Course Descriptions None 2022-2023

Course Title	Reasoning Techniques
Course Code	BENC2023
ECTS Credits	5,0
Assessment	Whole/Half Grades

Period

Period	Start	End	Mon	Tue	Wed	Thu	Fri
2	31-10-2022	16-12-2022	X		X		L

Level	no level
Coordinator	Mark Winands For more information:m.winands@maastrichtuniversity.nl
Language of instruction	English
Goals	* Knowledge and understanding: Students learn to understand how problems can be represented as logical problems, as search problems, as planning problems or as problems involving uncertainty and get accustomed to reasoning methods to solve problems of all four types mentioned above. * Applying knowledge and understanding: Students learn to apply the reasoning methods learned to toy problems and some more complex situations. * Making judgements: Students learn to judge which type of knowledge representation is suitable for the problem at hand, and which reasoning technique is suitable to solve the problem at hand. * Communication: students can explain the knowledge representation used and reasoning technique chosen to peers and other experts. * Learning skills: Students are able to critically reflect on their own and other's chosen representations and used reasoning methods.
Description	PLEASE NOTE THAT THE INFORMATION ABOUT THE TEACHING AND ASSESSMENT METHOD(S) USED IN THIS COURSE IS WITH RESERVATION. A RE-EMERGENCE OF THE CORONAVIRUS AND NEW COUNTERMEASURES BY THE DUTCH GOVERNMENT MIGHT FORCE COORDINATORS TO CHANGE THE TEACHING AND ASSESSMENT METHODS USED. THE MOST UP-TO-DATE INFORMATION ABOUT THE TEACHING/ASSESSMENT METHOD(S) WILL BE AVAILABLE IN THE COURSE SYLLABUS. Central in this course is how, based on available data, new knowledge and information can be obtained using reasoning processes. The course will be supported by tutorials, in which the acquired techniques can be put into practice by using Prolog. The following four techniques are discussed: (1) Reasoning using logic: syntax, semantics, and inference in first-order logic, situation calculus, forward and backward reasoning, completeness, logic programming with Prolog. (2) Problem solving using search: problem types, blind-search methods, informed-search methods, comparison of search methods, games as search problems, minimax, alpha-beta pruning, Monte Carlo Tree Search, chance games, constraint satisfaction problems. (3) Planning: planning in situation calculus, representation of states, goals and operators, state space and plan space, algorithms for classic planning. (4) Reasoning with uncertainty: uncertainty and probability theory, conditional probability, the Rule of Bayes, semantics of belief networks, exact and approximate inference in belief networks.
Literature	Study material: * Russell, S. and Norvig, P., Artificial Intelligence: A Modern Approach, 4th edition. Pearson, 2020. * Bratko, I. (2012). Prolog: Programming for Artificial Intelligence, 4th edition. Addison-Wesley Recommended literature: * Luger, G.F., Artificial Intelligence: Structures and Strategies for Complex Problem Solving, 6th edition. Pearson International Edition, 2009.
Prerequisites	BENC1002 Calculus BENC2001 Multivariable Calculus BENC1004 Linear Algebra
Keywords	
Teaching methods	Lecture
Assessment methods	Written Exam / Assignment
Evaluation in previous academic year	For the complete evaluation of this course please click http://iwio-sbe.maastrichtuniversity.nl/rapporten.asp?referrer=codeUM
This course belongs to the following programme / specialisation	