2010年度 前期	対象学年	大学院	レベル	2	計2単位	A 類 I (基礎科目)

【科 目 名】Perspectives in Mathematical Sciences III
Part 2: Kummer's ideal numbers

【担当教員】Lars Hesselholt

【成績評価方法】Grades based on attendance and written reports

【教科書および参考書】

[1] Charles A. Weibel, *The K-book: An introduction to algebraic K-theory*, Chapters I and II, available for free download at www.math.rutgers.edu/∼weibel/Kbook.html.

【講義の目的】In 1847, Lamé and Cauchy announced proofs of Fermat's last theorem in a meeting of the French Academy of Sciences. However, shortly thereafter, Kummer pointed out a fatal error in the proofs. In a way, this was a most fortunate turn of events, for some very important parts of modern mathematics grew out of Kummer's work. This portion of the course will present some parts of this mathematics. In the end, I will present a conjecture of Kummer—or as he wrote, "a theorem still to be proved"—that to this day remains an important open problem.

【講義予定】Here is a tentative outline:

Lecture 1: Rings, modules, and their homomorphisms. Matrices. Simple rings and their classification. Semi-simple rings.

Lecture 2: Free modules and projective modules. Every projective module over a local ring is free. The Grothendieck group.

Lecture 3: Invertible modules over a commutative ring and the Picard group. Dedekind domains and their Picard groups. The Picard group of a ring of integers in a number field is finite.

Lecture 4: Rings of integers in cyclotomic fields and their Picard group. Kummer's theorem on regular prime numbers. The Kummer-Vandiver conjecture.

【キーワード】Modules, projective modules, Grothendieck group, invertible modules, Picard group, cyclotomic fields, regular prime numbers, the Kummer-Vandiver conjecture.

【履修に必要な知識】Knowledge of standard undergraduate algebra and linear algebra.

【他大学院生の聴講】This course is open for any students at Nagoya University as one of the "open subjects" of general education.

【履修の際のアドバイス】《未記入》

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