# Course Descriptions None 2023-2024

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

Period

| Period | Start | End | Mon | Tue | Wed | Thu | Fri |
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| 2 | 30-10-2023 | 15-12-2023 | X | | X | | L |

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| 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.<br>* Applying knowledge and understanding: Students learn to apply the reasoning methods learned to toy problems and some more complex situations.<br>* 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.<br>* Communication: students can explain the knowledge representation used and reasoning technique chosen to peers and other experts.<br>* 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:<br>(1) Reasoning using logic: syntax, semantics, and inference in first-order logic, situation calculus, forward and backward reasoning, completeness, logic programming with Prolog.<br>(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.<br>(3) Planning: planning in situation calculus, representation of states, goals and operators, state space and plan space, algorithms for classic planning.<br>(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:<br>* Russell, S. and Norvig, P., Artificial Intelligence: A Modern Approach, 4th edition. Pearson, 2020.<br>* Bratko, I. (2012). Prolog: Programming for Artificial Intelligence, 4th edition. Addison-Wesley<br><br>Recommended literature:<br>* Luger, G.F., Artificial Intelligence: Structures and Strategies for Complex Problem Solving, 6th edition. Pearson International Edition, 2009. |
| Prerequisites | BENC1002 Calculus<br>BENC2001 Multivariable Calculus<br>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 |

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| This course belongs to the following programme / specialisation | Bachelor Business Engineering — Year 3 Elective Course(s) |