POZNAN UNIVERSITY OF TECHNOLOGY

EUROPEAN CREDIT TRANSFER AND ACCUMULATION SYSTEM (ECTS)

COURSE DESCRIPTION CARD - SYLLABUS

Course name
Operational Research and Econometrics [N2IZarz1>BOiE]

Course

Field of study	Year/Semester
Engineering Management	1/1
Area of study (specialization)	Profile of study
Enterprise Resource and Process Management	general academic
Level of study	Course offered in
second-cycle	polish
Form of study	Requirements
part-time	compulsory

Number of hours

Lecture	Laboratory classes	Other (e.g. online)
12	0	0
Tutorials	Projects/seminars	
12	0	

Number of credit points

4,00

Coordinators

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Lecturers

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Prerequisites

Course objective

Learning to plan and make quantitative and other decisions using methods of constrained optimization.
Learning methods of economic relations estimation and applications.

Course-related learning outcomes

Knowledge:
1. Student knows typical problems of operation management, analyzes and solves tasks [P7S_WG_02].
2. Knows graphical method and simplex for linear programming [P7S_WG_04].
3. Knows chosen optimization methods for multicriteria problems, graphs and networks solving [P7S_WG_08].
4. Knows statistics used to assess decisions and risk, knows rules used under uncertainty [P7S_WG_02].
5. Knows ordinary least squares method, its assumptions, properties and applications [P7S_WG_03].

Skills:

1. Student can solve optimization tasks using Excel Solver add-in [P7S_UW_01; _03].
2. Understands idea of graphical method and simplex algorithm [P7S_UW_04].
3. Can identify multi criteria decision tasks and problems that are solved with graph theory [P7S_UW_06].
4. Can optimize decision under risk and limit the level of risk [P7S_UW_06].
5. Can estimate econometrics model, can assess significance, goodness of fit and analyse results. In particular estimates costs model due to quantity of one or many products and sales trend [P7S_UW_02].

Social competences:
Is able to explain benefits of optimization in practice [P7S_KK_01-02; P7S_KO_01].

Methods for verifying learning outcomes and assessment criteria
Learning outcomes presented above are verified as follows:

Partial assessment:
a) at lecture the modelling and classifing study of optimization case is assessed,
b) at tutorial there is intrasemester assessment of tasks and theory.
Final grade:
a) of lecture results from final test including tasks and problem questions.
b) of tutorial - a group of 2 students use Solver to find out the optimum solution of a case different than the chosen one for partial assessment a) .

Programme content

1. Introduction: decision variable, objective, constraint, feasible solution, the optimum, linear programme (LP). Task formulation: product-mix (assortment), blending problem, transportation and transshipment, multiperiod scheduling, using of Excel add-in Solver
2. linear programming methods: simplex, graphical method, sensitivity analysis,
3. balanced and unbalanced transportation problems, feasible solution finding, optimization using alphas and betas potentials,
4. multigoal task, multigoal efficiency, metacriterion, hierarchy, goal programming (GP), optimization degree, point multicriteria method versus AHP for suppliers assessment
5. uncertainty and risk: rules, news boy, decision tree
6. estimation of an econometric model with ordinary least squares, assessment of significance and goodness of fit, and forecasing and forecast expected error calculus.

Teaching methods

lecture focused at problem, tutorial in solving tasks, case study

Bibliography
Basic:
1. Anholcer M., Gaspars H., Owczarkowski A., Ekonometria z Excelem, Wyd. UEP, Poznań 2010.
2. Brzęczek T., Gaspars-Wieloch H., Godziszewski B., Podstawy badań operacyjnych i ekonometrii, Wyd. PP, Poznań 2010.
3. Przykłady i zadania z badań operacyjnych i ekonometrii, Sikora W. (red.), Wyd. UEP, MD, Poznań 2005.
4. Gruszczyński M., Kuszewski T., Podgórska M. (red. nauk.), Ekonometria i badania operacyjne, Wydawnictwo Naukowe PWN, Warszawa, 2022.
5. Sikora W. (red.), Przykłady i zadania z badań operacyjnych i ekonometrii, Wydawnictwo UEP, Poznań, 2005.
6. Trzaskalik T. (red.), Wprowadzenie do badań operacyjnych z komputerem - CD, PWE, Warszawa, 2008.

Additional:
1. Józefowska J., Badania operacyjne i teoria optymalizacji, Wydawnictwo PP, Poznań 2011.
2. Sikora W. (red.), Badania operacyjne, PWE, Warszawa 2008.
3. Ugurlu K., Brzęczek T. (2023). Distorted probability operator for dynamic portfolio optimization in times of socio-economic crisis. Central European Journal of Operations Research, vol. 31(4):1043-1060

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	25	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	75	3,00