Course Specifications
Valid in the academic year 2017-2018

Mathematical Modelling of Artificial Intelligence (C003691)

Course size

<table>
<thead>
<tr>
<th>Credits</th>
<th>Study time</th>
<th>Contact hrs</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.0</td>
<td>165 h</td>
<td>45.0 h</td>
</tr>
</tbody>
</table>

Course offerings and teaching methods in academic year 2017-2018

A (semester 1)  Dutch  lecture  30.0 h

seminar: coached exercises  15.0 h

Lecturers in academic year 2017-2018

Cornelis, Chris  WE02 lecturer-in-charge

Offered in the following programmes in 2017-2018

Master of Science in Mathematics

<table>
<thead>
<tr>
<th>Credits</th>
<th>offering</th>
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<tbody>
<tr>
<td>6</td>
<td>A</td>
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</tbody>
</table>

Teaching languages

Dutch

Keywords

Order structures, algebraic structures for many-valued logics, fuzzy logic, fuzzy sets, calculus of fuzzy quantities, fuzzy inference

Position of the course

Many complex problems cannot be solved by a sharp analysis based on classical logic and the corresponding set theory. In case of increasing complexity a level is quickly reached above which accuracy and relevance counteract each other. A possible solution to these problems is to abandon the idea of accuracy and allow imprecision and partial certainties. The scientific literature of the last decade introduces many new models for representing imprecision and uncertainty. The most important of these is the theory of fuzzy sets. The usefulness of this new theory is confirmed by the massive demand for patents by Japanese companies for products based on fuzzy set theory. In this course we will introduce the basic principles and discuss some applications of this new theory, and thus introduce the student to a recent domain of applicable mathematics.

Contents

• Auxiliary order and algebraic structures (poset, lattice, Boolean algebra, Morgan algebra, ...)
• Logical operators on the unit interval (negators, triangular norms and conorms, implicators)
• Algebraic structures for many-valued logic calculi (residuated lattices, MTL algebra's, BL algebra's, MV algebra's, Heyting algebra's)
• Formal fuzzy logic
• Fuzzy sets, flou sets and L-fuzzy sets
• Degree of inclusion, similarity and fuzziness
• Fuzzy quantifiers
• Calculus of fuzzy quantities
• Fuzzy inference

Initial competences

No particular mathematical prerequisites. Only a positive attitude towards mathematics and formal logic is needed.

Final competences

1 Students should be familiar with the basic concepts and techniques from fuzzy set theory and related models of uncertainty among them L-fuzzy set theory and flou set theory.

(Approved)
2 Students should be ready to start more advanced courses offered in the master of computer science and the master of applied mathematics.

Conditions for credit contract
Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract
This course unit cannot be taken via an exam contract

Teaching methods
Lecture, self-reliant study activities, seminar: coached exercises

Extra information on the teaching methods
The theory is taught during the lectures. During the labs, the students solve exercises with the help of a teaching assistant. For the independent work, the students prepare an exercise or a theoretical topic and present it during class.

Learning materials and price
The learning material is available in electronic form on the course website on Minerva.

References

Course content-related study coaching
Students actively process the learning material while making exercises in the presence of a teaching assistant. Furthermore students can submit their solutions for additional exercises to get feedback from the assistant or the instructor. The assistant and the instructor are also available to students for additional individual explanation outside of the scheduled class times.

Evaluation methods
end-of-term evaluation and continuous assessment

Examination methods in case of periodic evaluation during the first examination period
Written examination

Examination methods in case of periodic evaluation during the second examination period
Written examination

Examination methods in case of permanent evaluation
Assignment
Possibilities of retake in case of permanent evaluation
not applicable

Calculation of the examination mark
Combination of non-periodical evaluation (presentation assignment, i.e. 20% of the final score) and periodical evaluation (written exam, i.e. 80% of the final score).
To be able to pass, a student should obtain a score of at least 10/20 for the exam.

(Approved)