COURSE DESCRIPTION CARD - SYLLABUS

Course name
Optimization methods in transport and logistics 2 [N1Trans1>MOwL2]

Course

Field of study
Transport

Year/Semester
3/6

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
part-time

Requirements
elective

Number of hours

Lecture
9

Laboratory classes
9

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

1,00

Coordinators

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Lecturers

Prerequisites

KNOWLEDGE: the student has a structured, theoretically founded knowledge of technology, transport systems and various means of transport. SKILLS: the student is able to properly use information and communication techniques, applicable at various stages of the implementation of transport projects. SOCIAL COMPETENCIES: the student understands that in technology, knowledge and skills very quickly become obsolete.

Course objective

Learning the techniques of making managerial decisions in the field of transport and logistics in the selection and effective use of technical and human resources.

Course-related learning outcomes

Knowledge:
The student has knowledge of important directions of development and the most important technical achievements and other related scientific disciplines, in particular transport engineering.
The student knows the basic techniques, methods and tools used in the process of solving tasks in the field of transport, mainly those of an engineering nature.

The student has a basic knowledge of managing / running a business and an individual entrepreneurship.

Skills:
The student is able - when formulating and solving transportation tasks - use appropriately selected methods, including analytical, simulation or experimental methods.
The student is able to assess the computational complexity of algorithms and transport problems.
The student has the ability to formulate tasks in the field of transport engineering and their implementation using at least one of the popular tools.

Social competences:
The student is able to think and act in an entrepreneurial way, e.g. finding commercial applications for the created system, taking into account not only the business benefits, but also the social benefits of the conducted activity.
The student is aware of the importance of knowledge in solving engineering problems, knows examples and understands the causes of malfunctioning transport systems that have led to serious financial and social losses or to serious loss of health and even life.
The student correctly identifies and resolves the dilemmas related to the profession of a transport engineer.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:
In the lecture part: the workshop based on a team solution to a given decision problem. Written test summarizing the lectures, in the form of a multiple-choice test. In the laboratory part: activity during classes and ongoing preparation for classes. Implementation of laboratory tasks individually and in groups. Periodic written checking of preparation for classes.

Programme content

The moduł is composed of the following items:
1. Binary programming applied to scheduling.
2. Selected network problems.
3. Numerical techniques applied to solving selected network problems.
4. Transport planning models in supply chains.
5. Facility location models in supply chains.
6. Models of multilevel supply chains.

Course topics

Lecture and laboratory classes are closely related. On the basis of the content presented during the lectures, the tasks (in most cases problematic, based on case studies) are performed during the laboratory classes.
1. Introduction (M0).
Key concepts related to the decision-making process and building a mathematical model; presentation of the main thematic areas and discussion of the detailed program, i.e .: module 0 (M0): introduction, module 1 (M1): selection and use of resources, module 2 (M2): building supply chains. Formulating an exemplary decision problem in which an intuitive solution is sought, and the effectiveness of the solution is checked in the form of a mathematical model (formal record of the decision problem) and solved with the use of an optimisation engine (Solver Platform for MS Excel).
2. The scheduling problem (a developed resource allocation problem); application of a binary programming (M1).
Formulating the resource allocation problem as a simplification of the scheduling problem. Analysis of the problem of assigning employees to tasks within the defined time frame of task execution. Building a mathematical model in the form of a binary programming task and solving the problem using Solver for MS Excel.
3. The supply chain model design; 1Po-1Pr-KT model (M2).
Modeling, optimisation and practical application of the 1-tier (n = 1), 1-product (p = 1) supply chain, based on the transport cost (KT) function. The essence and solving a balanced and unbalanced problem.

Application of Solver for MS Excel.
4. The supply chain model design; 1Po-1Pr-KT+KM model (M2).
Modeling, optimisation and practical application of the 1-tier (n = 1), 1-product (p = 1) supply chain, based on the joint transport cost (KT) and warehousing cost (KM) function. The essence and solving a balanced and unbalanced problem. Application of Solver for MS Excel.
5. The supply chain model design; 2Po-1Pr-KT model (M2).
Modeling, optimisation and practical application of the 2-tier (n = 2), 1-product (p = 1) supply chain, based on the transport cost (KT) function. Solving an exemplary problem with Solver for MS Excel.
6. Summary on M1 and M2.
Final test.

Teaching methods

1. Problem lecture with a multimedia presentation.
2. Workshop methods.
3. Case study.
4. Laboratories - computational experiments.

Bibliography

Basic
1. Ignasiak E. (red.): Badania operacyjne. PWE, Warszawa, 2001 (in Polish).
2. Sawicki P.: Optymalizacja w transporcie. Politechnika Poznańska, Wydział Inżynierii Lądowej i Transportu, Poznań 2024. E-skrypt available at: http://piotr.sawicki.pracownik.put.poznan.pl/dydaktyka/_-metody-optymalizacji-w/
Additional
1. Christopher M.: Logistyka i zarządzanie łańcuchem dostaw. Polskie Centrum Doradztwa Logistycznego, Warszawa, 2000 (in Polish).
2. Harmon M.: Step-by-Step Optimization with Excel Solver, www.ExcelMasterSeries.com, 2011.
3. Kukuła K. (red.): Badania operacyjne w przykładach i zadaniach, Wydawnictwo Naukowe PWN, Warszawa, 2011 (in Polish).
4. Sawicki P.: Wielokryterialna optymalizacja procesów w transporcie, Wydawnictwo Instytutu Technologii Eksploatacji, Radom, 2013 (in Polish).
5. Szapiro T. (red.): Decyzje menedżerskie z Excelem, PWE, Warszawa, 2000 (in Polish).

Breakdown of average student's workload

	Hours	ECTS
Total workload	40	1,00
Classes requiring direct contact with the teacher	18	0,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	22	0,50