科目ナンバリング	U-LAS10 20018 LE55						
授業科目名 <英訳>	Honors Mathematics B-E2 Honors Mathematics B-E2			担当者所属 職名・氏名	理学研究科　教授	COLLINS Benoit Vincent Pierre	
群	自然科学科目群			分野(分類)	数学(発展)	使用言語	英語
旧群	B群	単位数	2単位	週コマ数	1コマ	授業形態	講義（対面授業科目）
開講年度・開講期	2026・前期	曜時限	火3	配当学年	主として2回生	対象学生	理系向

[授業の概要・目的]

This course provides opportunities to learn mathematics in more depth for highly motivated students. It supplements Calculus A, B and Linear Algebra A, B, and takes these basic courses as starting point to treat more advanced related topics.
Through this course, students can also learn how to read, listen to, discuss and present mathematical arguments in English.

[到達目標]

One of the goals of this course is to help students get used to rigorous proofs of mathematical statements and abstract notions in mathematics. These two features are central to and represent the power of modern mathematics, because rigorously proven facts form unshakeable building blocks of far-reaching theories, and an abstract notion is applicable to various different situations as far as they share a key property.
If the number of students permits, the course will be interactive. In particular, an additional goal of this course is to provide a chance for the students to discuss mathematics in English.

[授業計画と内容]

Below is a list of themes that may be covered.
The actual topics of the lecture will be determined upon investigating the interests and level of the participating students.

1. Finite groups (tentatively 4 weeks)
1.1 Definition, basic notions, class formula
1.2 Symmetric and alternating groups
1.3 Elementary graph theory, Cayley graphs

2 Representation of finite groups (tentatively 3 weeks)
2.1 Matrix algebras, representations
2.2 Character formulas
2.3 Examples (symmetric group, SL2(Fp))

3 Matrix groups -- complex and real cases (tentatively 4 weeks)
3.1 Unitary and orthogonal groups
3.2 Matrix decompositions, properties of groups
3.3 Notions of Lie algebras, representations of groups
3.4 Characters, invariants.

4. Orthogonal functions and Fourier series (tentatively 3 or 4 weeks)
4.1 Orthonormal system of functions
4.2 Space of continuous functions on the circle and its completion
4.3 Fourier series

Honors Mathematics B-E2(2)へ続く↓↓↓

Honors Mathematics B-E2(2)

4.4 Notions of convergence of the Fourier series
4.5 Fourier series and Fourier transform

OR

5. Linear programming (tentatively 3 or 4 weeks)
5.1 Introduction to optimization with constraints
5.2 Basic properties of convex sets and convex functions
5.3 Duality
5.4 The simplex method and Karush-Kuhn-Tucker conditions

Total：14 classes, 1 Feedback session

[履修要件]

Calculus A, B and Linear Algebra A, B.
Familiarity with materials covered in Honors Mathematics A may be helpful.

[成績評価の方法・観点]

The evaluation of the course will take into account the following criteria:
(1) homework and presentation of students during the course (about 40%)
(2) final examination (about 60%)
Details will be discussed with students during the first classes.

[教科書]

未定

[参考書等]

（参考書）
授業中に紹介する

[授業外学修（予習・復習）等]

As in every math course, students should read notes carefully and repeatedly after the class, solve exercise problems and try to find alternative proofs, counterexamples, etc.
After many hours of such practice you may get an intuitive understanding of the materials covered.

[その他（オフィスアワー等）]

Students are welcome to ask questions during or at the end of the class.
The schedule of office hours will be announced in the first lecture.

[主要授業科目（学部・学科名）]

理学部