Course Descriptions None 2026-2027

Course Title	Reasoning Techniques
Course Code	KEN2230
ECTS Credits	5,0
Assessment	Whole/Half Grades

Period

Period	Start	End	Mon	Tue	Wed	Thu	Fri
2	26-10-2026	11-12-2026					

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	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	Bachelor Data Science and Artificial Intelligence students need to have earned 45 ECTS credits or more for their first year courses. This rule will prevent Business Engineering students from registering for this course. These students should use Ask SBE to indicate they want to register for this course.
Keywords	
Transitional Regulations	
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	