		
	[K7_W04] demonstrates knowledge encompassing selected issues in the field of detailed knowledge, particularly in the scope of methods, techniques, tools, and algorithms specific to Mechatronics		Has a theoretical detailed knowledge of the methods of identification and signal processing.		[SW3] Assessment of knowledge contained in written work and projects		
	[K7_W02] demonstrates structured and theory supported knowledge encompassing key issues in the field of Mechatronics, enabling modeling and analysis of stationary and non-stationary mechatronic systems, devices, and processes with continuous and discrete operation		Has expanded and deepened knowledge of certain branches of mechatronics including elements of discrete mathematics and applied and optimization methods, including mathematical and numerical methods necessary for identification		[SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge		
	[K7_U13] evaluates the feasibility and potential for utilizing new technical and technological achievements in accomplishing tasks characteristic for the field of study		Assesses the usefulness and possibility of using identification methods.		[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools		

Subject contents	LECTURES. Basic definitions and terms of modal analysis. Signal processing. Modal testing. Indirect methods of identification in the time domain. Direct methods of identification in the time domain. Methods of identification of one-degree-of-freedom systems in the frequency domain. Indirect methods of identification in the frequency domain. Direct methods of identification in the frequency domain. Coupling techniques in identification of mechatronic systems. Structural models modification. Operational modal analysis. Deep learning and optimization. FEM model validation. Hybrid models. PROJECT The students implement a mechatronic project in their own interdisciplinary teams, with the division of competences into individual team members. The main goal of the project is to identify the modal parameters (poles and scaled shapes of vibrations) of the real object. An additional goal is to create an FEM model of the real object. Then, the correlation of the FEM model and the model obtained through the experiment is assessed. Additional tasks are the synthesis of responses in the time and frequency domain.		
Prerequisites and co-requisites	Knowledge on Control Theory (I-st level). Knowledge on Theory and technique of systems (II-nd level). Knowledge and experience in Informatics (I-st level). Knowledge and experience in Modelling of mechatronic systems (I-st level). Knowledge and experience in Mechatronic design (I-st and II-nd level).		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Colloquium	50.0%	60.0%
	Projekt	50.0%	40.0%
Recommended reading	Basic literature	1. Uhl T.: Komputerowo wspomagana identyfikacja modeli konstrukcji mechanicznych. Warszawa: WNT 1997. 2. Maia N. M. M., Silva J. M. M.: Theoretical and Experimental Modal Analysis. Taunton, Somerset (England): Research Studies Press 1997. 3. Heylen W., Lammens S., Sas P.: Modal Analysis Theory and Testing. Leuven: KU Leuven 2007.	
	Supplementary literature	1. Wybrane zagadnienia analizy modalnej konstrukcji mechanicznych. (Red. T. Uhl). Kraków: Kated. Robotyki i Mechatroniki AGH 2005, 2006, 2008. 2. Lisowski W.: Wybrane problemy automatyzacji eksperymentalnej analizy modalnej. Kraków: AGH Uczelniane Wydawnictwa Naukowo-Dydaktyczne 2006. Rozprawy Monografie 158.	
	eResources addresses		
Example issues/ example questions/ tasks being completed	1. The ERA method 2. pLSCFd method 3. Residues 4. LSFD method 5. Time windows 6. H1 and H2 estimator 7. Spectrum leak 8. OMA 9. FBS 10. CMS 11. MAC 12. CMIF 13. Assumptions of Modal Analysis 14. Dynamic stiffness, effective mass 15. Modes scaling 16. Frequency aliasing 17. Correctness of measurements 18. Correctness of identification 19. Stages of identification 20. SVD decomposition 21. Poles Determination from the characteristic polynomial equation 22. Multiple poles 23. Inverse problem - load identification 24. TPA 25. FRF synthesis 26. Complex shapes 27. Peak-Picking - damping determination 28. Self-excited vibrations		
Work placement	Not applicable		

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