

FACULTY OF MANAGEMENT

SUBJECT CARD**Name of subject in Polish: Analiza Normatywna****Name of subject in English: Prescriptive Analytics****Main field of study (if applicable): Business Engineering****Specialization (if applicable): Business Intelligence****Profile: academic****Level and form of studies: 2nd level studies, full-time****Kind of subject: obligatory****Subject code W08IZZ-SM8019****Group of courses: NO**

	Lecture	Classes	Laboratory	Project	Seminar
Number of hours of organized classes in University (ZZU)	30		30		
Number of hours of total student workload (CNPS)	50		75		
Form of crediting	Examination		Crediting with grade		
For group of courses mark (X) final course					
Number of ECTS points	2		3		
including number of ECTS points for practical classes (P)			3		
including number of ECTS points corresponding to classes that require direct participation of lecturers and other academics (BU)	1,28		1,28		

PREREQUISITES RELATING TO KNOWLEDGE, SKILLS AND OTHER COMPETENCES

1. Knowledge of matrix algebra
2. Ability to use computational software (MATLAB, R)

SUBJECT OBJECTIVES

C1 To gain knowledge on formulating decision models

C2 To learn how to evaluate alternatives

C3 To be able to build composite indicators

SUBJECT EDUCATIONAL EFFECTS

relating to knowledge:

PEU_W01 Student has in-depth knowledge of mathematical models to support decision making in management.

PEU_W02 Student has knowledge of building composite indicators under different preference structures.

relating to skills:

PEU_U01 Student can formulate decision models.

PEU_U02 Student can evaluate alternatives and support decision making.

relating to social competences:

PEU_K01 Student can enlarge His/Her knowledge and abilities, as well as to work in groups to formulate and to appraise decision models.

PROGRAMME CONTENT

Lecture		Number of hours
Lec 1	Decision Analysis, Decision Support Systems and Business Intelligence	2
Lec 2	Decision Tree Analysis to Evaluate Alternatives	2
Lec 3	Fundamentals of Linear Programming	2
Lec 4	Duality and Sensitivity Analysis	2
Lec 5	Transportation and Assignment Problems	2
Lec 6	Graph Theory and Optimization	2
Lec 7	Multi-objective Mathematical Programming	2
Lec 8	Multi-Criteria Analysis	2
Lec 9	UTA Method and its Variants	2
Lec 10	Analytic Hierarchy Process	2
Lec 11	Efficiency Measurement	2
Lec 12	Incorporating Value Judgments in Efficiency Measurement	2
Lec 13	Efficiency Measurement in Processes with Network Structures	2
Lec 14	Building Indices with Hierarchical Structure	2
Lec 15	Course Assessment	2
	Total hours	30

Laboratory		Number of hours
Lab 1	Introduction to Matlab, R – lpsolve and Gurrobi Optimizer	2
Lab 2	Decision Tree Analysis	2
Lab 3	LP formulation in Matlab, R	2
Lab 4	Sensitivity Analysis and Visualization	2
Lab 5	Specific Cases in Linear Programming	2
Lab 6	Specific Cases in Linear Programming	2
Lab 7	Solution Methods in Multi-objective Mathematical Programming	2
Lab 8	Presentation of Group Assignments	2
Lab 9	UTASTAR and UTADIS - Applications	2
Lab 10	Group Decision Making with Analytic Hierarchy Process	2
Lab 11	Performance Measurement	2

Lab 12	Hybrid Approaches in Performance Measurement	2
Lab 13	Performance of Supply Chains	2
Lab 14	Deriving Composite Indicators	2
Lab 15	Presentation of Group Assignments	2
	Total hours	30

TEACHING TOOLS USED
N1. Slide Presentations N2. Step-by-step solutions of examples N3. Set of case studies and software illustration (Matlab, R)

EVALUATION OF SUBJECT LEARNING OUTCOMES ACHIEVEMENT

Evaluation (F – forming during semester), P – concluding (at semester end)	Learning outcomes	Way of evaluating learning outcomes achievement
F1	PEU_U01, PEU_U02, PEU_K01	Report of team work results
F2	PEU_U01, PEU_U02, PEU_K01	Report of team work results
F3	PEU_W01, PEU_W02, PEU_U01, PEU_U02	Test
$P(W) = 0.5 F3 + 0.5 \text{ Participation}$ $P(L) = 0.4 F1 + 0.4 F2 + 0.2 \text{ Participation}$		

PRIMARY AND SECONDARY LITERATURE
PRIMARY LITERATURE: [1] Greco, S., Figueira, J., & Ehrgott, M. (2016). Multiple criteria decision analysis. New York: Springer. [2] Cooper, W. W., Seiford, L. M., & Tone, K. (2006). Introduction to data envelopment analysis and its uses: with DEA-solver software and references. Springer Science & Business Media. [3] Miettinen, K. (2012). Nonlinear multiobjective optimization. Springer Science & Business Media.
SECONDARY LITERATURE: [1] Dantzig, G. B., & Thapa, M. N. (2006). Linear programming 2: theory and extensions. Springer Science & Business Media.
SUBJECT SUPERVISOR (NAME AND SURNAME, E-MAIL ADDRESS)
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