

科目ナンバリング		U-LAS70 10002 SE50					
授業科目名 <英訳>	ILAS Seminar-E2 :Encounters with modern arithmetic (現代整数論との出会い) ILAS Seminar-E2 :Encounters with modern arithmetic			担当者所属 職名・氏名	数理解析研究所 講師 上田 福大		
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	2025・後期	受講定員 (1回生定員)	15 (15) 人	配当学年	主として1回生	対象学生	全学向
曜時限	木5	教室	共東22			使用言語	英語
キーワード	Algebra-related						
[授業の概要・目的]							
It is a classical question from centuries ago whether a quintic (or of higher degree) polynomial equation is solvable in terms of its coefficients, with only use of the usual operations (addition, subtraction, multiplication, division) and application of radicals (square roots, cube roots, etc). Modern/abstract algebra was born to answer this question, the answer to which turns out to be negative in general. On the other hand, abstract algebra has gone far beyond this and is rightly regarded as one of the central features of modern mathematics nowadays, which is in particular fundamental for the study of arithmetic problems.							
[到達目標]							
We will learn the basic concepts and theorems in group theory, ring theory, field theory, and Galois theory. As an application, we shall also be able to determine which polynomial equations are solvable in radicals.							
[授業計画と内容]							
We intend to cover a big chunk of modern algebra in a condensed and interesting way, to make it accessible to most undergraduate students. Both concepts and examples will be emphasized. Below are the plan and contents of the course. The lectures, as well as the order of the lectures, may be modified, depending on students' background and understanding of the course materials.							
-Set Theory [1 week]: Notion of sets, mappings, mathematical induction, Zorn's lemma.							
-Group theory [4 weeks]: Definition and examples of groups, homomorphisms, abelian groups, symmetric groups, Sylow's theorem. -							
Ring theory [3 weeks]: Definition and examples, ideals, quotient rings, Euclidean domains, PIDs, UFDs, polynomial rings.							
-Field theory [3 weeks]: Definition and examples, field extensions, polynomials, finite fields.							
-Galois theory [2 weeks]: Galois extensions, roots of unity, solvability.							
-Some applications to arithmetic [1 week]							
-Feedback [1 week]							
[履修要件]							
特になし							
[成績評価の方法・観点]							
The evaluation consists of the following weighted parts: -Performance in class (20%).							
----- ILAS Seminar-E2 :Encounters with modern arithmetic (現代整数論との出会い) (2)へ続く -----							

- Presentation (60%): Each student reviews a mathematical topic assigned by the instructor. Such a topic is typically a section from the textbook below.
- Report (20%): Your report covers the details of your presentation. Each student needs to email the report to the instructor no later than Friday of Week 15.

**【教科書】**

D. Dummit and R. Foote 『Abstract Algebra』 (Wiley; 3rd edition) ISBN:9780471433347

There is no need to purchase the textbook. Several pdf versions of this book are available online for free.

**【参考書等】**

(参考書)

Other supplemental materials, such as handouts from the instructor, may be introduced during the classes.

**【授業外学修(予習・復習)等】**

Along with preparation and review, students are encouraged to form study groups.

**【その他(オフィスアワー等)】**

**【主要授業科目(学部・学科名)】**