

Subject card

Subject name and code	Techniques for Optimizing Effectiveness of Enterprises, PG_00169817						
Field of study	Economics						
Date of commencement of studies	October 2025		Academic year of realisation of subject		2027/2028		
Education level	Bachelor's studies		Subject group		Obligatory subject group in the field of study Optional subject group		
Mode of study	part-time studies		Mode of delivery		at the university		
Year of study	3		Language of instruction		Polish		
Semester of study	5		ECTS credits		2.0		
Learning profile	academic		Assessment form				
Conducting unit	Department of Economics and Management of Transportation Companies -> Faculty of Economics -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Michał Suchanek				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	8.0	0.0	0.0	0.0	0.0	8
	E-learning hours included: 0.0						
	Additional information:						
	All contact hours include varied forms of didactic activity aimed at both the transfer of knowledge and the development of practical skills and social competence. In particular, the student participates in: 1. Interactive lectures - with elements of case studies, analysis of information systems and problem discussion (about 50% of contact hours). 2. Exercise/laboratory classes - during which the student works independently on selected systems, analyzes data and interprets results (about 40% of contact hours). 3. Didactic consultations - intended for: • individual project support (e.g., advice on case analysis), • substantive assistance in preparation for credit, • ongoing clarification of issues related to lectures and exercises (approx. 10% of contact hours).						
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	8		3.0		39.0	50
Subject objectives	This course introduces students to the theory, algorithms, and applications of optimization. The optimization methodologies include linear programming, network optimization, integer programming, and decision trees. Applications to logistics, manufacturing, transportation, marketing, project management, and finance.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[EKONL3_U02] is able to use the knowledge of theory and data to analyse concrete economic and social processes and phenomena and to analyse these phenomena using methods developed in economics, finance and management sciences	The student is able to combine theoretical knowledge with enterprise data and integrate information streams into formal decision-making problems.	[SU4] test/exam - oral or written
	[EKONL3_W01] has advanced knowledge of the nature of social sciences, their place in the system of sciences, knows the role of economic sciences in this system and uses universal economic terminology	The student understands the importance of decisions at the individual level for the organization as a whole. Understands the vagaries and sensitivities of decisions fraught with behavioral constraints.	[SW4] test/exam - oral or written
	[EKONL3_W02] has advanced knowledge of the different types of existing business entities and organisations and public institutions	The student understands the diversity of objectives of economic and economic actors in different areas of economics.	[SW4] test/exam - oral or written
	[EKONL3_K04] is willing to think and act in an entrepreneurial manner; adapts to new situations and conditions, takes on the challenges of creative thinking, is resilient in the face of failure, is able to identify risks and assess the risks of failure	The student is able to aggregate business problems into formal language, identify the objectives, constraints and sensitivity of solutions to decision-making problems	[SK4] test/exam - oral or written
	[EKONL3_K05] correctly identifies, diagnoses and resolves professional dilemmas and different options for solutions	The student is able to formulate linear and non-linear decision-making problems in the areas of enterprise	[SK4] test/exam - oral or written
	[EKONL3_U01] can correctly interpret economic and social phenomena and apply knowledge of economics, finance and management sciences to explain economic phenomena	The student knows how to simplify complex economic phenomena into solvable problems using optimization techniques	[SU4] test/exam - oral or written
	[EKONL3_W04] knows the types of economic and social ties and the regularities governing them	The student understands the ties between the various departments of the enterprise.	[SW4] test/exam - oral or written
	[EKONL3_W03] has advanced knowledge of the relations between economic agents and social organisations operating in the national, international and intercultural arenas	The student understands the impact of actors in the economic environment of the enterprise on the functions of the organization's purpose and its departments.	[SW4] test/exam - oral or written
	[EKONL3_W05] has advanced knowledge of man as a subject who creates social structures and the principles of their functioning and of his action in these structures, knows well the motives of human economic decision-making	The student understands the differences between the purpose functions of individual employees, departments and the organization as a whole.	[SW4] test/exam - oral or written
	[EKONL3_W07] has knowledge of the basic economic and financial principles of the functioning and management of economic entities and organisations as well as the legal, organisational, moral and ethical norms and rules governing the functioning of public institutions	The student understands the functions of the purpose of the various subsystems of enterprises and the rules that determine their formulation.	[SW4] test/exam - oral or written
	[EKONL3_U06] uses the knowledge acquired in economics, finance and management to solve economic and social dilemmas arising in the professional context	The student understands the importance of optimization techniques in solving practical decision-making problems.	[SU4] test/exam - oral or written
	[EKONL3_K01] recognises the importance of economic knowledge in identifying and solving economic problems and of consulting experts when difficulties in solving them independently	The student is able to use optimization theory to formulate and solve practical decision-making problems. Knows how to use literature sources to differentiate subclasses of problems	[SK4] test/exam - oral or written

	Course outcome	Subject outcome	Method of verification
	[EKONL3_U08] has the ability to observe, understand and analyse economic and social phenomena and processes using appropriate scientific methods	The student knows how to simplify complex economic phenomena into solvable problems using optimization techniques	[SU4] test/exam - oral or written

Subject contents	1 Theory and applications of linear programming Educational content: • Formulation of decision-making problems in the form of linear programming (PL) models. • Interpretation of results - objective function, constraints, decision variables • Simplex method, graphical solution of two-dimensional models • Practical applications of PL in logistics, production planning, resource allocation Learning outcomes: • The student is able to build PL models for real business problems • Independently solves optimization tasks and interprets the results in the context of operational efficiency 2 Theory of integer programming Learning Content: • Models with integer and binary constraints (0-1) • Differences between linear and integer programming • Algorithms: branch and bound method, Gomory's cut method • Applications: scheduling, yes/no decisions, investment project selection Learning outcomes: • The student knows the methods of solving integer problems and can apply them in strategic planning • Knows how to transform a decision-making problem into an appropriate mathematical model 3 Network flows and heuristics Educational content: • Classical network problems: shortest path, maximum flow, cheapest flow • Representation of processes as network graphs (network model) • Algorithms: Dijkstra, Ford-Fulkerson, Kruskal, Prima • Heuristics and meta-heuristics (e.g., greedy algorithm, genetic algorithms, simulated annealing) as approaches to complex problems Learning outcomes: • Students are able to model and analyze process flows from a network perspective • Knows how to apply algorithms and heuristics to solve operational optimization problems 4 Decision trees Learning Content: • Creating decision trees as a decision support tool • Calculating expected value and making decisions under uncertainty • Applications of decision trees in risk analysis, investment scenarios and operational strategy • Principles of building transparent and interpretable trees (e.g., decision tools in Excel or Python) Learning outcomes: • The student is able to create and interpret decision trees, taking into account risk and probability factors • Can apply the technique to make rational strategic decisions 5 Behavioral economics Learning Content: • The role of psychology and cognitive behavior in economic decision-making • Heuristics and cognitive errors (e.g., anchoring effect, overconfidence) • Application of behavioral economics principles in the analysis of management effectiveness • Experiments and case studies - analysis of real decision-making situations Learning outcomes: • The student is able to identify irrational patterns in decision-making behavior • Understands the impact of behavioral factors on the efficiency of the enterprise and is able to take them into account in optimization analysis
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Prerequisites and co-requisites	The student should understand the diversity of business and economic entities. He should understand the role of enterprise information systems as sources of information in the formulation and solution of decision-making problems. The course uses knowledge and skills derived from mathematics, statistics and accounting.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Written exam	51.0%	100.0%
Recommended reading	Basic literature	Makuch, M. A. (2012). Decyzje podmiotów gospodarczych w ujęciu ekonomii behawioralnej. <i>Studia i Prace Wydziału Nauk Ekonomicznych i Zarządzania Uniwersytetu Szczecińskiego</i>, 27. Zaleśkiewicz, T. (2011). <i>Psychologia ekonomiczna</i>. Warszawa: Wydawnictwo Naukowe PWN. Godłów-Legiędź, J. (2013). Ekonomia behawioralna: od koncepcji racjonalności do wizji ustroju ekonomicznego. <i>Ekonomia</i>, (25), 24-41. Łańcuchowska, M. (2013). Podejmowanie decyzji w warunkach ryzyka. In <i>Finanse, rachunkowość i zarządzanie Polska, Europa, Świat 2020</i>. Wydawnictwo Uniwersytetu Łódzkiego.	
	Supplementary literature	Wornalkiewicz, W. (2023). Implementacja procedury optymalizacji usług logistycznych. Zeszyty Naukowe Wyższej Szkoły Technicznej w Katowicach, 16. Kociemba, D. (2020). Możliwości wykorzystania dodatku Solver w celu optymalizacji zadań logistycznych-studium przypadków. <i>Przedsiębiorczość i Zarządzanie</i>, 21(4), 133-148. Waśniewski, J., & Strumiłło, J. (2022). Uwarunkowania digitalizacji usług zdrowotnych. Wydawnictwo Uniwersytetu Gdańskiego. Ignaciuk, E., Markiewicz, M., Bednarz, J., Letkiewicz, A., Jarocka, M., Suchanek, M., ... & Nowosielski, T. (2014). Optymalna alokacja zasobów w systemach gospodarczych i gospodarujących. Ignaciuk, E., Markiewicz, M., Bednarz, J., Letkiewicz, A., Jarocka, M., Suchanek, M., ... & Nowosielski, T. (2014). Optymalna alokacja zasobów w systemach gospodarczych i gospodarujących.	
	eResources addresses	Adresy na platformie eNauczanie:	
	Example issues/ example questions/ tasks being completed		
Work placement	Not applicable		

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