



Exchange programme Vrije Universiteit Amsterdam

Vrije Universiteit Amsterdam - Exchange programme Vrije Universiteit Amsterdam - 2024-2025

Exchange

Vrije Universiteit Amsterdam offers many English-taught courses in a variety of subjects, ranging from arts & culture and social sciences, neurosciences and computer science, to economics and business administration.

The International Office is responsible for course approval and course registration for exchange students. For details about course registration, requirements, credits, semesters and so on, please [visit the exchange programmes webpages](#).

Logic and Modelling

Course Code	X_401015
Credits	6
Period	P5
Course Level	200
Language Of Tuition	English
Faculty	Faculty of Science
Course Coordinator	dr. K. Sojakova
Examiner	dr. K. Sojakova
Teaching Staff	dr. K. Sojakova, T. Baanen
Teaching method(s)	Lecture, Practical, Written partial exam, Seminar

Course Objective

The course objective is to obtain a good knowledge and understanding of the most important logical systems: propositional logic, predicate logic, and modal logic. (Knowledge and understanding)

The students learn to use these systems to model data, knowledge, and actions. (Applying knowledge and understanding)

An important aspect of the course is the ability to reason using these logics and reason about these logics: what can and what can not be expressed with a logic system, and what are the differences between the systems with respect to expressive power or the existence of decision procedures. (Applying knowledge and understanding) (Making judgements)

Course Content

The focus of the lecture is on propositional logic and first-order predicate logic. We work with natural deduction as a proof system. The relation between semantic and syntactic methods is important; the central keywords are correctness, consistency, and completeness. Moreover, we pay attention to expressive power, for example when formulating queries. A fundamental tool, for this purpose, is the compactness theorem.

Algorithmically there is the contrast between the decidability of propositional logic and the undecidability of predicate logic (for example, seen by a coding of the Post Correspondence Problem). As a variation of the mentioned logics, we consider modal logic with Kripke models as semantics.

Additional Information Teaching Methods

Lecture (2 * 90 hours per week) Exercise classes (2 * 90 hours per week) Computer practicum using the Lean proof assistant, done during exercise classes.

Method of Assessment

Final exam (100%) and computer assignments using the Lean proof assistant (required to qualify for the exam, and 0.5 bonus points for doing extra problems).

Literature

Mandatory literature:

- Jeremy Avigad, Robert Y. Lewis, Floris van Doorn, Logic and Proof https://avigad.github.io/logic_and_proof/
- Michael Huth, Mark Ryan, Logic in Computer Science (2nd edition) Cambridge University Press, 2004 ISBN 0 521 54310 X

Additional Information Target Audience

Bachelor Computer Science (year 1)
Bachelor Econometrics and Operations Research (year 3)

Recommended background knowledge

X_401090 Logic and Sets