

# Exercise of fundamental mathematics

Syllabus Number

0L191

Remedial Subject

Elective 1 credit

FUKUDA, Chieko

## 1. Course Description

This course is designated to achieve the Educational Goals 2, and 3 of General Basic Subjects.

First, students acquire a wide knowledge of natural science based on the Educational Goals 3. In each lesson, students listen to lectures about fundamental mathematics and solve mathematical problems. It helps students acquire the necessary and fundamental mathematical skills to learn mathematics at university.

Second, students achieve logical, critical and active manners based on the Educational Goals 2. In pre-assignment, students solve the basic questions. In learning when attending a lesson, they acquire logical and critical thinking skills and communication skills through advanced problem solving in group work. In post-assignment, students solve practice questions. It enhances the development of students' skills in making self-regulated learning.

## 2. Course Objectives

(1) Students prepare to study basic mathematics in their first year at the university. They will learn "calculation of numbers and symbols", "Quadratic functions", "Exponent functions and Logarithmic functions" and "Trigonometric functions".

(2) Students will be able to learn autonomously through pre-assignment.

(3) Students can logically think through advanced problem solving in group work, and be able to communicate it to other students.

## 3. Grading Policy

(1) Small tests in lesson and the assignments (reports of advanced problems and practice questions) (30%). They are returned after marking.

(2) Two mid-term examinations in the 4th and 8th lesson (30%). The example of answers are presented on LMS.

(3) A term-end examination is conducted at the end of the term (40%). The example of answers and explanations are presented on LMS.

## 4. Textbook and Reference

Textbook

Kenji Ueno ed. Study Group on Mathematical Learning Materials of Engineering Basic Mathematics (Engineering Mathematics Text Series), ISBN 978-4-627-05711-1 Mori Kita publication

Reference

Mathematics I and Mathematics II textbooks and reference books used in high school.

## 5. Requirements(Assignments)

In the first lesson, 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. As a pre-assignment, students refer to the teaching materials, check the contents of the lesson, and solve the basic questions. (60 minutes)

Each lesson is as follows:

(1) Do a small test for the confirmation of previous lesson.

(2) Confirm the basic questions solved in pre-assignment.

(3) Solve advanced problems in group work, and discuss them with other students.

(4) Submit a report of the advanced problems. (Answer presented to LMS)

As a post-assignment, solve the practice questions specified in the teaching materials and check the contents of the lesson. (60 minutes)

## 6. Note

The Teaching materials will be distributed in the first lesson. Also they are presented on LMS.

If your reports of each submission or the midterm examinations are not in the target level, we will prepare students for additional classes outside of the scheduled time table.

## 7. Schedule

[1] Distribution of the teaching materials of all lessons and explanation how to learn each lesson. Numbers and their calculations (textbook pp.1-13)

The nature of equations and inequalities

Calculation of rational numbers, square roots and complex numbers

Pre-assignment: While reading the textbook pp.1-12, solve the basic questions in the Teaching Materials. (60 minutes)

Post-assignment: Textbook p.13 Solving Exercise 1 (60 minutes)

[2] Calculation of the formula (textbook pp.14-29)

Calculation of polynomials, factoring, factor theorem, the calculation of the fractional expression.

Pre-assignment: While reading the textbook pp.14-19,22-28, solve the basic questions in the Teaching Materials. (60 minutes)

Post-assignment: Textbook p.21 Solving Exercise 2 and p.29 Solving Exercise 3(60 minutes)

- [3] Equations (textbook pp.30-37) Solving quadratic equations, third and fourth order equations, various equations  
Pre-assignment: While reading the textbook pp.30-36, solve the basic questions in the Teaching Materials. (60 minutes)  
Post-assignment: Textbook p.37 Solving Exercise 4 (60 minutes)
- [4] Intermediate test-1  
Calculation of number and formula (textbook pp.1-38)  
Explanation of answer
- [5] Quadratic function and its graph (textbook pp.56-62)  
Graph of the quadratic function, the maximum and minimum values  
Pre-assignment: While reading the textbook pp.56-61, solve the basic questions in the Teaching Materials. (60 minutes)  
Post-assignment: Textbook p.62 Solving Exercise 7 (60 minutes)
- [6] Quadratic function and equation · Inequality (textbook pp.63-68)  
The relationship between quadratic functions and equations or inequalities  
Pre-assignment: While reading the textbook pp.63-67, solve the basic questions in the Teaching Materials. (60 minutes)  
Post-assignment: Textbook p.68 Solving Exercise 8 (60 minutes)
- [7] Functions and graphs (textbook pp.70-84)  
General properties of functions, various functions  
Pre-assignment: While reading the textbook pp.70-83, solve the basic questions in the Teaching Materials. (60 minutes)  
Post-assignment: Textbook p.84 Solving Exercise 9 (60 minutes)
- [8] Intermediate test-2  
Various functions (textbook pp.56-85)  
Explanation of answer.
- [9] Exponential function (textbook pp.86-91)  
Exponential law, graph of exponential function  
Pre-assignment: While reading the textbook pp. 86-90, solve the basic questions in the Teaching Materials. (60 minutes)  
Post-assignment: Textbook p.91 Solving Exercise 10 (1,2,3,4,7) (60 minutes)
- [10] Logarithmic function (textbook pp.96-100)  
Logarithm definition, logarithmic law of calculation, graph of logarithm  
Pre-assignment: While reading the textbook pp. 96-100, solve the basic questions in the Teaching Materials. (60 minutes)  
Post-assignment: Textbook p.106 Solving Exercise 11 (1,2,3,4,5,8) (60 minutes)
- [11] Exponential and logarithm equations and inequalities (textbook pp.92-94, pp.101-105)  
Equations and inequalities of exponential or logarithm, common logarithm  
Pre-assignment: While reading the textbook pp.92-94, pp.101-105, solve the basic questions in the Teaching Materials. (60 minutes)  
Post-assignment: Textbook p.95 Solving Exercise 10 (5,6,8,9) and p.106 Exercise 11(6,7,9,10,11)(60 minutes)
- [12] Sine and cosine (textbook pp.108-121)  
The definition of the sine and cosine, radian system, graphs of trigonometric function  
Pre-assignment: While reading the textbook pp.108-120, solve the basic questions in the Teaching Materials. (60 minutes)  
Post-assignment: Textbook p.122 Solving Exercise 12 (60 minutes)
- [13] Basic properties of trigonometric functions, equations and inequalities (textbook pp.122-132)  
Tangent, basic formulas, equations · inequality, inverse trigonometric  
Pre-assignment: While reading the textbook pp.122-132, solve the basic questions in the Teaching Materials. (60 minutes)  
Post-assignment: Textbook p.124 Solving Exercise 13 (60 minutes)
- [14] Addition Theorem of Trigonometric Function (Textbook pp.133-141)  
Addition theorem of trigonometric functions, various formulas, inverse of trigonometric functions  
Pre-assignment: While reading the textbook pp.133-140, solve the basic questions in the Teaching Materials. (60 minutes)  
Post-assignment: Textbook p.141 Solving Exercise 14 (60 minutes)
- [15] Application of trigonometric functions to triangles (Textbook pp.142-152)  
Sine Theorem, Cosine Theorem, Triangle and Trigonometric Function, Area of Triangle, Chapter Exercise (p.152)  
Pre-assignment: While reading the textbook pp.142-150, solve the basic questions in the Teaching Materials. (60 minutes)  
Post-assignment: Textbook p.151 Solving Exercise 15 (60 minutes)