Syllabus
ME 56300 – Mechanical Vibrations
(Fall 2016)

Instructor Contact Information:
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Teaching Assistants:
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Class Time and Location:
TR 9:00– 10:15 pm, Seng-Liang Wang Hall room #2555

Attendance:
Attendance at class lectures is required for on-campus students. You will be responsible for additional information provided during class time.
Note: Access to recorded lectures is granted only to off-campus students.

Office Hours:
On-campus students: MW 2-3pm (1016 HLAB) or by appointment.
Off-campus students: by appointment with the instructor or the TAs. Webex sessions will be planned when possible to hold remotely group office hours.

A "Discussion Board" on Blackboard will be setup for Q&A about the topics discussed in the course. This method of communication is preferred over individual emails. The threads will be organized by chapters and topics. Read existing chapters and if you do not find the answer to your specific question feel free to open a new thread. The discussion board will be administered by the instructor and the TAs.

Catalog Description
The course will cover fundamental concepts on the vibration of mechanical systems including, but not limited to, review of systems with one degree for freedom, Lagrange's equations of motion for multiple degree of freedom systems, introduction to matrix methods, transfer functions for harmonic response, impulse response, and step response, convolution integrals for

response to arbitrary inputs, principle frequencies and modes, applications to critical speeds, measuring instruments, isolation, torsional systems, introduction to nonlinear problems.

Course Objectives:

Upon successful completion of this course, you will be able to understand basic and intermediate concepts necessary for the analysis of the dynamics of complex structures under various loading conditions. In particular, you will be able to:

- Explain and correlate the properties of complex structures to the overall vibration characteristics in order to design systems having required dynamical properties.
- Apply theoretical and numerical procedures to predict the dynamic response of either discrete or continuous structural systems under different loading conditions.
- Develop reduced order models to treat systems with a large number of DOF.
- Understand and implement approximate methods for the numerical solution of distributed parameter systems.
- Understand the main features of the dynamics of nonlinear lumped parameters systems.

Short list of main topics covered:

a. Dynamics of Single Degree Of Freedom (SDOF) systems.
b. Dynamics of Multiple Degree Of Freedom (MDOF) systems.
c. Damping.
d. Fundamentals of analytical dynamics.
e. Numerical techniques for the response of dynamical systems.
f. Dynamics of continuous systems.
g. Analytical and approximate solutions of continuous systems.
h. Intro to the dynamics of discrete nonlinear systems and perturbation techniques.
i. Static and dynamic reduction.

Study Material:

- **Course lecturebook:** "*Mechanical Vibrations: A lecturebook*", Chuck Krousgrill and Jeff Rhoads. The course lecturebook is ***required*** and will be available for purchase at the University Bookstore in West Lafayette, IN. (typically available two weeks before class)
- **Course textbook:** "*Mechanical Vibrations"*, S. S. Rao, Prentice Hall, 6th Ed., 2016. (Recommended but not required).
- **Class notes**: you are strongly encouraged to collect comprehensive class notes throughout the entire course. Several information complementary to the textbook will be provided in class.

Homework:

Homework will be assigned following completion of major topics. Homework assignments will be posted on Blackboard. Please return electronic scans of your homework via Blackboard by the deadline indicated online. Note that Blackboard will not accept submissions after the deadline. Timely submission is your responsibility.

Assignments can be typed or neatly hand-written. The solution procedure must be clearly presented.

You are allowed to discuss homework with your classmates, however the work that you submit should be your own original contribution.

Note: most of the homework will require use of software to perform calculations. The choice of the specific software is left to you. Matlab is recommended but other software like Mathematica, Maple, Fortran, C++ can also be used. Please make sure you have access to the software before the homework start.

Late Assignment Policy:

A grade reduction will be applied for assignments turned in late:

- 30% within 1 day (after due date)
- 60% within 2 days (after due date)
- 100% for more than 2 days

The deadline is the official date specified on Blackboard for any homework. Homework turned in any time after the deadline are considered late. Exceptional cases can be discussed with the instructor ahead of the homework deadline.

Exams:

The examination will consist in one midterm exam (administered during regular lecture time) and a final exam. Exams are **closed** books/notes. Only a handwritten formulary is admitted. A one page, single-side formulary (letter paper format) will be admitted for the midterm. A one page, double-side formulary (letter paper format) will be admitted for the final. The formulary must be turned in with the exam and will be returned to you with the graded exam.

	Date*	Time	Room
Midterm	October 7, 2016	9:00-10:15 AM	Seng-Liang Wang Hall room #2555
Final	TBA	TBA	TBA

*Tentative date

Off-campus students: the general exam rules discussed above apply also to off-campus students. The exam will be administered via a local proctor. The student is responsible for taking

arrangements with the proctor for the exam. Specific questions about local proctors and the detailed exam modalities should be addressed to Sarah Black (black110@purdue.edu).

Note: there will be no make-up examinations unless a student contacts the instructor prior to an exam about extenuating circumstances that do not allow the student to take the exams on schedule.

Re-Grading Policy:

Any request of re-grading (either homework or exams) should be made within 7 days from the day the homework/test is returned.

Course Grading Policy:

Final course grades will be based on the following:

- Homework 15%
- Midterm exam 40%
- Final exam 45%

Honor Code:

You are expected to understand and abide by the principles and procedures set forth in the Purdue University Academic Code of Honor and uphold the pledge: "we students must follow the Regulations Governing Student Conduct of Purdue University out of a sense of mutual respect, rather than out of fear of the consequences of their violation". This code is strictly enforced by ME 56300 course personnel. For questions regarding the honor code, please visit the following website: http://www.purdue.edu/studentregulations/student_conduct.

Students with Disabilities:

Any student who has a documented disability and is registered with Disability Services should speak with the professor as soon as possible regarding accommodations. Students who are not registered should contact the Disability Resource Center - http://www.purdue.edu/disabilityresources/.