STONY BROOK UNIVERSITY (SUNY)
DEPARTMENT OF MECHANICAL ENGINEERING

Vibration and Control

COURSE TITLE:	**MEC532** Vibration and Control, Spring 2024
PREREQUISITES:	Permission of instructor
LECTURE:	Wed 16:00 – 18:50; Room: Old Engineering 106
INSTRUCTOR:	Dr. Imin Kao, Professor Email: imin.kao@stonybrook.edu
OFFICE:	LE-167; Phone (631) 632-8308
OFFICE HOURS:	Tue 11:00-13:00, Wed 14:00-15:50 & 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, frequency response, multiple-dof systems and responses, relevant classical control theory, modern state-space feedback control theory, application of control methodology in systems with dynamics and vibration, eigenvalue problems and modal analysis, vibration analysis of various continuous systems.
TEXTBOOK:	• Materials from the manuscript of my book in "Mechanical Vibration and Control" to be published by the Springers Publishing Company • L. Meirovitch, "Fundamentals of Vibrations," Waveland Press, 2010 (ISBN 978-1-57766-691-2)
REFERENCES:	S. Graham Kelly, "Mechanical Vibrations," Schaum's Outlines, 1996 D. J. Inman, "Vibration with Control," Wiley, 2006 R. C. Dorf and R. H. Bishop, "Modern Control Systems," 13th ed., Pearson, 2017 (ISBN: 9781292152974, 1292152974) L. Meirovitch, "Principles and Techniques of Vibrations," Prentice-Hall, 1997
EXAMINATIONS:	Two midterm exams (in-class and/or take-home) 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:

`Homework:`	Weekly assignments, 25 pts
`Midterms:`	Two midterm exams, 20 pts each
`Final:`	One final exam (see schedule above), 35 pts

TOPICS: (on the next page)

Topics of MEC532 course include the following:

- Introduction of mechanical vibration and control
- Ordinary and partial differential equations of motion for vibration analysis
- Free, forced, damped vibration and analysis for one-dof and multiple dof systems
- Responses: transient and steady-state responses; frequency response
- Algebraic eigenvalue problems and modal analysis
- Converting dynamic equations of motion to state-space realization and the Canonical forms
- Modern control theory (or state-space control theory): Control law (controller) and estimator design
- Combining the analyses of vibration and control: modal analysis and state-space control design of multiple dof systems
- Vibration analysis of distributed of continuous systems and differential eigenvalue problems
- Use of software (MATLAB and Mathematica) for the analysis of vibration and control

Important calendar days for the Spring 2024 semester:

Holidays (no classes held):	March 11-17, 2024 (Spring recess) May 6, 2024 (Reading Day)
Classes to be held:	1/24/24, 1/31/24, 2/7/24, 2/14/24, 2/21/24, 2/28/24, 3/6/24, 3/13/24, 3/20/24, 3/27/24, 4/3/24, 4/10/24, 4/17/24, 4/24/24, 5/1/24
First Day of Classes: Last Day of Classes: Reading Day: Final Examinations: Commencement:	Monday, January 22, 2024 Saturday, May 4, 2024 Monday, May 6, 2024 May 7-15, 2024 Friday, May 17, 2024

Brightspace

We are using Brightspace, a digital learning environment, for this course. To learn more and for SUNY Online helpdesk information, visit: https://brightspace.stonybrook.edu If you would like, you can add a link to Brightspace in your Blackboard "My Courses" list to easily move between the LMSs during this transition. Information can be found here.

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Various University Policies and Statements

Student Accessibility Support Center Statement: If you have a physical, psychological, medical, or learning disability that may impact your course work, please contact the Student Accessibility Support Center, Stony Brook Union Suite 107, (631) 632-6748, or at sasc@stonybrook.edu. They will determine with you what accommodations are necessary and appropriate. All information and documentation is confidential.

Academic Integrity Statement: Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty is required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty please refer to the academic judiciary website at http://www.stonybrook.edu/commcms/academic_integrity/index.html

Critical Incident Management: Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Student Conduct and Community Standards any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures. Further information about most academic matters can be found in the Undergraduate Bulletin, the Undergraduate Class Schedule, and the Faculty-Employee Handbook.