COURSE DESCRIPTION CARD - SYLLABUS

Course name
Multi-Criteria Decision Models in Business [S1DSwB1>WMDwB]

Course

Field of study
Data Science in Business

Year/Semester
2/4

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
15

Laboratory classes
0

Other
0

Tutorials
30

Projects/seminars
0

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

Students are expected to have analytical thinking skills, the ability to solve decision-making problems, and the capability to interpret data in a business context. Basic competencies in management, logical reasoning, and data handling will be useful. Openness to making decisions under uncertainty is also important.

Course objective

The aim of this course is to develop skills in analyzing and optimizing business decisions using multi-criteria methods, enabling the evaluation of alternatives based on multiple criteria and the application of modern decision-support tools.

Course-related learning outcomes

Knowledge:
Characterizes the classification of decision problems and methods of multi-criteria decision analysis

[DSB1_W01].
Describes methods for determining the weights of decision criteria and their impact on analysis results in a business context [DSB1_W05].
Explains the application of decision support systems in project management, market analysis, and finance [DSB1_W07].

Skills:
Selects appropriate information sources and analytical tools for solving decision-making problems in business [DSB1_U01].
Applies multi-criteria decision-making methods, considering the specificity of the problem and the strategic goals of the organization [DSB1_U02].
Analyzes decision data, visualizes the hierarchy and networks of dependencies between criteria, and assesses the quality of results obtained in the decision-making process [DSB1_U04].
Formulates the specification of decision problems, taking into account fuzzy logic and grey system theory [DSB1_U05].
Justifies the choice of multi-criteria analysis methods and critically evaluates the effectiveness of different approaches in a business context [DSB1_U11].

Social competences:
Utilizes current scientific achievements in the field of multi-criteria methods and their application in business [DSB1_K02].
Takes responsibility for the quality and reliability of decisions made, considering their impact on the strategic functioning of the organization [DSB1_K05].

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture:
There are two tests, each graded in the form of points-50 points per test. The final grade is determined by the sum of points from both tests. The first test takes place midway through the course, while the second is held at the end. The passing threshold is a total of 50 points from both tests.
Laboratories:
Students receive two graded assessments. The first involves preparing a case study on solving a selected business problem using multi-criteria decision-making methods specified by the instructor, worth up to 50 points. The second assessment is a test, also worth 50 points. The passing threshold is a total of 50 points from all activities.

Programme content

The course covers the theoretical and practical aspects of decision-making in multi-criteria environments. Students will learn about the classification of decision problems, methods for determining criterion weights, and various decision analysis and optimization techniques, such as SAW, TOPSIS, VIKOR, AHP, ANP, DEMATEL, PROMETHEE, and ELECTRE. The course will also explore the applications of decision models in business, including project management, market analysis, finance, and decision support systems. Additionally, modern approaches such as fuzzy logic and grey system theory will be discussed.

Course topics

Introduction to multi-criteria decision theory
Types of decision problems and classification of multi-criteria methods
Decision criteria - their nature and methods for determining weights
SAW (Simple Additive Weighting) method - classical weighted approach
TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) method
VIKOR method - compromise-based decision-making
Analytic Hierarchy Process (AHP) - hierarchical decision-making
Analytic Network Process (ANP) - extending AHP to dependency networks
DEMATEL method - analysis of interrelationships between criteria
PROMETHEE (Preference Ranking Organization Method for Enrichment Evaluations)
ELECTRE (Elimination and Choice Expressing Reality) - dominance-based methods

Multi-criteria decision models in market analysis and business strategy
Application of multi-criteria methods in project management
Use of decision models in finance and investment evaluation
Decision support systems and their implementation in business
Modern decision-making approaches (fuzzy logic or grey system theory)

Teaching methods

Lectures: Problem-based lecture, case study presentation
Laboratories: Analysis of real-world data, practical group tasks, case study analysis

Bibliography

Basic:
Nermend, K. (2017). Metody analizy wielokryterialnej i wielowymiarowej we wspomaganiu decyzji. Wydawnictwo Naukowe PWN
Trzaskalik, T. (2014). Wielokryterialne wspomaganie decyzji. Przegląd metod i zastosowań, Zeszyty Naukowe Politechniki Śląskiej, 74, 1921

Additional:
Roy, B. (1990). Wielokryterialne wspomaganie decyzji. WNT. Warszawa
Mierzwiak, R., Nowak, M. (2020). Modele decyzyjne w teorii systemów szarych, PTE
Nowak, M., & Borowiec, A. (2019). Intuicyjne rozwiązywanie problemów decyzyjnych z wykorzystaniem teorii systemów szarych. Przegląd Organizacji, (12), 28-35.

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	47	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	53	2,00