

逻辑学基础理论

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30690552,,逻辑学基础理论,Foundations of Logic

总学分: 2,总学时: 32,周学时:32//

开课单位: 人文学院,课程类别: 本科专业基础课,课程特色: 全
外文授课,课程面向: 本科生

考核方式: 考试,教学方式: 课堂讲授为主

课程团队: Dag Westerstahl 俞珺华

课程内容简介:本课程带领学生纵览一系列逻辑学经典结论,包括哥德尔(一阶逻辑)完全性和(一阶算术)不完备性定理、一阶逻辑不可判定性的丘奇-图灵证明、以及塔斯基的(形式算术中)真之不可定义性定理。在回顾一阶逻辑的语法和语义之后,课程将介绍亨金借助语法模型和极大一致集的对一阶逻辑完全性的证明,讨论该结论及其证法的哲学和逻辑学影响,并引入一点模型论的内容。进而,课程介绍理论的完备、不完备、可判定等概念。在了解20世纪初哲学和数学发展的背景(包括希尔伯特计划)之后,课程先在非形式的水平上介绍不完备性定理及相关结论,包括其证明思路,然后再逐渐补充重要的细节。课程总体上强调哲学和数学意义上的重要概念和思路,同时也为进一步学习技术细节铺平道路。

Course Description:The course gives an overview of classical meta-logical results, in particular, Godel's completeness and incompleteness theorems, Church- Turing's proof of the undecidability of first-order logic, and Tarski's theorem on the undefinability of truth. After a recapitulation of the syntax and semantics of first-order logic, Henkin's proof of completeness, in terms of syntactic models and maximal consistent sets, is presented. Philosophical and logical consequences of the result and its proof are discussed, with some glimpses from model theory. The course then presents the notions of complete and incomplete theories, as well as decidability of theories. After an overview of the philosophical and mathematical background in the early 20th century, including Hilbert's Program, the incompleteness theorems and related results, and the ideas behind their proofs, are presented at an informal level. The remainder of the course fills in some of the details. The course presentation focuses on important concepts and ideas, philosophical as well as mathematical, but also gives pointers to the technical details.

先修要求:课程预设学生对逻辑学初级内容有所了解,但并无严格先修要求。

适用院系专业:哲学、数学、理论计算机科学

教学目标:以经典结论为线索,精确严格地介绍逻辑学基础理论核心内容,培养学生对基础理论问题的兴趣,激发学生对不同学科间深层次联系思考。

预期学习成效:通过课程学习,学生将获得对逻辑学基础理论清晰准确的了解,和在一定程度上使用经典思路方法的能力。学习本课程后,常见逻辑学分支专门教材将基本进入到学生自学能力范围。

参考书:教材: Dag Westerstahl, Basic Metalogic: Completeness, Incompleteness, Computability, Stockholm University, 2017 参考书: (1) Dirk van Dalen, Logic and Structure, Springer, 第五版, 2013. (2) G. Boolos, J. Burgess och R. Jeffrey, Computability and Logic, 第五版(而非更早版本), Cambridge University Press, 2007 and later. (3) Per Lindstrom, First-order Logic, Thales, 2011. (4) Peter Smith, An Introduction to Godel's Theorems, 第二版, Cambridge University Press, 2013.