

Hokkaido University Syllabus

 Course Title

Machine and Structural Dynamics

 Subtitle

 Instructor (Institution)

Yukinori KOBAYASHI(Faculty of Engineering)

 Other Instructors (Institution)

Yukinori KOBAYASHI(Faculty of Engineering)

 Course Type

 Open To Other Faculties / Schools


OK

 Year


2015

 Semester


1st Semester

 Course Number

092560

 Type of Class

Lecture

 Number of Credits

2

 Year of Eligible Students

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 Eligible Department / Class

 Other Information

 Numbering Code

ENG 6661

 Major Category Code

 Major Category Title

ENG

Engineering, Graduate School of Engineering

 Level Code

 Level

6

Specialized Subjects (advanced) in graduate level (Master's Course and Professional Course)

 Middle Category Code

 Middle Category Title


6

 Small Category Code

 Small Category Title

6

 Language Code

 Language Type

1

Classes are in English.

 Key Words


Vibration, Analytical dynamics, Variational approach, Lagrange's equation, Control theory

 Course Objectives

This course offers advanced topics on engineering mechanics and vibration analysis for machine and structures. Vibration problems of continuous systems like beams and plates are the main topics in this course. Variational approach is important to understand Lagrange's equation and Hamilton's principle to derive the governing equations of the continuous systems.

 Course Goals

Derivation of analytical model of continuous systems is a goal of this course. Understandings of the variational approach and Hamilton's principle are the other goal of this course. It is also useful to understand the optimal control. Additionally, fundamentals on modal analysis and nonlinear vibrations are introduced to understand advanced topics on vibration.

 Course Schedule

Lecture 1: Vibration analysis of continuous systems (7 times)

- (1) Vibration of string
- (2) Vibration of bar
- (3) Vibration of beam
- (4) Vibration of membrane and plate
- (5) Modal analysis

Lecture 2: Variational principle for vibration analysis (4 times)

- (1) Variational principle, Lagrange's equation, Hamilton's principle
- (2) Vibration analysis of continuous systems
- (3) Galerkin's method and Ritz method

Lecture 3: Nonlinear vibration and modern control theory (4 times)

- (1) Nonlinear free vibration
- (2) Nonlinear forced vibration
- (3) State feedback, Optimal control
- (4) Vibration control, Application of control theory

Final examination

■ ■ Homework

There is no one textbook that adequately responds to the goal of this lecture. Some reading materials and handouts will be prepared for your understanding. Please contact the instructor if you need further advice.

■ ■ Grading System

10% class participation
20% assignments
70% final examination

■ ■ Textbooks

■ ■ Reading List

■ ■ Websites

■ ■ Website of Laboratory

http://net-hm.eng.hokudai.ac.jp/~rd/labo/index_en.html

■ ■ Additional Information

■ ■ Update

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