

# SYLLABUS

Teacher					
Course	Optimization Methods and Decision Models in Logistics and Transport				
Module	Compulsory subjects	ECTS	5	Course code	23SM.P.LA.22

Major	Speciality	Academic year		
LOGISTICS	Industrial systems engineering	2023/2024		
Semester	Fourth	Year of studies	Second	

Type of studies	Full-time				Extramural			
Type of classes	Lecture	Exercise	Laboratories	Project	Lecture	Exercise	Laboratories	Project
Amount of hours	30	10	20					
TOTAL	60							

Course objectives	Upon completion of this course, the student will be able to formulate logistics and transport decision problems using optimisation models, apply quantitative methods to support decision-making, and use analytical tools to evaluate alternative solutions. The course focuses on optimisation techniques, decision models, and their application in logistics and transport systems.
-------------------	---

Minimum knowledge required from the student before the classes beginning	
Familiarity with linear algebra is required	

Recommended literature to study before the classes beginning	
Meckes E.S., Meckes M.W., <i>Linear Algebra</i> 1st Edition, Cambridge Mathematical Textbooks, 2018	

LEARNING OUTCOMES			KEK	METHODS OF ASSESSMENT	
KNOWLEDGE	K01	Apply theoretical knowledge to use appropriate optimisation and decision-making tools for modelling logistics and transport processes	K2_W04_L_P	EM5 EM9	Written examination with practical tasks
	K02	Explain and apply methods of quantitative and mathematical analysis in logistics decision-making contexts	K2_W02_L_P	EM1 EM9	Oral exam. Written test with computational tasks
	K03	Explain and apply modern optimisation methods and decision models in logistics and transport systems and understand their interdependencies with other functional areas	K2_W03_L_P	EM1 EM9	Oral exam. Written test with computational tasks
	K04	Understand the role of decision-making models in logistics services, including conditions of uncertainty and complex operational environments	K2_W06_L_P K2_W07_L_P	EM1 EM15	Oral exam. Evaluation of activity in the class-room
SKILLS	S01	Use integrated knowledge from various logistics fields to identify, analyse and solve decision problems in logistics and transport	K2_U01_L_P	EM1 EM10	Oral exam. Written test in the form of open tasks. Project evaluation
	S02	Apply optimisation methods and decision models using IT tools and present results in English	K2_U03_L_P K2_U09_L_P	EM10 EM15	Project evaluation Evaluation of activity in the class-room
	S03	Demonstrate basic skills in developing and implementing analytical and optimisation models	K2_U04_L_P K2_U09_L_P	EM1 EM8	Oral exam. Written test in the form of open tasks
	S04				
SOCIAL COMPETENCE	SC01	Demonstrate the ability to identify and resolve professional dilemmas related to decision-making in logistics and transport	K2_K02_L_P	EM16	Assessment of the work, students co-operation in
	SC02	Apply analytical thinking and act in an entrepreneurial way in solving optimisation problems	K2_K02_L_P	EM15 EM16	Evaluation of activity in the lab. Project evaluation
	SC03	Cooperate in teams in the development of decision models, considering economic, technical and organisational aspects and the consequences of decisions	K2_K05_L_P	EM15 EM16	Evaluation of activity in the lab. Project evaluation Evaluation of activity in the classroom

	Introduction to optimisation in logistics and transport Decision models in logistics systems Linear programming and optimisation models Graphical and simplex methods Sensitivity analysis and duality
--	--

<b>Course contents</b>	Lecture	<p>Sensitivity analysis and duality</p> <p>Transportation and assignment models</p> <p>Network optimisation models (shortest path, MST, max flow)</p> <p>Integer programming and decision constraints</p> <p>Dynamic programming in logistics decisions</p> <p>Queueing models in decision-making</p> <p>Nonlinear optimisation models</p> <p>KKT conditions and advanced optimisation</p>
	Exercises	<p>Formulation of logistics decision problems using linear programming models</p> <p>Sensitivity analysis and interpretation of optimisation results in logistics systems</p> <p>Multi-criteria decision-making in transport and logistics problems</p> <p>Optimisation of distribution routes using decision models</p> <p>Comparative analysis of alternative logistics solutions using quantitative methods</p> <p>Application of decision-support tools in transport planning problems</p>
	Laboratories & project	<p>Construction and solving optimisation models</p> <p>Application of simplex and goal programming</p> <p>Transport models (cost/time optimisation)</p> <p>Decision modelling using MS Excel / OR tools</p> <p>Integer and dynamic programming applications</p> <p>Queueing and nonlinear models</p> <p>Development of decision-support solutions</p>

<b>Teaching methods</b>	TM2	A lecture with a multimedia presentation, topic-related films, discussions
	TM11	
	TM14	Laboratories – experiment and laboratory analysis
	TM8	Project method

<b>Obligatory literature</b>	1	Hillier F.S., Lieberman G.J., Introduction to Operations Research, McGraw-Hill Education, 2021
	2	Albright S.C., Winston W.L., Business Analytics: Data Analysis and Decision Making, Cengage Learning, 2020
	3	Chopra S., Supply Chain Management: Strategy, Planning, and Operation, Pearson, 2019

<b>Additional literature</b>	1	Min H., Global Business Analytics Models: Concepts and Applications in Predictive, Descriptive and Prescriptive Analytics, Springer, 2018
	2	
	3	

<b>Requirements to pass the course</b>		
<p>Exercises are evaluated on the basis of the student's activity during the classes and on the basis of a written colloquium.</p> <p>The laboratory consists of practical classes that are assessed on an ongoing basis for the performance of the lecturer's instructions and for activity in the classroom. Students solve tasks individually and in teams.</p> <p>The subject ends with an oral exam, which refers to the content presented at the lectures.</p>		