



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Management of road transportation systems [S2Trans1-TrD>ZSTD]

Course

Field of study

Transport

Year/Semester

2/3

Area of study (specialization)

Road Transport

Profile of study

general academic

Level of study

second-cycle

Course offered in

Polish

Form of study

full-time

Requirements

compulsory

Number of hours

Lecture

30

Laboratory classes

0

Other

0

Tutorials

0

Projects/seminars

15

Number of credit points

3,00

Coordinators

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Lecturers

Prerequisites

Knowledge: student has a basic knowledge of mathematics and operational research moreover transportation and management as well Skills: student is able to accumulate information, interpret it, reasoning based on it, express and justify opinions, identify, associate and interpret phenomena occurring in a practice Social competence: student is aware of the importance and understands non-technical aspects and effects of transportation processes, including those coming from transportation management

Course objective

To prepare students for management of transportation systems and make them familiar with single and multicriteria methods that allow for optimization of real life transportation systems.

Course-related learning outcomes

Knowledge:

Student knows advanced methods, techniques and tools used in solving complex engineering tasks and conducting research in a selected area of transport

Skills:

Student is able to use analytical, simulation and experimental methods to formulate and solve engineering tasks and simple research problems

Social competences:

Student understands that in the field of transport engineering, knowledge and skills very quickly become obsolete

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:

Lectures: a recapitulation written exam.

Project: presentation in subgroups of a solution to one of the case studies carried out during the semester (assigned randomly).

Programme content

The content of the module program:

- 1) The concepts of optimization and decision making.
- 2) The single-criterion optimization and principles of creating mathematical models of decision problems.
- 3) An application of optimization tools.
- 4) Multi-criteria decision making/aid – MCDM/MCDA.
- 5) Basic decision problems in transportation management.

Course topics

The content of lectures:

- 1) The make-or-buy problem. Definitions and the essence of the make-or-buy problem in transport/logistics enterprises (own or foreign transport/logistics).
- 2) The fleet sizing/composition problem. Definitions of the problem of determining the size/composition of fleet in the transport/logistics enterprise; the essence of the problem and its peculiarities; elements affecting the size/composition of fleets. An application of the Queue Theory.
- 3) Fleet replacement problem. Definitions of the problem of replacing rolling stock in a transport/logistics enterprises; the essence of the problem and its specifics; strategies for replacing vehicles and their practical application; TCO.
- 4) Distribution planning problem. Definitions of the distribution planning problem; the essence of the problem and its peculiarities; distribution networks and their structure; distribution network design methods.
- 5) Vehicle Routing Problem (VRP). Definitions of the VRP; the essence of the problem and its specifics; algorithms for solving the VRP. Route planning by forwarders/planners (manual one) and by TMS class software (algorithmic one).
- 6) The problem of selecting/evaluating a transportation subcontractor (carrier). Definitions of the carrier selection problem; the essence of the problem and its specifics; application of the Multi-Criteria Decision Making/Aid – MCDM/MCDA. Definitions and essence of the MCDM/MCDA, classification and review of methods; principles of creating decision-maker preference models.

The content of the project (adjusted to the lectures program):

- 1) The make-or-buy problem - case study.
- 2) The fleet sizing/composition problem - case study.
- 3) The vehicle replacement problem - case study.
- 4) The distribution network design problem - case study.
- 5) The Vehicle Routing Problem (VRP) - case study.
- 6) The problem of selecting/evaluating a transportation subcontractor (carrier) - case study.

Teaching methods

1. Lectures including multimedia presentation, movies
2. Project - case studies

Bibliography

Basic

1. Sikora W. (red.): *Badania operacyjne*. Polskie Wydawnictwo Ekonomiczne, Warszawa 2008 (in Polish)
2. Hillier F., Lieberman G.: *Introduction to Operations Research*. McGraw Hill Publishing, New York 2002
3. Wagner H.: *Badania operacyjne: zastosowania w zarządzaniu*. Polskie Wydawnictwo Ekonomiczne, Warszawa 1980 (in Polish)
4. Figueira J., Greco S., Ehrgott M. (eds.): *Multiple Criteria Decision Analysis. State of the Art. Surveys*. Springer, New York 2005

Additional

1. Jędrzejczak Z., Kukła K., Skrzypek J., Walkosz A.: *Badania operacyjne w przykładach i zadaniach*. Wydawnictwo Naukowe PWN, Warszawa 2005 (in Polish)
2. Jacyna M.: *Modelowanie wielokryterialne w zastosowaniu do oceny systemów transportowych*. Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2001 (in Polish)

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	45	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00