

## Measurement Science and Technology

2 units (selection)

Tetsuo Iwata · PROFESSOR / MECHANICAL SCIENCE, MECHANICAL ENGINEERING, INTELLIGENT STRUCTURES AND MECHANICS SYSTEMS ENGINEERING, Hiroyuki Ukida · ASSOCIATE PROFESSOR / MECHANICAL SYSTEMS, MECHANICAL ENGINEERING, INTELLIGENT STRUCTURES AND MECHANICS SYSTEMS ENGINEERING

**Target)** To understand importance of the Fourier transformation for developing various kinds of measurement techniques, measurement equipments, measurement systems.

**Outline)** Among the various measurement techniques used in the fundamental and applied research, optical measurement methods including their principles, methodologies, instrumentations, and evaluation methods are reviewed. In the lecture, emphasized is the importance of the concept of the Fourier transformation to understand and to deal with linear systems in the modern scientific measurement system. Practical methods of object inspections, distance measurements, and shape reconstructions using images are also lectured.

**Style)** Lecture

**Keyword)** *measurement techniques, measurement devices, Fourier transform*

**Relational Lecture)** “**Micro-Nano Engineering**”(0.5), “**Digital Control Theory**”(0.5), “**Actuator Control Theory**”(0.5)

**Goal)**

1. To understand Fourier series and Fourier transform.
2. To understand relations among Fourier transform and measurement principles of scientific instruments.
3. To understand techniques used with practicable various measurement devices.

**Schedule)**

1. Frequency response of the amplifier
2. Optical information processing
3. Fourier-transform infrared spectroscopy
4. Subfringe interferometry
5. Computed tomography
6. Sampling theorem and quantization theorem
7. Wavelet transformation
8. Lock-in amplifier and boxcar integrator
9. Optics for microscope
10. X-ray diffraction
11. Image measurement systems
12. Feature extraction from images

13. Binocular stereo method

14. Pattern projection

15. Shape from shading and texture

16. Examination

**Evaluation Criteria)** Assignments count 50% and examinations count 50%.

**Textbook)** Printed synopses are used.

**Reference)** To be introduced in the class.

**Contents)** <http://cms.db.tokushima-u.ac.jp/cgi-bin/toURL?EID=216630>

**Student)** Able to be taken by only specified class(es)

**Contact)**

⇒ Iwata (M427, +81-88-656-9743, iwata@me.tokushima-u.ac.jp) MAIL

⇒ Ukida (M424, +81-88-656-9448, ukida@me.tokushima-u.ac.jp) MAIL (Office

Hour: 毎週金曜日 17:00~ 18:00)