

Physical Measurement and Analysis

Syllabus Number

3E221

Special Subjects

Elective 2 credit

OGAWA, Mitsuhiro

1. Course Description

Not only is the measurement merely to measure the physical quantities, but it includes all acts of the quantitative recognition of things such as the research of the measurement, the development of measurement methods, the data processing for measurement data, and the recognition for the measurement of objects.

Contents of this course are as follows:

- Physical background for measurement data
- Principle of measurements
- Methods of measurements
- Processing of measurement data
- Correct evaluation for measurement values with errors
- Method of processing signal data with noise

This course relates to DP4.

2. Course Objectives

The aim of this course is to make students understand the significance of measurements and acquire the ability to perform correct evaluation for measurement values, to express measurement results correctly, and to process measurement data properly.

3. Grading Policy

Final Exam: 60%

Middle Exam and Exercises: 20%

Reporting: 20%

The results will be informed and reviewed mainly via LMS.

4. Textbook and Reference

Textbook

Nishihara and Matsuda Japanese textbook, ISBN: 978-4627664449 Morikita Publishing Co., Ltd.

5. Requirements(Assignments)

LMS will be used in this course.

Function calculator can be used in the final and middle exam.

For preparation, 90 min are required for each class in standard. You should read the textbook and try to find what you cannot understand, then take a class.

For review, 90 min are required for each class in standard. Practice questions for review will be distributed in class.

6. Note

The 14th class will proceed with learners' discussion.

7. Schedule

- [1] Science of measurement, What the measurement is
- [2] Accuracy and error
- [3] Math for measurement
- [4] Least squares method
- [5] Interpolation method(s)
- [6] Correlation of measured values
- [7] Middle Exam
- [8] Principle of measurement; Null method and other measurement
- [9] Mechanical sensor
- [10] Various sensors and sensing
- [11] Measurement as pre-process for signal processing
- [12] Digital Signal Processing #1 (Sampling, averaging, correlation and basic of Fourier analysis)
- [13] Digital Signal Processing #2 (Practical application of Fourier analysis)
- [14] Novel topics in this field
- [15] Final Exam and summary of this course