Structural Dynamics Control  
TME146  
Quarter 2, 2020/2021

- Credits: 7.5 Higher education credits (hec)  
- Institution: Dept. of Mechanics and Maritime Sciences  
- Teaching Language: English  
- Prof. Viktor Berbyuk – Lecturer & Examiner

PREREQUISITES:

Basic knowledge in dynamics of particles and rigid bodies vibrations, some familiarity with system control.
Course Aim

• Cross the bridge between the structural dynamics and control engineering and give insight into smart materials and active structures for vibration control.

• Give knowledge on methods and concepts of passive, semi-active and active vibration control of structures and dynamic systems.

• Give knowledge on experimental validation of vibration control algorithms by using modern data acquisition software and hardware.
Course Organization

- Lectures and Problem Solving Sessions
- Computer Assignments in Matlab
- Experimental Validation in Lab.
- Papers Review Project (*not compulsory*)
- Written exam.
- Block Schedule: C

- Mondays: 13:15-17:00 (Lectures & Computer Assignments)
- Thursdays: 08:00-11:45 (Lectures & Computer Assignments)
- Fridays: 15:15-17:00 (Problem Solving Sessions)
LEARNING OUTCOME

• **Knowledge how to formulate and solve** passive, semi-active as well as active vibration control problems for structures and dynamic systems

• **Knowledge how to evaluate and validate** vibration control algorithms by experiments and practice with modern data acquisition software and hardware (CompactDAQ, CompactRIO)

• **Knowledge about smart materials sensor and actuators** technology for active structural dynamics applications.
Integrated Teaching Approach: Theory, Virtual Instrumentation and Graphical System Design, and Experiment

Structural Dynamics Control

MATLAB
SDC Course: Lab 1

- Parameter identification for stiffness & damping
- Design of passive vibration absorber
  - Vibration analysis of carts using LabVIEW VI
  - The measurement system CompactDAQ
    - 3 accelerometer channels module NI9233
  - Manual speed control
  - Change of masses and springs is done easily
SDC Course Lab 2

- Study and work with Real-time controller
- Analyze performance of semi-active damper
- Compare different vibration control algorithms.

- CompactRIO
  Vibration control of carts using LabVIEW VI at RT-processor level
- 2 accelerometers channel module NI9233
- 1 ch. Voltage output for motor speed module 9215
- 1 ch. Voltage output for damper current
Vibration Control Test Rig at the Vibrations and Smart Structures Lab
Learning Outcome Applications

MECHANICAL SYSTEMS

- DYNAMICS, CONTROL AND PARETO OPTIMIZATION OF ENGINEERING SYSTEMS
- VIBRATION DYNAMICS AND CONTROL, SMART STRUCTURES
- ACTIVE TECHNOLOGY AND SUSPENSIONS
- MECHANICAL POWER TRANSMISSION SYSTEMS
- VEHICLES DYNAMICS, SAFETY, COMFORT, ENERGY EFFICIENCY
- WIND TURBINE TECHNOLOGY
- POWER HARVESTING FROM VIBRATIONS

Professor Viktor Berbyuk, e-mail: viktor.berbyuk@chalmers.se
Course textbook:

Berbyuk V., *Structural Dynamics Control*, Lecture Notes, CHALMERS.

Textbook available at Cremona for SEK 270 before course start.

*Structural Dynamics Control*
Second Edition

VIKTOR BERBYUK

Department of Applied Mechanics
Division of Dynamics
CHALMERS UNIVERSITY OF TECHNOLOGY
Göteborg, Sweden 2014
Thank You for Your Attention!

Welcome to the TME146 course!

Viktor Berbyuk
E-mail: viktor.berbyuk@chalmers.se

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