Title: **Multicriteria and Group Decision Support**	Code **000 5**
Field **Computer Science**	Year / Semester **2 / 3**
Specialty **Business Intelligence**	Course **obligatory**
Hours / sem. Lectures: **16** Classes: **-** Laboratory: **16** Projects / seminars: **-**	Number of credits **6**

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Status of the course in the study program:

Obligatory course at the IV-th year of studies of the extra-mural complementary master's course in computer science

Objectives of the course:

To present a theoretical base and practical methodology of multicriteria decision aiding, negotiation and conflict management in multi-agent systems.

Course description:

Definition of actions. Principles of constructing a coherent family of criteria. Evaluation scales of attributes and criteria. Preference models: (i) utility function, (ii) binary relation, (iii) decision rules. Different kinds of preference information and ways of acquisition. Methods of multicriteria choice, ranking and sorting based on the use of relational models of preferences: ELECTRE III/IV, TRI-ASSISTANT, PROMETHEE I, II. Analytical Hierarchy Process (AHP) based on the use of a functional model of preferences. Method for construction of a utility function aggregating cardinal criterion scales (MACBETH). Intelligent decision support based on the use of the rough set theory (RST). System ROSE (ROugh Set data Explorer). Acquisition of preferential information in form of decision examples. Inconsistency of decision examples with indiscernibility and/or dominance principle. Definition of rough approximations of decision classes or a comprehensive preference relation for multicriteria and multiattribute decision problems: (a) classification, (b) sorting, (c) choice and ranking. Induction of decision rules from the rough approximations. Exploitation of results of using decision rules in problems (a), (b) and (c) in view of giving a final recommendation. Application of dominance-based rough set approach (DRSA) to hierarchical family of criteria and evaluation on interval scales. Problem of missing data. Combination of RST and fuzzy set theory in view of representing a degree of similarity, dominance and/or membership to a decision class. Comparison of functional, relational and decision-rule preference models. Representation of aggregation operators for ordinal criteria (general utility function, associative operators, Sugeno integral, max-min weighted sum, max, min, ordered weighted max, k-ordered statistics) by equivalent decision rules. Methodology of negotiation and conflict management in multi-agent systems.

Initial knowledge:

Basic knowledge in Operational Research, Artificial Intelligence and Decision Support.

Teaching methods:

Lectures and laboratory exercises with software supporting multicriteria decision and negotiation.

Assessment methods:

Reports of laboratory exercises, written examination.

Bibliography:

1. *C.A.Bana e Costa (ed.):* Readings in Multiple Criteria Decision Aid*. Springer-Verlag, Berlin, 1990.*
2. *S.Greco, B.Matarazzo, R.Słowiński: „The use of rough sets and fuzzy sets in multiple criteria decision making". [W] T.Gal, T.Hanne, T.Stewart (red.),* Advances in Multiple Criteria Decision Making*. Kluwer, Boston, 1999.*
3. *S.Greco, B.Matarazzo, R.Słowiński: "Rough sets theory for multicriteria decision analysis".* European J. of Operational Research *129 (2001) no.1, 1-47.*
4. *Z.Pawlak, R.Słowiński: "Rough set approach to multi-attribute decision analysis".* European Journal of Operational Research *72 (1994) 443-459.*
5. *B.Roy: Wielokryterialne wspomaganie decyzji. WNT, Warszawa, 1990.*
6. *B.Roy, D.Bouyssou: Aide Multicritère à la Décision – Méthodes et Cas. Economica, Paris, 1993.*
7. *R.Słowiński (ed.):* Intelligent Decision Support. Handbook of Applications and Advances of the Rough Sets Theory*. Kluwer Academic Publishers, Dordrecht, 1992.*
8. *R.Słowiński: "Rough set learning of preferential attitude in multi-criteria decision making". In: J. Komorowski, Z. W. Ras (eds),* Methodologies for Intelligent Systems*, Lecture Notes in Artificial Intelligence, vol. 689, Springer-Verlag, Berlin, 1993b, 642-651.*
9. *R.Słowiński, J.Stefanowski, S.Greco, B.Matarazzo: "Rough sets based processing of inconsistent information in decision analysis".* Control and Cybernetics *29 (2000) no.1, 379-404.*
10. *R.Słowiński (ed.): Fuzzy Sets in Decision Analysis, Operations Research and Statistics. Kluwer Academic Publishers, Boston, 1998.*
11. *C.Tessier, L.Chaudron, H.Muller: "Conflicting Agents – Conflict Management in Multi-Agent Systems", Kluwer Academic Publishers, Boston, 2001.*