University of Gdańsk

Subject card

Subject name and code	Techniques for Enterprise Performance Optimisation, PG_00199881		
Field of study	Economics		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2028/2029
Education level	Bachelor's studies	Subject group	Obligatory subject group in the field of study Optional subject group Subject group related to scientific research in the field of study
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	3.0
Learning profile	academic	Assessment form	credit
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, prof. UG	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	8.0	10.0	0.0	6.0	0.0	24

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	24	0.0	51.0	75

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_W07] has an advanced knowledge of the 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 [SW2] presentation/project/paper/ report
	[EKONL3_W03] knows 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 [SW2] presentation/project/paper/ report
	[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 [SW2] presentation/project/paper/ report
	[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	[SK2] presentation/project/paper/ report [SK4] 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 [SW2] presentation/project/paper/ report
	[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	[SK2] presentation/project/paper/ report [SK4] test/exam - oral or written
	[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	[SU2] presentation/project/paper/ report [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	[SK2] presentation/project/paper/ report [SK4] 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.	[SU2] presentation/project/paper/ report [SU4] test/exam - oral or written
	[EKONL3_W05] has a 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 [SW2] presentation/project/paper/ report
	[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	[SU2] presentation/project/paper/ report [SU4] test/exam - oral or written
	[EKONL3_W02] has an 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 [SW2] presentation/project/paper/ report

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.	[SU2] presentation/project/paper/ report [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

<table>
<tr><td>Prerequisites and co-requisites</td><td colspan="3">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.</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>Pass/fail assessment is based on attendance and participation in classes, the results of tests and assessments, and the completion of a project. Students work in teams of 3–4 to prepare a project on optimisation techniques, which is discussed and approved during consultations with the lecturer and then presented in class. The grading scale is in accordance with the Study Regulations.</td><td>51.0%</td><td>100.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td colspan="2">Makuch, M. A. (2012). Decyzje podmiotów gospodarczych w ujęciu ekonomii behawioralnej. Studia i Prace Wydziału Nauk Ekonomicznych i Zarządzania Uniwersytetu Szczecińskiego, 27.

Zaleśkiewicz, T. (2011). Psychologia ekonomiczna. Warszawa: Wydawnictwo Naukowe PWN.

Godłów-Legiędź, J. (2013). Ekonomia behawioralna: od koncepcji racjonalności do wizji ustroju ekonomicznego. Ekonomia, (25), 24-41.

Łańcuchowska, M. (2013). Podejmowanie decyzji w warunkach ryzyka. In Finanse, rachunkowoć i zarządzanie Polska, Europa, Świat 2020;. Wydawnictwo Uniwersytetu Łódzkiego.</td></tr>
<tr><td>Supplementary literature</td><td colspan="2">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. Przedsiębiorczość i Zarządzanie, 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.</td></tr>
<tr><td>eResources addresses</td><td colspan="2"></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>
</table>

Document generated electronically. Does not require a seal or signature.