

# Course Specifications

Valid as from the academic year 2024-2025

**Course size** *(nominal values; actual values may depend on programme)*

**Credits 6.0** **Study time 165 h**

**Course offerings and teaching methods in academic year 2025-2026**

A (semester 1)	Dutch	Gent	lecture seminar
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**Lecturers in academic year 2025-2026**

Wiermann, Andreas	WE16	lecturer-in-charge
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**Offered in the following programmes in 2025-2026**

	crdts	offering
<a href="#">Bachelor of Science in Mathematics</a>	6	A

**Teaching languages**

Dutch

**Keywords**

Cardinality, Zorn's lemma, axiom of choice, syntax, semantics, quantifier elimination, completeness theorem, compactness theorem, Löwenheim Skolem theorem, ZFC-axioms.

**Position of the course**

In this basic course we treat naive set theory, elementary model theory, and core results from first order predicate logic. The goal is to impart broad basic knowledge over logic. This knowledge shall also be useful in other courses (e.g. algebra and analysis).

This course is basic for the course on proof theory.

**Contents**

1. Transfinite sets
2. Zorn's Lemma, axiom of choice and further equivalents
3. First order languages, mathematical structures
4. Quantifier elimination.
5. The Löwenheim Skolem theorems
6. Completeness- and compactness theorem

**Initial competences**

Final competences of the courses Analysis I and Algebra I.

**Final competences**

- 1 Being able to calculate with cardinalities.
- 2 Being able to apply transfinite induction and recursion.
- 3 Knowing several equivalents of Zorn's lemma.
- 4 Being able to show quantifier elimination for algebraically closed fields.
- 5 Being able to apply the completeness-, compactness and Löwenheim Skolem theorems.
- 6 Being able to construct non standard models.

**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**

Seminar, Lecture

**Extra information on the teaching methods**

Lecture, self-reliant study activities, seminar: coached exercises.

**Study material**

Type: Syllabus

Name: Sets, Models and Proofs

Indicative price: Free or paid by faculty

Optional: no

Available on Ufora : Yes

Online Available : Yes

Available in the Library : Yes

Available through Student Association : No

Additional information: The lecture notes can also be bought in book form.

**References**

Moerdijk, Van Oosten.

Sets, models and proofs.

Springer Undergraduate Mathematics Series. Springer, Cham, 2018. xiv+141 pp.

ISBN: 978-3-319-92413-7; 978-3-319-92414-4

Buchholz: Logic 1, Logic 2, downloadable via WWW,

Enderton: A Mathematical Introduction into Logic. Academic Press.

Shoenfield: Mathematical logic. Addison Wesley (from 1967 but still very readable, please check AMS reviews for an appraisal),

Marker: Model Theory. Springer. (good book on model theory),

Jech: Set Theory. Springer (the standard text book on set theory).

**Course content-related study coaching**

Lecturer and assistant are available for the student. An electronic environment allows easy communication between students and teachers.

**Assessment moments**

end-of-term assessment

**Examination methods in case of periodic assessment during the first examination period**

Written assessment with open-ended questions

**Examination methods in case of periodic assessment during the second examination period**

Written assessment

**Examination methods in case of permanent assessment****Possibilities of retake in case of permanent assessment**

examination during the second examination period is not possible

**Extra information on the examination methods**

The exam tests insight.

**Calculation of the examination mark**

First exam: periodic evaluation (100%).

Second exam: periodic evaluation (100%).