科目ナンバリング							
授業科目名<英訳>	ILAS Seminar-E2 :Introduction to Computation and Logic（計算と論理への入門） ILAS Seminar-E2 :Introduction to Computation and Logic			担当者所属職名・氏名	人間・環境学研究科 准教授 DE BRECHT, Matthew		
群	少人数群	単位数	2単位	週コマ数	1コマ	授業形態	ゼミナール（対面授業科目）
開講年度・開講期	2024・前期	受講定員(1回生定員)	15 (5) 人	配当学年	主として1回生	対象学生	全学向
曜時限	月5	教室	総人1306			使用言語	英語
キーワード	computation / logic						

（総合人間学部の学生は，全学共通科目として履修登録できません。所属部局で履修登録してください。）

[授業の概要・目的]

Computers are a relatively recent invention, but they have drastically changed how modern humans live and think. However, few people really know what it means to "compute" something, or how we discovered the basic principles of computation. It turns out that the discovery of computation has its roots in the development of formal logic and a determination to find a rigorous foundations for mathematics about a century ago. In this course, we will introduce the students to formal logic and its relationship with computation. We will also introduce some of the main people involved with the various discoveries, and emphasize the historical background and motivations. The aim of the course is for students to not only gain a deeper understanding of computation, but also understand how it was discovered.

[到達目標]

The students will become familiar with logical reasoning, formal proofs, and the theory of computability. They will also become familiar with the historical background and motivations that led to these developments.

[授業計画と内容]

Below are some possible topics that we will cover during the course. The topics we cover will depend on the interests and abilities of the students.

1) Propositional logic
2) First-order Predicate logic (Frege)
3) First-order Arithmetic (Peano)
4) Set theory (Cantor)
5) Paradoxes, foundations & Hilbert's program (Russell, Hilbert)
6) Intuitionism & constructive mathematics (Brouwer)
7) Incompleteness theorem (Godel)
8) Lambda calculus, Church numerals, and arithmetic (Church)
9) Turing machines and Turing completeness (Turing)
10) Further topics (Curry-Howard correspondence)

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[履修要件]

特になし

[成績評価の方法・観点]

Students are expected to actively participate in discussion, read material, and solve exercises in class. Evaluation will approximately be based on the following: class participation (30%), written and oral assignments (30%), final (40%)

[教科書]

No textbook. Relevant materials will be distributed in class.

[参考書等]

（参考書）

The following books might be useful as references and background reading, but are not required. We will also look at some original papers, which will be handed out in class.

1) "Logic in Computer Science" by Michael Huth and Mark Ryan
Publisher: Cambridge University Press (2004), ISBN: 978-0521543101

2) "A profile of mathematical logic" by Howard Delong.
Publisher: Dover Publications (2004), ISBN: 978-0486434759

3) "A Beginner's Guide to Mathematical Logic" by Raymond Smullyan.
Publisher: Dover Publications (2014), ISBN: 978-0486492377

4) "Introduction to Mathematical Logic" by Elliott Mendelson.
Publisher: Chapman and Hall (2015), ISBN: 978-1482237726

5) "Godel, Escher, Bach" by Douglas Hofstadter.
Publisher: Basic Books (1999), ISBN: 978-0465026562

[授業外学修（予習・復習）等]

Students should review the course material after each class, and will have homework assignments.

[その他（オフィスアワー等）]