COURSE DESCRIPTION CARD - SYLLABUS

Course name
Decision making and aiding in logistics [S2Log2E-SL>PiWDwL]

Course

Field of study
Logistics

Year/Semester
2/3

Area of study (specialization)
Logistics Systems

Profile of study
general academic

Level of study
second-cycle

Course offered in
English

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
0

Other (e.g. online)
0

Tutorials
0

Projects/seminars
15

Number of credit points

2,00

Coordinators

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Lecturers

Prerequisites

Student has a basic background in logistics, mathematical modeling and quantitative (operations research) methods. He/ she can carry out analytical tasks and manage projects as well as apply operations research methods in logistics. He/ she is able to perform a team work.

Course objective

To familiarize students with the basic concepts, paradigms and terms of decision making and aiding and show them how to apply the methodology of decision making and aiding in logistics. The course intends to present a spectrum of decision making and aiding tools and their application in solving complex logistics decision problems.

Course-related learning outcomes

Knowledge:
1. Student knows dependencies in the area of decision making and aiding in logistics [P7S_WG_01]
2. Student knows issues in the field of decision making and aiding and its connections with the field of logistics [P7S_WG_02]
3. Student knows extended concepts for logistics and its specific issues in the area of decision making

and aiding [P7S_WG_05]
4. Student knows the detailed methods, tools and techniques characteristic of the decision making and aiding in logistics [P7S_WK_01]
5. Students knows extended issues in the field of mathematics and optimization methods in studying the structure of economic and logistic phenomena and systems in the field of decision making and aiding [P7S_WG_04]

Skills:
1. Based on the literature review and analysis of other sources of information, student can collect and provide, in an orderly manner, information on the problem within the framework of logistics and its specific issues in the area of decision making and aiding [P7S_UW_01]
2. Student can communicate using appropriately selected resources in a professional environment and in other environments within logistics and its specific issues within decision making and aiding process [P7S_UW_02]
3. Student can make a critical analysis of technical solutions used in the analyzed logistics system (in particular with regard to technical devices, objects and processes) within decision making and aiding process [P7S_UW_04]
4. Student can assess the suitability and the possibility of using new achievements (techniques and technologies) within decision making and aiding process in logistics [P7S_UW_06]
5. Student can formulate and solve tasks through interdisciplinary integration of knowledge from different fields and disciplines used to design logistics systems within decision making and aiding process in logistics [P7S_UO_01]
6. Student can identify changes in requirements, standards, regulations, technological development and behaviour of the labor market. Based on their recognition he/she is able to determine the needs to extend and enhance his/ her own and others' knowledge within decision making and aiding process in logistics [P7S_UU_01]

Social competences:
1. Student recognizes cause - effect relationships in achieving the defined goals and is able to grade the significance of alternative or competitive tasks within decision making and aiding process in logistics [P7S_KK_01]
2. Student is responsible for his/ her own work and ready to comply with the rules of working in a team and taking responsibility for the tasks carried out jointly within decision making and aiding process in logistics [P7S_KR_01]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Formative assessment: homeworks, discussions summarizing individual lectures, giving the student the opportunity to assess the understanding of the problem, active participation in lectures. Final assessment: 45 minute written exam in the subject, test composed of 20-25 questions (open and closed), passing threshold - 50%.
Project: Formative assessment: assessment of class activities, active participation in classes. Final assessment: grading the project in the field of decision making and aiding in logistics, evaluation of the student's skills in mathematical modeling of the decision problem and his/ her ability to perform computational experiments.

Programme content

The essence of decision making and decision aiding in logistics. Selected case studies concerning logistics decision processes with the description of the role of main subjects / participants of these processes.

Course topics

Lecture: Introduction to the topic. The essence of Decision Making (DM) and Decision Aiding (DA) in logistics. Content of the lecture and characteristics of the projects. Definition and basic characteristics of Decision Making (DM) and Decision Aiding (DA). Similarities and differences. The scheme/ paradigm and stakeholders/ participants of DM and DA processes in logistics. Major decision problems in logistics - their features and solution procedures. Classification of logistics decision problems. Multiple criteria character of decision processes in logistics. Major standards of logistics customer's service (6 R concept)

and their implications - multiple criteria evaluation of logistics solutions. The Methodology of Multiple Criteria Decision Making/ Aiding (MCDM/A) - historical background, major methodological schools (French/ European vs. American). Utility Function and Outranking Relation. Basic terms and concepts of MCDM/A (Multiple criteria decision problem - MCDP, variants, consistent family of criteria, Pareto optimal solution, Maximal Point and Nadir Point, etc.), classification of MCDM/A methods. Solving selected categories of decision problems in logistics. Ranking problems, sorting problems, choice (optimization) problems. Application of appropriate solution procedures. Phases of decision problems recognition and solving. Characteristics of alternative approaches: multiple criteria matehmatical programming, multiple criteria ranking procedures, multiple criteria sorting methods. Description and characteristics of selected MCDM/A methods - Electre, AHP/ANP, Promethee, UTA, VIG, LBS, Mackbeth. Case studies and practical demonstration of selected MCDM/A methods. Analysis and solving selected real life logistics decision problems, Case studies. Scheduling of logistics processes; selection of logistics service providers; location analysis in logistics; fleet composition problem; evaluation of warehouses/ distribution centers.
Project: Application of the MCDM/A methodology. Solving a selected decision problem. Analysis and selection of certain decision problems for project analysis. Demonstrating the multiple criteria character of the selected decision problems. Proving their importance in logistics. Practical identification of a selected decision problem and its verbal description. Definition of the essence of the problem, circumstances and constraints. Recognition of stakeholders and their major interests. Definition of the Decision Maker and his/ her objectives. Defining the category of the decision problem (chioce, ranking, sorting). Mathematical modeling - structuring of the decision problem. Definition of variants/ solutions, constratints and consistent family of criteria. Recognition of the DM's and stakeholders expectations and preferences. Mathematical formulation of the decision problem. Review and assessment of selected MCDM/A methods. Selection of a certain method for computational experiments that best fits the character of the decision problem, e.g. Electre, AHP. Solving the decision problem. Performing computational experiments with the application of a selected MCDM/A method. Preference modeling. Generating final solutions. Review and analysis of solutions. Finding a compromise solution.

Teaching methods

Lecture: conversatory lecture; interactive discussion.
Project: project method; practical analysis of the decision problem; computational experiments.

Bibliography

Basic:
1. Żak J., Multiple Criteria Decision Making/ Aiding in Engineering.Teaching Materials, Poznań University of Technology, EU Program - "Engineer of the Future", Poznań, 2014.
2. Żak J., The Methodology of Multiple Criteria Decision Making/Aiding in Transportation [w:] Żak J., Hadas Y., Rossi R.(Eds.), Advanced Concepts, Methodologies and Technologies for Transportation and Logistics, Springer, Heidelberg, 2018, s. 9-38.
3. Żak J., The Methodology of Multiple Criteria Decision Making/Aiding as a System-Oriented Analysis for Transportation and Logistics [w:] Świątek J., Tomczak J., Advances in Systems Science - Proceedings of the International Conference on Systems Science 2016, Springer, Heidelberg, 2017, s. 265-284.

Additional:
1. Figueira J., Greco S., Ehrgott M., Multiple Criteria Decision Analysis. State of the Art Surveys, Springer, New York, 2005.
2. Koksalan M., Wallenius J., Zionts S., Multiple Criteria Decision Making. From Early History to the 21st Century, World Scientific, New Jersey - London - Singapore, 2011.

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	20	1,00