COURSE DESCRIPTION CARD - SYLLABUS

Course name
Decision support [N1Inf1>WDEC]

Course

Field of study
Computing

Year/Semester
3/6

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
part-time

Requirements
compulsory

Number of hours

Lecture
20

Laboratory classes
20

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

5,00

Coordinators

dr hab. inż. Robert Susmaga
robert.susmaga@put.poznan.pl

Lecturers

Prerequisites

Basic knowledge of: a) discrete mathematics, b) linear algebra, c) data structures (arrays one- and two-dimensional. Ability to design, implement and test computer programs (in selected programming language) performing simple operations on static data (single- and two-dimensional). (Desirable) cognitive curiosity and perseverance in striving to expand one's knowledge.

Course objective

The overall goal is for students to learn theoretical and practical aspects of computing decision support, in particular: -- distinguishing classes of decision-making problems: classification, selection, ranking, -- acquiring the ability to model decision-making problems from the above classes in categories quantitative and qualitative; defining decision variants, attributes and evaluation criteria, -- understanding the analyst's role in the decision-making process as an IT specialist supporting the solution decision-making problem consistent with the decision-maker's value system, -- learning methods of collecting information about the decision-maker's preferences and methods of modeling them preferences for individual and group decision-makers in functional and relational categories and rules, -- learning the basic elements of usability theory, multi-criteria decision support and intelligent decision support systems with symbolic representation of knowledge -- developing skills in solving real decision-making problems.

Course-related learning outcomes

Knowledge:
Student
-- has structured, theoretically based general knowledge in the field of support methodology
decisions, algorithms and complexity, elements of artificial intelligence, and IT tools for
decision support (K1st_W4)
-- has knowledge of important directions of development and the most important achievements in computer science and others
related scientific disciplines in the field of computer decision support (K1st_W5)
-- has a rough knowledge of the life cycle of IT systems in the field of computer systems
decision support (K1st_W6)
-- knows the basic techniques, methods and tools used in the solving process
basic decision-making problems in the field of key computer science issues, such as systems
decision support or artificial intelligence (K1st_W7)

Skills:
Student
-- is able to obtain information from various sources in Polish (or English), as appropriate
integrate them, interpret and critically evaluate them, draw conclusions and justify them
opinions they form (K1st_U1)
-- can plan and conduct experiments, including measurements and computer simulations,
interpret the obtained results and draw conclusions (K1st_U3)
-- is able to use appropriately selected methods when formulating and solving IT tasks,
including analytical, simulation and experimental methods (K1st_U4)
-- is able - in accordance with the given specification - to design and implement a simple IT system
to support decisions, using appropriate methods, techniques and tools (K1st_U10)
-- has the ability to formulate algorithms and program them using at least one
from popular tools (K1st_U11)
-- is able to determine the directions of further learning and implement the self-education process
(K2st_U16)

Social competence:
Student
-- understands that in IT knowledge and skills become obsolete very quickly (K1st_K1)
-- is aware of the importance of knowledge in solving engineering problems and is aware of the fact that
that incorrect solutions to these problems lead to malfunctioning systems
IT (K1st_K2)
-- understands the importance of popularizing activities regarding the latest achievements in the field
computer science (K2st_K3)

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The learning outcomes presented above are verified in the following way:
(laboratories):
-- based on the assessment of the current progress in the implementation of assigned tasks.
(lectures):
-- assessment of knowledge and skills demonstrated in a written test containing several (4-6) tasks
(analogous to the tasks presented during classes); The time allowed for passing is 60-90 minutes
(lectures); to obtain a positive grade you must score at least 1+[m/2] (rounded down)
points, where m is the maximum score (e.g. to obtain a positive grade at m = 30 you must
score at least 16 points).

Programme content

Principles of contructing and analysing multi-criteria decision problems.
Classes of decision problems: choice, classification, ranking. Decision paradigms: functional, relational and preference modelling within these. Selected methods of multi-criteria choice, classification and ranking.

Course topics

The course program covers the following topics:
Classes of decision-making problems: choice, classification, ranking. Principles of computer decision support: the concept of decision variant, attribute and evaluation criterion. Problem modeling decision-making in analytical terms, as optimization problems, and symbolic, as artificial intelligence problems. Distinction between the roles of the analyst, the decision-maker and other participants in the problem
decision-making. Formulating decision-making problems as mathematical programming problems. Basic multi-criteria decision-making problems. The construction and properties of a family of criteria for a given
decision problem. Binary relationships, including the relationship of dominance (in the Pareto sense) and relationships
preferences, indistinguishability and incomparability. The concept of a decision variant (solution) compromise due to the value system, i.e. the preferences of a given decision-maker. Model categories preferences: functional, relational and rule-based. Properties of an additive, sum-type preference model weighted. Elements of utility theory. Methods of supporting multi-criteria choice and ranking: ASSESS method for constructing a multi-attribute utility function using the determination method deterministic lottery equivalents; UTA+ method based on the preference model in the form additive utility function constructed in ordinal regression mode. Relational elements preference models. ELECTRE Is multi-criteria choice support method and support method multi-criteria ELECTRE TRI classification based on a preference model in the form of a superiority relationship
constructed in compliance and non-compliance test mode. Modeling inconsistencies in problems decision-making based on elements of rough set theory. Intelligent assistance system decisions with symbolic representation of knowledge based on rough set theory; rule knowledge representation in classification problems. Examples of decision-making problems and choosing the right ones
methods to solve them.

Teaching methods

Lectures: multimedia presentation supplemented with computational examples, demonstration of selected ones
computational aspects.
Labs: modeling sample data processing and visualization problems multidimensional and solving these problems, performing simulation experiments, discussion, team work, multimedia show and demonstration.

Bibliography

Basic
1. Multi-criteria decision support, B. Roy, WNT, Warsaw, 1990
2. Multi-criteria decision support: methods and applications, T. Trzaskalik (ed.), PWE, Warsaw, 2014.
Supplementary
1. Lecture materials
2. Information techniques in system research, P. Kulczycki, O. Hryniewicz, J.Kacprzyk (ed.), WNT, Warsaw, 2007.
3. R. D. Luce, H. Raiffa, Games and decisions, National Scientific Publishing House, Warsaw, 1964.
4. Encyclopedia of Complexity and Systems Science, R.A. Meyers (ed.), Springer, New York, 2009.
5. Multiple Criteria Decision Analysis: State of the Art Surveys, J.Figueira, S.Greco and M.Ehrgott (eds.), Springer, New York, 2005.

Breakdown of average student's workload

	Hours	ECTS
Total workload	125	5,00
Classes requiring direct contact with the teacher	42	1,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	83	3,50