

Mechanical Dynamics1

Syllabus Number 1D201
Basic Major Subjects
Requisites 2 credit
KUROSAWA, Yoshio

1. Course Description

One degree of freedom vibration is described in basic vibration problems. This course describes free vibration, natural frequencies, forced vibration and its resonance in the one degree of freedom model composed of mass, spring and damper. The objective is to study basic principles and laws in vibration engineering.

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 for the refinement of design in order to solve problems of automobile riding comfort and so on. This course describes free vibration, natural frequencies, forced vibration and resonance using a simple 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 to every lecture.

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

7. Schedule

- [1] A machine and vibration, modeling, procedure of the vibration analysis, harmony vibration
- [2] Composition of the harmony vibration
- [3] Free vibration for one degrees of freedom by no damped system
- [4] Energy method
- [5] Free vibration for one degrees of freedom by damped system
- [6] Coulomb damping
- [7] Viscous damping and Coulomb damping
- [8] Short examination, Forced vibration for one degrees of freedom by no damped system
- [9] Commentary of the short examination and summary of the first half
- [10] Response function and resonance
- [11] Forced vibration for one degrees of freedom by damped system (viscous damping)
- [12] Forced vibration for one degrees of freedom by damped system (Coulomb damping, hysteresis)
- [13] Forced vibration by inappropriate external force, forced vibration by the displacement input
- [14] Transient response by impulse, vibration analysis using Laplace transform
- [15] Vibration of the rotor system