

# Mechanical Dynamics2

Syllabus Number

1D202

Special Subjects

Elective 2 credit

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## 1. Course Description

Second or more-degrees-of-freedom systems and systems with constant vibration are described based on the knowledge of single-degree-of-freedom vibration system learned in Mechanical Dynamics 1. This course describes free vibration, natural frequencies, forced vibration and its resonance in linear vibration systems. Finally, nonlinear vibration systems and parametric resonance are introduced briefly.

In this class, it acquires knowledge, technology and ability about diploma policy 2 and 3 and 4.

## 2. Course Objectives

Vibration engineering in machine design is important to fatigue fracture under cyclic load. Also, it is important to refine design problems related to riding comfort in automobiles and so on. This course describes free vibration, natural frequencies, forced vibration and resonance in second-degree-of-freedom model composed of mass, spring and damper. The objective is to study basic principles and laws in vibration engineering.

## 3. Grading Policy

- Term-end examination : 65%
- Short examination : 20%
- Print and the problem to have let out while lecturing : 15%

Students will not be evaluated when they are not attending lectures more than 2/3. Small test will be returned after grading and will be explained during lecture. Answers will be upload to LMS.

## 4. Textbook and Reference

Textbook

Yoshio Iwata et al Mechanical vibration Surikougakusya  
ISBN978-4-901683-80-7

## 5. Requirements(Assignments)

The materials for each lesson will be uploaded on the LMS in advance, and the answers to the problem exercises performed during the lesson will be uploaded on the LMS until the next lesson.

Please prepare and review the lecture for about 3 hours each time.

## 6. Note

Please bring a scientific calculator every lecture.

If you're absent from lecture, please study and revise the topics taught on that day.

## 7. Schedule

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|------|---|
| [1]  | Free vibration for two degrees of freedom by no damped system   |
| [2]  | Free vibration for two degrees of freedom by torsional vibration system and car body vibration system |
| [3]  | Forced vibration for two degrees of freedom   |
| [4]  | Lagrange equation   |
| [5]  | Matrix vibration analysis (free vibration, orthogonality of eigenmode)                                |
| [6]  | Matrix vibration analysis (modal coordinate)  |
| [7]  | Matrix vibration analysis (forced vibration)  |
| [8]  | Short examination, vibration of continuum   |
| [9]  | Commentary of the short examination and summary of the first half                                     |
| [10] | Vibration of string   |
| [11] | Free vibration for stick  |
| [12] | Forced vibration for stick  |
| [13] | Transverse vibration of beam  |
| [14] | Vibration of panel  |
| [15] | Term-end examination and summary  |