科目ナンバリング	U-LAS10 10002 LE55						
授業科目名 <英訳>	Calculus with Exercises A Calculus with Exercises A			担当者所属 職名・氏名	理学研究科　准教授　劉　逸侃		
群	自然科学科目群			分野(分類)	数学(基礎)	使用言語	英語
旧群	B群	単位数	3単位	週コマ数	2コマ	授業形態	講義（対面授業科目）
開講年度・開講期	2025・前期	曜時限	火2・水2	配当学年	主として1回生	対象学生	理系向

[授業の概要・目的]

Calculus and linear algebra form the essential mathematical background necessary for understanding and developing modern science and technology. In this lecture, basics of calculus required for further pursuing of studies majored in science are explained.

Calculus with Exercises A strengthens the theoretical base of high school knowledge of differentiation and integration for real functions of one variable, and provides instructions on other more advanced methods of mathematical analysis.

[到達目標]

The objective of this course is to learn and understand basic notions of differentiation and integration of functions of one variable and methods of mathematical analysis based on them, as well as to become able to apply this knowledge to solving problems.
In addition to learning the basic calculus, students can learn through this course how to discuss and present mathematical topics in English.

[授業計画と内容]

This subject is composed of two interrelated parts: Lecture and Exercises. The exercises sessions will take place basically once in two weeks, their purpose being to deepen the students' understanding of the contents of the lecture sessions through active participation in problem solving and through regular submission of reports.

In the course outline below, the order in which the given items will be presented is not fixed and depends on the background and understanding of the enrollees.

1. Fundamental concepts (1 week)
Numbers, sets, mappings, basic notions of mathematical logic.
2. Properties of real numbers and continuous functions (3-4 weeks)
Infimum and supremum of sets of real numbers, convergence of sequences, infinite series, limits of functions, definition and basic properties of continuous functions (intermediate value theorem, etc.).
3. Differentiation of functions of one variable (4-5 weeks)
Differential coefficients, derivative, differentiation of composite functions and inverse functions, derivatives of higher order, Taylor expansion, the mean-value theorem and its applications (monotonicity, convexity, extrema), infinitesimals, calculation of approximations*.
4. Integration of functions of one variable (3-4 weeks)
Riemann integral, integrability of continuous functions, definite integrals, the fundamental theorem of calculus, integration by parts and by substitution, improper integrals, length of curve*.

Moreover, topics related to

Calculus with Exercises A(2)へ続く↓↓↓

Calculus with Exercises A(2)

5. Important functions (1-3 weeks)
Exponential function, trigonometric functions, logarithm, inverse trigonometric functions, Gamma function*.

will be explained according to necessity at the corresponding place.

* denotes optional topics.

Total：14 classes, 1 Feedback session

[履修要件]

特になし

[成績評価の方法・観点]

Students will be evaluated based on their performance in both the lecture and the exercises sessions.
* Lecture will be graded based mainly on the final examination.
* Exercises will be evaluated based mainly on submitted reports and participation in class.
The details of the evaluation system will be given by the lecturer in the first lecture.

Students who fail to pass the examination but reach a certain standard are eligible for reexamination.

[教科書]

A. M. Bruckner, J. B. Bruckner, B. S. Thomson 『Elementary Real Analysis』（Prentice-Hall）（This book can be downloaded for free at https://classicalrealanalysis.info/Free-Downloads.php .）

[参考書等]

（参考書）
A. M. Bruckner, J. B. Bruckner, B. S. Thomson 『Elementary Real Analysis』（This book can be downloaded for free at https://classicalrealanalysis.info/Free-Downloads.php .）
M. Spivak 『Calculus』（Publish or Perish）ISBN:978-0914098911
N. L. Carothers 『Real Analysis』（Cambridge University Press）ISBN:978-0521497565
E. Hewitt, K. Stromberg 『Real and Abstract Analysis』（Springer）ISBN:978-0387901381

[授業外学修（予習・復習）等]

It is difficult to follow the lecture without regular study. Therefore, students are expected to devote an amount of time equivalent to the time of the lecture to solve report problems and to review the contents of previous lectures.

[その他（オフィスアワー等）]

It is advisable to attend the lecture "Linear Algebra with Exercises A" in parallel. Moreover, it is recommended to register for "Calculus with Exercises B" in the second semester.

There are no fixed office hours. If you wish to have a consultation, please feel free to contact the lecturer.

[主要授業科目（学部・学科名）]

理学部