Vibration Engineering

1. Course Description

This course covers fundamental concepts on the vibration of mechanical systems including an introduction to matrix methods and the Lagrange's equations of motion for one degree and two degrees of freedom systems (1-DOF and 2-DOF).

2. Course Objectives

Upon successful completion of this course, you will be able to derive and solve ordinary differential equations for the following fundamental vibrations, and to explain the dynamics of them.
(1) 1-DOF Undamped Free Vibration
(2) 1-DOF Damped Free Vibration
(3) 1-DOF Undamped Forced Vibration
(4) 1-DOF Damped Forced Vibration
(5) 2-DOF Undamped Free Vibration
(6) 2-DOF Damped Free Vibration
(7) 2-DOF Undamped Forced Vibration
(8) 2-DOF Damped Forced Vibration

3. Grading Policy

Homework: 20%, Mid-term exam: 40%, Final exam: 40%

4. Textbook and Reference

Textbook
ISBN-13: 978-4130628105
Reference
ISBN-13: 978-4627667112

5. Requirements(Assignments)

Differential Equations

6. Note

7. Schedule

[1]   Overview of Mechanical vibration systems, Simple pendulum
[2]   (1) 1-DOF Undamped Free Vibration (Solution of ODE)
[3]   (2) 1-DOF Damped Free Vibration (Overdamping, Critical damping)
[4]   (2) 1-DOF Damped Free Vibration (Underdamping)
[5]   (3) 1-DOF Undamped Forced Vibration (Solution of ODE)
[6]   (3) 1-DOF Undamped Forced Vibration (Resonant vibration)
[7]   (4) 1-DOF Damped Forced Vibration (Steady-state vibration)
[8]   (4) 1-DOF Damped Forced Vibration (Solution of ODE)
[9]   Summary, Mid-term exam
[10]   (5) 2-DOF Undamped Free Vibration (solution of equation of motion)
[11]   (5) 2-DOF Undamped Free Vibration (Proper Value, Characteristic Vector, Vibration Mode)
[12]   (7) 2-DOF Undamped Forced Vibration
[13]   (6) 2-DOF Damped Free Vibration
[14]   (8) 2-DOF Damped Forced Vibration
[15]   Summary, Term end exam