Course number	U-LAS70 10002 SE50				
Course title (and course title in English)	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	**Instructor's name, job title, and department of affiliation**	Graduate School of Human and Environmental Studies Associate Professor,DE BRECHT, Matthew		
Group	Seminars in Liberal Arts and Sciences	**Number of credits**	2	**Number of weekly time blocks**	1
Class style	seminar (Face-to-face course)	**Year/semesters**	2024・First semester	**Quota (Freshman)**	5 (5)
Target year	Mainly 1st year students	**Eligible students**	For all majors	**Days and periods**	Mon.5
Classroom	1306, Faculty of Integrated Human Studies			**Language of instruction**	English
Keyword	computation / logic				

(Students of Faculty of Integrated Human Studies cannot take this course as liberal arts and general education course. Please register the course with your department.)

[Overview and purpose of the course]

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.

[Course objectives]

The students will become familiar with logical reasoning, formal proofs, and the theory of computability. This will help the student develop skills that are important in any field of research, such as critical thinking and the ability to construct rigorous arguments. Students will also become familiar with the historical background and motivations that led to the development of formal logic and computation.

[Course schedule and contents)]

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)

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10) Further topics (Curry-Howard correspondence)

[Course requirements]

None

[Evaluation methods and policy]

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%)

[Textbooks]

No textbook. Relevant materials will be distributed in class.

[References, etc.]

（References, etc.）

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

[Study outside of class (preparation and review)]

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

[Other information (office hours, etc.)]