

## Capita Selecta in Soft Computing (C001719)

Course size (nominal values; actual values may depend on programme)  
Credits 6.0 Study time 165 h Contact hrs 45.0 h

Course offerings and teaching methods in academic year 2017-2018

Deze cursus is 2-jaarlijks en wordt niet aangeboden

Lecturers in academic year 2017-2018

Cornelis, Chris WE02 lecturer-in-charge

Offered in the following programmes in 2017-2018 crdts offering

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Teaching languages

Dutch

Keywords

Fuzzy relations, fuzzy relational calculus, fuzzy topology, alternative models for representing imprecise information

Position of the course

The concept of a relation is fundamental, in a sense that sometimes science is described as the discovery of relations between objects, systems and structures. In this course we will give an overview of the recent developments in the classical relational calculus and its extension to imprecise relationships, the so-called fuzzy relational calculus. In parallel to defining and studying the theoretical concepts, we will illustrate them in many practical contexts. The term soft computing refers to a collection of models for representing and processing imprecise information. We will therefore also give a short overview of some of these models and describe their relationship with the most prominent among them, namely fuzzy set theory.

This fits within the following learning outcomes of the master programme: 1.1, 1.4, 1.7, 2.1, 2.3, 2.7, 3.2, 5.2.

Contents

1. Recent developments in relational calculus

1.1 Basic concepts

1.2 Operations

1.3 Classical images

1.4 New images and their properties

1.5 Special relations

1.6 Classical composition

1.7 New compositions and their properties

2. Fuzzy relational calculus

2.1 Basic concepts

2.2 Operations

2.3 Classical fuzzy images

2.4 New images and their properties

2.5 Approximate equality and similarity

2.6 Classical fuzzy composition

2.7 New compositions and their properties

3. Alternative models for representing imprecise information

3.1 Introduction of the alternative models (rough sets, fuzzy rough sets, interval-valued fuzzy sets, imprecise probabilities, ...)

3.2 Links between the different models

4. Introduction to fuzzy topology

5. Applications, including for example to medical diagnosis, preference structures, image processing, approximate reasoning, data mining, artificial intelligence, expert systems, fuzzy control, decision making, ...

#### Initial competences

A basic knowledge of fuzzy set theory and a positive attitude w.r.t. a mathematical approach.

#### Final competences

- 1 The students should be familiar with fuzzy relational calculus and its applications.
- 2 Moreover, they should be aware of the existing models for representing imprecise information.
- 3 They should be capable of initiating independent research in these areas.

#### 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

Guided self-study, lecture, project

#### Extra information on the teaching methods

The learning material is provided in Dutch and English.

#### Learning materials and price

The learning material is electronically available (free of charge), using the Minerva website.

#### References

R. Boete, Vaagrelaties - Fundamenten en Toepassingen, masterproef, Universiteit Gent, 2013 (in Dutch).

E.E. Kerre, Fuzzy Sets and Approximate Reasoning, Xian Jiaotong University Press, 1998.

E.E. Kerre, Introduction to the Basic Principles of Fuzzy Set Theory and Some of its Applications, Communication and Cognition, 1993.

#### Course content-related study coaching

Students can ask questions during lectures or via e-mail.

#### Evaluation methods

end-of-term evaluation and continuous assessment

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

Written examination with open questions

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

Written examination with open questions

#### Examination methods in case of permanent evaluation

Assignment

#### Possibilities of retake in case of permanent evaluation

examination during the second examination period is possible

#### Extra information on the examination methods

Theory: periodical evaluation.

Exercises: permanent evaluation

#### Calculation of the examination mark

The project counts for 10 points out of 20, the written exam counts for 10 points out of 20.