Course number	U-LAS10 10002 LE55		
Course title (and course title in English)	Calculus with Exercises A Calculus with Exercises A	**Instructor's name, job title, and department of affiliation**	Graduate School of Science Associate Professor,YIKAN LIU Graduate School of Science Assistant Professor,Maria Stella ADAMO
Group	Natural Sciences	**Field(Classification)**	Mathematics(Foundations)
Language of instruction	English	**Old group**	Group B
Number of credits	3		
Number of weekly time blocks	2	**Class style**	Lecture (Face-to-face course)
Year/semesters	2026・First semester		
Days and periods	Tue.2・Wed.2	**Target year**	Mainly 1st year students
Eligible students	For science students		

[Overview and purpose of the course]

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.

[Course objectives]

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.

[Course schedule and contents)]

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*.

Continue to Calculus with Exercises A(2)↓↓↓

Calculus with Exercises A(2)

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

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

[Course requirements]

None

[Evaluation methods and policy]

The final grade is a comprehensive assessment based on performance in both the lecture and exercise components of the course. Students are required to attend and actively participate in both sessions to receive a passing grade. The total score is weighted as follows:
- Lecture Component (approx. 2/3 of the total grade): Evaluated by the professor in charge of lectures.
- Exercise Component (approx. 1/3 of the total grade): Evaluated by the professor in charge of exercises.

The specific evaluation criteria for both components will include a combination of the following:
1. In-class Participation: Engagement during both lecture and exercise sessions.
2. Assignments and Reports: Periodic take-home homework or technical reports.
3. Mid-term exam: A mid-term examination or equivalent evaluation may be conducted at the discretion of the instructors.
4. Final Examination: A comprehensive examination covering the course material.

The final distribution of points across these categories will be finalized based on the progression of the course.

Details will be explained in class.

[Textbooks]

Instructed during class

[References, etc.]

（References, etc.）

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

Continue to Calculus with Exercises A(3)↓↓↓

Calculus with Exercises A(3)

[Study outside of class (preparation and review)]

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.

[Other information (office hours, etc.)]

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.

[Essential courses]

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