GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Theory of Decision and Engineering Diagnostics, PG_00041442		
Field of study	Civil Engineering		
Date of commencement of studies	February 2025	Academic year of realisation of subject	2025/2026
Education level	second-cycle studies	Subject group	Optional 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	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Building Engineering -> Faculty of Civil and Environmental Engineering		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Anna Jakubczyk-Gałczyńska	
	Teachers		

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	30.0	15.0	0.0	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	5.0	25.0	75

Subject objectives

The aim of the course is to teach students the statistical theory of decisions in the field of diagnostics and use in the assessment of the technical condition of buildings. Students will learn the basic tools of artificial intelligence and machine learning used for decision making and diagnostics. Modern methods and techniques for the practical application of knowledge will be presented.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W05] has knowledge about business activity specific for construction sector; understands principles of financial economy of companies, knows rules of defining quality management procedures in a construction company; has knowledge about optimisation of building enterprises and existing risk and uncertainty	The student knows the rules of doing business in the construction industry. The student uses specialized software and knows the techniques supporting decision making.	[SW1] Assessment of factual knowledge [SW3] Assessment of knowledge contained in written work and projects
[K7_W15] has deep and adequate knowlege of civil engineering, within offered specialization and profile	The student knows the building law and regulations and is able to write construction documentation. Student is able to apply modern tools to solve decision problems.	[SW3] Assessment of knowledge contained in written work and projects
[K7_K02] Rocognizes the significance of knowledge in solving cognitive and practical problems; reliably evaluates results of his own and team research	The student is able to work independently and in a group in solving selected organizational problems in construction.	[SK4] Assessment of communication skills, including language correctness [SK1] Assessment of group work skills
[K7_K01] is aware of necessity of professional competences improvement; obeys the professional ethics code	The student knows the basic tools of artificial intelligence and machine learning used for decision making and diagnostics.	[SK5] Assessment of ability to solve problems that arise in practice
[K7_U05] can formulate and perform basic research on engineering, technological or organisational problems in civil engineering	The student is able to identify the engineering problem and knows the basic techniques of its solution.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information

<table>
<tr><td>Subject contents</td><td colspan="3">Decision Theory. Decision trees. Building diagnostics. Diagnostics of buildings with the impact of vibrations. Diagnostic methods - a review. Artificial neural network. Support vector machine. Statistica program - practical aspects. Bayesian networks. Assessment of building use degree. Construction expertise.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td colspan="3">The student has knowledge of the technology and organization of construction works and management of construction projects - is able to solve basic optimization problems using linear programming, transport issues and is able to create a bill of quantities, cost estimate, schedule.</td></tr>
<tr><td>Assessment methods and criteria</td><td colspan="3"><table><tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr><tr><td>Test 1, 2</td><td>60.0%</td><td>100.0%</td></tr></table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">1. Materials provided by the teacher
2. The Act of 7 July 1994 Construction Law
3. Individual Regulations of the Ministers
4. Kawecki, J., 2011. Oddziaływania dynamiczne na obiekty budowlane. Zeszyty Naukowe Politechniki Rzeszowskiej. Budownictwo i Inżynieria Środowiska, 58(3/I), 115–134 [in Polish]
5. Fenton, N .; Neil, M. Risk Assessment and Decision Analysis with Bayesian Networks; CRC Press: Boca Raton, FL, USA, 2012
6. Rutkowski, L. 2009. Metody i Techniki Sztucznej Inteligencji. Wydawnictwo Naukowe PWN, Warszawa. [in Polish]</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">1. Dulinska, J.; Kawecki, J.; Kozioł, K.; Stypuła, K.; Tatara, T. Oddziaływania Parasejsmiczne Przekazywane na

Obiekty Budowlane; Wydawnictwo Politechniki Krakowskiej: Kraków, Poland, 2014. (In Polish)

2. Cortes, C., Vapnik, V., 1995. Support–vector networks. Machine Learning, 20, 273–297

3. Koller, D.; Friedman, N. Probabilistic Graphical Models: Principles and Techniques; MIT Press: Cambridge, MA,

USA, 2009

4. Osowski, S., 2000. Sieci Neuronowe do Przetwarzania Informacji. Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa. (In Polish)</td></tr>
<tr><td>eResources addresses</td><td colspan="2">Adresy na platformie eNauczanie:</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="3"></td></tr>
<tr><td>Work placement</td><td colspan="3">Not applicable</td></tr>
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