# Calculus 1

### 1. Course Description

Calculus 1 is the introduction part of analysis and the foundation of many mathematical subjects in university. Analysis is an important mathematical field that describes numerous phenomena appearing in natural science and engineering by mathematical expressions and contributes to elucidating these phenomena. First, with regard to the main function of one variable, we treat limit, concept of differentiation, derivative, Taylor's theorem, concept of integration, primitive function, definite integration, etc. And these items will be continued to Calculus 2, Applied Mathematics 1, Applied Mathematics 2 and specialized subjects. This subject leads to future learning, such as the method of handling functions, grasping the properties of individual functions, and the shape of graphs.

In this course, you will acquire knowledge, techniques, and attitudes about DP 3 and DP 4.

### 2. Course Objectives

1. Understand the continuity and differentiability of functions, and apply to specific functions.
2. Understand the nature of the function (including the inverse trigonometric function and the limit of the indefinite form), and can reliably calculate the derivative of the basic function.
3. Understand the concept of Taylor's theorem and Maclaurin's theorem. Be able to apply them to specific functions.
4. Be able to reliably calculate the definite integral (including improper integral) of the basic function.

### 3. Grading Policy

(1) Confirmation tests (25%). They are returned after scoring. Example answer is presented on LMS.
(2) Two mid-term examinations in the 5th and 9th lesson (25%, 25%). Example answer is presented on LMS.
(3) A term-end examination is conducted at the end of the term (25%). Example answer and explanation are presented on LMS.

### 4. Textbook and Reference

Textbook
Yoshihiro Tashiro    "Mathematical Differential Integration of Engineering"
ISBN 978-4-627-04932-1    Morikita Publishing

### 5. Requirements(Assignments)

In each class session, the following cycle (1), (2), and (3) will be repeated
(1) As a pre-assignment, One week before each class, we will distribute teaching materials include a summarize of the theme, the range of the textbook, basic questions and practical questions for each lesson, and present them to LMS as well. Students refer to the teaching materials, check the content of the lesson, and prepare for a lesson. (60 minutes)
(2) Each lesson is as follows.
1) Confirmation test on the previous lesson's content.
2) Examples in the preparatory study will be explained and related problems will be practiced.
3) During the class, we distribute Excercise-step1. Students will do exercises and explanations, with some group work.
(3) As a post-assignment, Each student solves the Exercises-step2 distributed at the end of the class, and check the answers . (Answers will be shown on the LMS) (60 minutes)

### 6. Note

1) Class materials will be distributed in each class. They will also be presented on the LMS.
2) If a student's score does not reach the target level in a confirmation test or midterm examination, the student will receive individual guidance outside of class hours.

### 7. Schedule

[1]      Distribution of the teaching materials of all lessons and explanation how to learn each lesson.
Differential (pp.12-20):
Limit of function, a differential function.

[2]      Differential (pp.20-31):
Tangent, increase / decrease of function and maximum / minimum.

[3]      Differentiation (pp.32-40):
Function continuity and differentiation.

[4]      Derivative (pp.40-42):
derivative of composite function.

[5]      Midterm exam 1.
Differentiation of various functions 1(pp.43-47):
Exponential function, Logarithmic function.

[6]      Differential (pp.47-54):
Differentiation of various functions 2: Arc degree, Trigonometric function.