SUNY AT STONY BROOK
DEPARTMENT OF MECHANICAL ENGINEERING

Vibration and Control

COURSE TITLE: MEC532 Vibration and Control, Fall 2007
PREREQUISITES: Permission of instructor

LECTURE: Wed 17:20 – 20:10; Room: Old Engineering 112
INSTRUCTOR: Dr. Imin Kao, Professor email: kao@mal.eng.sunysb.edu
OFFICE: LE-167; Phone (631)632-8308
OFFICE HOURS: Mon 12:00-14:00, Wed 15:00-17:00 & other time by appointment

COURSE OBJECTIVES: Fundamentals of vibrations and control of vibrations of structures and dynamic systems. Topics include one dof systems and responses, multiple dof systems and responses, classical feedback control theory, modern state-space feedback control theory, application of control methodology in structures and systems under vibration and dynamics; introduction of optimal control theory; feedforward control; distributed transducers for active control of vibration.

TEXTBOOK: No textbook is required. Most course materials are based on lecture notes and handouts. Recommended references are listed.

EXAMINATIONS: Two midterm exams (in class)
One Final Exam (TBA)
   • All exams are scheduled in class, unless otherwise specified
   • NO make-up exams unless arranged prior to the exams

GRADING: Your semester letter grade is based on your performance on the following subjects, including exams and homework assignments:

   Midterms: Two midterm exams, 25 pts ea.
             Final: One final exam (see schedule above), 35 pts
             Homework: Assigned weekly, 15 pts

TOPICS: (on the next page)
Topics of MEC532 course include the following:

- Introduction to mechanical vibrations of one dof systems
- Free, forced, damped vibration and analysis for one dof systems
- Responses: transient and steady-state response using the Laplace Transform
- Multiple dof systems and their free/forced vibration analysis
- Modal analysis and eigenvalue problems
- Classical feedback control theory and block diagram representation of dynamic systems
- Root locus, Bode diagrams, and Nyquist plot
- Control of response of one dof systems
- Modern control theory (or state-space control theory)
- Converting dynamic equations of motion to state-space realization
- Canonical forms of state-space realization
- SISO and MIMO systems and control
- Control law (controller) & estimator design
- Introduction to optimal control
- Example of 2 dof and multiple dof systems
- Feedforward control and adaptive control
- Distributed transducers for active control of vibrations
- MATLAB and Simulab usage
- Introduction to nonlinear control
**Usage of the Blackboard and PodCasting**

You are required to use the Internet to access Blackboard and online information for important announcements, homework/handouts, and supplementary materials of the course. I will use PodCasting to make available lectures and supplementary materials. The PodCasting materials can be accessed through iTunes\(^1\) or viewed directly on your computer. You can access blackboard and podcast server at:

http://blackboard.stonybrook.edu
http://podcast.ic.sunysb.edu:16080/weblog/MEC532/

Please note that you have to use your NetID to login to the blackboard system. Go to the helpdesk in the Main Library SINC Site if you have problems logging in. You can also call: 631-632-9602 or e-mail: helpme@ic.sunysb.edu for further information.

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http://studentaffairs.stonybrook.edu/disabilityservices/
http://studentaffairs.stonybrook.edu/dss/staff

Students requiring emergency evacuation are encouraged to discuss their needs with their professors and Disability Support Services. Call 911 if you need immediate assistance. For more information, go to:

http://www.stonybrook.edu/facilities/ehs/fire/disabilities.shtml

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\(^1\) iTunes is a free software for both PC and Macintosh. Download it from http://www.apple.com/itunes/download/.