

<b>Course number</b>	U-LAS70 10002 SE50				
<b>Course title (and course title in English)</b>	ILAS Seminar-E2 :Introduction to Logic, Proofs and Programs (論理, 証明およびプログラムへの入門)	<b>Instructor's name, job title, and department of affiliation</b>	Graduate School of Human and Environmental Studies Associate Professor, THIES, Holger		
<b>Group</b>	Seminars in Liberal Arts and Sciences	<b>Number of credits</b>	2	<b>Number of weekly time blocks</b>	1
<b>Class style</b>	seminar (Face-to-face course)	<b>Year/semesters</b>	2025・First semester	<b>Quota (Freshman)</b>	15 (15)
<b>Target year</b>	Mainly 1st year students	<b>Eligible students</b>	For all majors	<b>Days and periods</b>	Mon.5
<b>Classroom</b>				<b>Language of instruction</b>	English
<b>Keyword</b>	Computation / Logic / Formal proof				
( 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. )					
<b>[Overview and purpose of the course]</b>					
<p>This course is an introduction to basic logical principles and formal methods in computer science. Students will learn fundamental concepts and techniques of mathematical logic and their applications to computer science and other areas.</p> <p>The emphasis is on the computational aspects of logic and the topics will be introduced through hands-on use of a proof assistant, a tool for machine-checked mathematical proofs.</p> <p>The software assists students in constructing formal proofs and automatically checks their correctness.</p>					
<b>[Course objectives]</b>					
<p>Students will become familiar with logical reasoning and formal proofs.</p> <p>They will also get some practical experience in the use of a proof assistant.</p> <p>The course will help students develop skills that are important in any field of research, such as critical thinking and the ability to construct rigorous arguments.</p>					
<b>[Course schedule and contents]</b>					
<p>Below are some possible topics that we will cover during the course. We will spend one or two weeks on each topic. The topics we cover may change depending on the interests and abilities of the students.</p> <ol style="list-style-type: none"> <li>1) Propositional logic</li> <li>2) First-order Predicate logic</li> <li>3) Basics of functional programming</li> <li>3) Computer assisted theorem proving</li> <li>5) Natural deduction</li> <li>6) Type Theory</li> <li>7) Constructive Logic</li> <li>8) The relationship between proofs and programs</li> </ol> <p>Total: 15 sessions (14 class sessions and 1 feedback session)</p>					
<small>Continue to ILAS Seminar-E2 :Introduction to Logic, Proofs and Programs (論理, 証明およびプログラムへの入門)(2)</small>					

### [Course requirements]

No prior knowledge is required, however some familiarity with rigorous mathematical proofs and interest in computer programming will be helpful.

The course will include some practical exercises. It is recommended that students have access to a computer where they can install software.

### [Evaluation methods and policy]

Students are expected to actively participate in discussion, read material, and solve exercises in class.

Evaluation will be based on the following: written and oral assignments (50%), final report or project (50%)

### [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.

1) "Logic in Computer Science" by Michael Huth and Mark Ryan

Publisher: Cambridge University Press (2004), ISBN: 978-0521543101

2) "A Beginner's Guide to Mathematical Logic" by Raymond Smullyan.

Publisher: Dover Publications (2014), ISBN: 978-0486492377

3) "Software Foundations" by Benjamin C. Pierce et al., Volume 1: Logical Foundations, available online:

<https://softwarefoundations.cis.upenn.edu/>

4) " Interactive Theorem Proving and Program Development " , by Yves Bertot and Pierre Casteran,

Publisher: Springer (2004), ISBN: 978-3662079645.

### [Study outside of class (preparation and review)]

Students should review the course material after each class and solve the homework assignments.

### [Other information (office hours, etc.)]

### [Essential courses]