COURSE DESCRIPTION CARD - SYLLABUS

Course name
Business Forecasting (Econometrics and Operations Research) [S1DSwB1>PwB]

Course

Field of study
Data Science in Business

Year/Semester
3/5

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
elective

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 and a basic understanding of mathematical and statistical methods. Competencies in logical problem-solving, data interpretation, and fundamental probability theory will be beneficial. Openness to using computational tools for decision analysis is also recommended.

Course objective

The objective of the course is to introduce students to quantitative methods for supporting business decision-making through modeling, analysis, and forecasting of economic phenomena. Students will learn to identify, model, and solve decision-making problems under conditions of limited resources, risk, and uncertainty.

Course-related learning outcomes

Knowledge:

Characterizes the basic methods of forecasting and optimizing business decisions, including linear programming, transportation models, and decision support methods [DSB1_W01].
Describes the application of econometric methods such as the least squares method (OLS), time series analysis, and market trend forecasting [DSB1_W04].
Explains the importance of risk and uncertainty management in forecasting, sensitivity analysis, and the use of Monte Carlo simulation in business decision-making [DSB1_W07].

Skills:
Designs forecasting experiments, builds predictive models, and applies parameter estimation methods in business analysis [DSB1_U03].
Formulates the specification of optimization problems, selects appropriate linear and multi-criteria programming methods, and evaluates their effectiveness [DSB1_U05].
Conducts a critical analysis of forecasting models, assesses model fit quality, and interprets the obtained results in the context of business decision-making [DSB1_U07].
Applies econometric and optimization modeling standards in business decision-making, utilizing sensitivity and scenario analysis techniques [DSB1_U10].

Social competences:
1. Uwzględnia wpływ jakości prognoz na podejmowanie decyzji biznesowych oraz odpowiedzialność wynikającą z wykorzystania modeli predykcyjnych [DSB1_K01].
2. Współpracuje w zespołach analitycznych, integrując różne techniki prognozowania i modelowania decyzyjnego w celu wspierania strategii przedsiębiorstwa [DSB1_K02].

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture:
There will be 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 at the end. The passing threshold is a total of 50 points from both tests.
Laboratories:
There will be 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 at the end. The passing threshold is a total of 50 points from both tests.

Programme content

The course covers key methods for forecasting and optimizing business decisions, integrating elements of operations research and econometrics. Students will learn fundamental concepts related to decision modeling and linear programming, including optimization problem-solving techniques such as the simplex algorithm and sensitivity analysis. Topics will also include transportation models, multi-criteria optimization, and decision support methods such as AHP. In the econometrics section, students will explore the least squares method, model goodness-of-fit assessment, time series analysis, and market trend forecasting. Additionally, the course will address uncertainty and risk in forecasting, sensitivity analysis, and the use of Monte Carlo simulation in business decision-making.

Course topics

Introduction to Business Forecasting
Key Concepts: Decision Variable, Objective, Constraints, Optimum, Feasible Solution
Fundamentals of Linear Programming
Linear Programming Methods: Geometric Method, Simplex Algorithm, Sensitivity Analysis
Transportation Problems - Closed and Open Models, Alpha and Beta Potential Methods
Multi-Criteria Optimization - Meta-Criterion, Goal Hierarchy, Goal Programming
Decision Support Methods - Scoring Method, AHP for Supplier Selection
Risk and Uncertainty Management in Forecasting
Newsvendor Model and Decision Rules under Uncertainty
Introduction to Econometrics - Basic Assumptions of Econometric Models
Classical Least Squares Method (OLS) - Model Parameter Estimation
Model Goodness-of-Fit Assessment - Determination Coefficient, Significance Tests

Econometric Forecasting - Prediction Methods and Forecast Error Evaluation
Time Series Models - Trend, Seasonality, Autoregressive Analysis
Sensitivity Analysis of Forecasts and Optimal Solutions
Monte Carlo Simulations in Business Forecasting

Teaching methods

Lectures: Problem-based lecture, case study presentation
Exercises: Problem-solving tasks, case study analysis, group work

Bibliography

Basic:
Bernardelli, M., Decewicz, A., Tomczyk, E. (2021). Ekonometria i badania operacyjne. PWN
Maciąg, A., Pietroń, R., Kukla, S. (2013). Prognozowanie i symulacja w przedsiębiorstwie. PWE

Additional:
Trzaskalik, T. (2024). Wprowadzenie do badań operacyjnych z komputerem. PWE

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