

# Computational Analysis on Aerospace Engineering

Syllabus Number

2G214

Basic Major Subjects

Elective Requisites 2  
credit

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## 1. Course Description

Excel is a very useful software. We can do anything, even most of the scientific computing with Excel. In this course, students will learn about macros and VBA just after reviewing the basic use of Excel. In addition, you will learn the outline of the calculation in the computer. Then, you will learn the basics of numerical calculations and solve exercise problems. The contents of this course are as follows:

1. Numerical error in a calculation.
2. Approximation of the function. (Method of least squares, etc.)
3. Numerical integral.

## 2. Course Objectives

Computer is essential for science and engineering researchers and technicians. Mathematical analysis is very important too. In the case that the target of the analysis is a complex phenomenon, analytical solutions cannot be gotten because the analysis become too difficult. In such a case, the numerical calculation can be used to get approximate solutions in place of the analytical solutions. The goal of this lecture is to get the knowledge of the outline of the computer, and to learn problem-solving skills by numerical calculation. It is also the goal of this lecture to be familiar with Excel.

## 3. Grading Policy

Evaluate according to the answer content of the exercise question (100%).  
I do not perform final exam.

Feedback such as commentary will be sent after submitting the answer, for examples and ideas of exercises' correct answers.

## 4. Textbook and Reference

Textbook

水島二郎・柳瀬眞一郎 『理工学のための数値計算法[第2版]』 ISBN-13: 978-4901683708

I also distribute materials as necessary. 数理工学社

## 5. Requirements(Assignments)

Familiarize yourself with using Excel on a daily basis.

Write procedures and tips on the notebook and bring the notebook to the lecture. It helps you. (1 hour)  
The exercise is mainly in the homework form, and in order to answer, it is necessary to understand the contents explained. Review carefully and do exercises and submit within the due date. (2 hours)

## 6. Note

This lecture is a practical form in the CL classroom.

The sequel of this lecture will be Mr. Kawamura's "Numerical Calculation". I strongly recommend you to continue taking classes.

Excel is the most useful software. In this lecture, I want you to be able to use Excel firmly.

## 7. Schedule

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| [1]  | Basic usage of Excel Review.   |
| [2]  | Excel macros.  |
| [3]  | Excel VBA.   |
| [4]  | History of computer.   |
| [5]  | Calculation behavior in computer.  |
| [6]  | Characteristics of numerical calculation, meaning of approximation, occurrence of error.   |
| [7]  | Approximation of function (1) (interpolation method, least squares method, Fourier series expansion, Expansion by power function, Lagrangian interpolation polynomial etc.). |
| [8]  | Approximation of function (2) (Lagrangian interpolation polynomial (sequel)).  |
| [9]  | Approximation of function (3) (Spline interpolation).  |
| [10] | Approximation of function (4) (Least squares method).  |
| [11] | Solving numerical integration (1) trapezoidal method.  |
| [12] | Solving numerical integration (2) Trapezoid method (sequel).   |
| [13] | Solving numerical integration (3) Simpson method.  |
| [14] | Solving numerical integration (4) Simpson method (sequel).   |
| [15] | Solving numerical integration (5) Practice issues.   |