MECH 592 Machine Tool Structures and Vibrations
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The room and lecture times will be adjusted based on the needs of registered students.

The major focus of this course is "Linear Vibrations and Experimental Modal Analysis". Machine tools are used as a real world application to teach practical use of vibration engineering in machine design and troubleshooting rotating machinery.

CONTENTS

1- Overview of Metal Cutting Operations (2 weeks)
   Orthogonal cutting Mechanics
   Oblique Cutting Mechanics
   Mechanics of Milling
Project/Lab. Orthogonal Cutting, Milling Tests on CNC Machine Tools

2- Linear Vibrations and Modal Analysis
   Static Machine Tool Deformations
   Overview of Single and Multi-Degree of Vibrations
   Frequency Response of Machine Structures
   Experimental Modal Testing of Machines
   Troubleshooting Machine Design via Modal Analysis
   Oriented Frequency Response Function of Machines
Project/Lab. Experimental Modal Analysis of a Machine Structure

3- Chatter Vibrations of Machine Tools
   Orthogonal Chatter Vibration Stability
   Chatter Vibration Stability in Milling
      Frequency Domain Stability Analysis
      Semi Discrete Time Domain Stability Analysis
Project/Lab. Chatter Stability of an Actual Machine

4- Application of cutting, vibrations and stability in variety of real life problems in various industries.

Lecture notes will be distributed via VISTA regularly.

Additional Reference Books

- Y. Altintas – "Manufacturing Automation: Principles of Metal Cutting, Machine Tool Vibrations and CNC Design, Cambridge University Press, 2000.

- D.J. Ewins, “Modal Testing: Theory, Practice and Application”, Research Studies Press, 2000.
- D. J. Inman, “ Engineering Vibration” , Prentice Hall, 2007.

Journals

- Trans. ASME J. Manufacturing Science
- Annals of CIRP
- Int. J. Machine Tool Design and Manufacture
- J. Sound and Vibrations

Grading

50% - Projects
50 % - Final Exam. Exam will be close book, but one formula sheet and calculators will be allowed. Students must obtain passing grade from the exam.