



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Decision aiding in transport [S2TIIZM1E>WDwT]

Course

Field of study

Information Technology for Smart and Sustainable Mobility

Year/Semester

2/3

Area of study (specialization)

–

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

15

Other

0

Tutorials

0

Projects/seminars

15

Number of credit points

3,00

Coordinators

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Lecturers

Prerequisites

Knowledge: the student has a basic knowledge of transport, its role in the economy and society. Skills: the student is able to interpret phenomena occurring in organizations, formulate opinions, and draw conclusions. Social competencies: the student is able to work in a group, shows independence in solving problems, acquiring and improving the knowledge.

Course objective

Learning the concepts of decision aiding and making in the field of transport, including decision problems, how to solve them and implement improvements in transport companies.

Course-related learning outcomes

Knowledge:

The student has advanced and detailed knowledge of selected issues related to the application of IT tools in transport systems, including familiarity with concepts related to the decision-making process. The student demonstrates knowledge of advanced methods, techniques, and tools used for solving complex engineering tasks and conducting research in a selected area of transport engineering,

particularly multi-criteria decision support methods.

Skills:

The student is able-when formulating and solving engineering tasks related to decision-making-to integrate knowledge from various fields of transport, computer science, and mathematics, and to apply a systems approach that also takes non-technical aspects into account.

The student is able-by applying, among others, multi-criteria decision support methods-to select an appropriate method for solving a decision-making problem and to solve complex tasks in the field of transport engineering, including non-standard tasks and those involving a research component, as well as to carry out tasks under conditions that are not fully predictable.

Social competences:

The student is prepared to critically assess their knowledge and understands that in transport engineering and computer science, knowledge and skills become outdated very quickly

The student understands the importance of using the latest knowledge in transport engineering to solve research and practical problems

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Learning outcomes presented above are verified as follows:

Activity during lectures, including participation in discussions and ongoing preparation for classes.

Workshops consisting of team solving a given decision problem. In the laboratory classes part: activity during classes and ongoing preparation for classes. Implementation of laboratory tasks individually and in groups. Periodic checking of preparation for classes in writing. In the project part: implementation and presentation of transport system projects, subject to multicriteria evaluation, along with the computational experiments and the analysis of the obtained results. Written exam to verify the learning outcomes.

Programme content

The course is composed of the following items:

1. Decision situation.
2. Multiple Criteria Decision Aiding (MCDA).
3. Decision Aiding Methods.
4. Axiomatic Analysis of Selected MCDA Methods.
5. Selection of the Most Suitable MCDA Method.

Course topics

Lectures 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. Reminder of key concepts related to the decision-making process; introduction to issues related to decision problems in transport and how to solve them. Presentation of the main thematic areas and discussion of the detailed program of activities.
2. Decision problem analysis. The essence of decisions made in transport. Basic entities involved in the decision-making process and their impact on the decision aiding process. Case study.
3. Types of decision problems in transport, their essence and characteristics. Creating a mathematical model for the ranking problem, including evaluation criteria, a performance matrix and a model of decision maker's preferences. Case study.
4. Characteristics of various methodological trends in the area of decision aiding methods. Presentation of selected decision aiding methods. Solving decision problems with the application of various decision aiding methods.
5. Selection of the most suitable method allowing to solve a decision problem - basic stages. Sensitivity analysis. Case study.
6. The application of a selected method to solve a decision problem in a transport company. Workshops.
7. Summary of lectures and laboratory classes. Written exam.

Project classes

1. Introduction to the project, including definition of the purpose and the scope of the course. A

reminder of the basic information on decision aiding and decision model design with an application of decision aiding methods.

2. Presentation of the concepts of projects implemented by students, including: general characteristics of the modeled transport systems, definition of decision problems, presentation of the analyzed processes in the form of flowcharts.

3. Presentation of the individual stages of the project implementation - data, selection of the most suitable decision aiding method and computational experiments. Discussion of the problems that occur.

4. Final presentations of transport systems projects - assumptions, decision model, analysis of research results.

Teaching methods

1. Problem lecture with a multimedia presentation.

2. Case study.

2. Workshop methods.

4. Laboratory classes - computational experiments.

5. Project method - individual or team implementation of a large, multi-stage practical task, the result of which is the creation of a work in the form of a solved decision problem with analyzes.

Bibliography

Basic:

1. Belton V., Stewart T.J.: Multiple Criteria Decision Analysis. An Integrated Approach. Kluwer Academic Publishers, London, 2002.

2. Sawicka H.: Decision Aiding in Transport. Lecture materials, Poznan University of Technology

3. Vincke P.: Multicriteria Decision-Aid. John Wiley & Sons, Chichester, 1992.

Additional:

1. Figueira J., Ehrgott M., Greco S. (eds.): Multiple Criteria Decision Analysis: State of the Art Surveys. Springer-Verlag, New York, 2005.

2. Keeney R., Raiffa H.: Decisions with Multiple Objectives. Preferences and Value Tradeoffs. Cambridge University Press, Cambridge, 1993.

3. Lotfi V., Pegels C.: Decision Support Systems for Management Science / Operations Research. Irwin, Homewood-Boston, 1989.

4. Macharis C. (ed.): Decision Making for Sustainable Transport and Mobility. Edward Elgar Publishing, Cheltenham, 2018.

5. Roy B.: Multicriteria Methodology for Decision Aiding. Springer Science+Business Media, Dordrecht, 1996.

6. Saaty T.L.: The Analytic Hierarchy Process: Planning, Priority Setting, Resource Allocation, Mc-Graw Hill, New York, 1980.

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