

Mechanical Vibrations I (1997)
20-263-480, Sections 451, 452

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Reference Texts:

- [1] **Theory of Vibration with Applications, Fourth Edition (1993), Prentice Hall**
William T. Thomson.
- [2] **Vector Mechanics for Engineers, McGraw Hill, Beer & Johnson (Or Equivalent).**
- [3] **Design of Machinery, McGraw Hill, Norton.**
- [4] **Elementary Differential Equations and Boundary Value Problems, John**
Wiley & Sons, Boyce & Diprima (Or Equivalent).
- [5] **MATLAB Primer, Kermit Sigmon, Office of College Computing, UC-COE (Or**
Equivalent).

Required Supplies:

All tests will be worked in large size (8.5 in. x 11 in.) blue books. Be sure to bring two (2) to each test. Quizzes will be worked on handouts or a single sheet of paper.

Grading:

Quiz Average (5-6)	30%
Test Number 1	20%
Test Number 2	20%
Final Exam	30%

Professional Attitude:

Students and faculty are expected to conduct themselves in a professional manner. Students and faculty are expected to arrive on-time for class, to participate in discussions during class, to complete assignments (reading, homework, grading) on time, to maintain respect for fellow students and faculty and to cooperate with the goals of the class/lab. Students unable to attend class/lab should report this to the instructor via e-mail or telephone, prior to the class. Attendance at each test and quiz is mandatory; an absence must be reported prior to class with a valid excuse (illness, travel, etc.). Students should come to class with the materials required for that class session (book, notes, paper, pencil, calculator, blue book, etc.)

Communication Skills:

Since every class period, homework quiz and test is an opportunity to communicate with each other as engineers, a student's grade will depend upon their communication skills. Particularly, with respect to written work, points will be removed from the grading of a problem if the problem is not completed in an systematic and organized manner.

Homework:

*Homework is assigned for the benefit of the student to emphasize areas of importance in the material. Most questions on the tests will be similar to assigned homework. Homework will be assigned each week but will not be collected and graded on a regular basis. **A homework problem may be requested in place of a quiz or test problem, seven (7) days after it is assigned.***

Quizzes:

*A quiz will be given at the beginning of class each Thursday after the first week of classes except for the days of the two tests. Each quiz will take no longer than ten (10) minutes. Unless otherwise noted, each quiz will be closed book, closed notes. **A homework problem may be requested in place of a quiz or test problem, seven (7) days after it is assigned.***

Tests:

*Two tests will be given during the quarter. The dates for the tests are given in the following schedule of pertinent dates. Each test will take the full time period. Partial credit is given for organized work that is incomplete. Unless otherwise noted, all tests and the final exam will be closed book, closed notes. **A homework problem may be requested in place of a quiz or test problem, seven (7) days after it is assigned.***

Course Goals:

The text and material to be covered have been selected to give the student a classical background in mechanical vibrations of discrete systems and to relate this background to modern practice in analysis of simple vibrating mechanical systems. Assignments will be made each week and may utilize MATLAB, an applied linear algebra application program available on IBM compatible personal computers. Prior knowledge of the MATLAB program is assumed and a minimal level of experience in computer programming is desirable. Some of the topics to be covered are:

- *Introduction (Review of Past Classes)*
- *Single Degree of Freedom (SDOF) Systems*
 - *Nomenclature - Units - Concepts*
 - *Newton's Method*
 - *Energy Method*
 - *Applications*
- *Multiple Degree of Freedom (MDOF) Systems*
 - *Newton's Method*
 - *Eigenvalue/Eigenvector Solutions*
 - *Frequency, Damping, Modal Vector Concepts*
- *Analytical/Experimental Relationships*
 - *Frequency Response Function Concepts*

Pertinent Course Dates:

<i>Week 1</i>	<i>June 23-27</i>	
<i>Week 2</i>	<i>June 30 - July 4</i>	
<i>Week 3</i>	<i>July 7-11</i>	
<i>Week 4</i>	<i>July 14-18</i>	<i>(Test Number 1: July 17)</i>
<i>Week 5</i>	<i>July 21-25</i>	
<i>Week 6</i>	<i>July 28 - August 1</i>	
<i>Week 7</i>	<i>August 4-8</i>	<i>(Test Number 2: August 7)</i>
<i>Week 8</i>	<i>August 11-15</i>	
<i>Week 9</i>	<i>August 18-22</i>	
<i>Week 10</i>	<i>August 25-26</i>	
<i>Week 11</i>	<i>August 27-30</i>	<i>(Final Exams)</i>

Reading Assignments:

Reading assignments must be completed prior to the first class meeting each week.

Vibrations I - Course Outline			
Week	Topic	Reading Reference	
Week 1	Review Math Concepts Review Measurements/Instrumentation Discuss Nomenclature, Units	Thomson	Appendix C Chapter 1
Week 2	Free Vibration (SDOF) Newton's Method	Thomson	Chapter 2
Week 3	Free Vibration (SDOF) Energy Method	Thomson	Chapter 2
Week 4	Harmonic Vibration (SDOF) Test Number One	Thomson	Chapter 3
Week 5	Harmonic Vibration (SDOF) Impedance Method	Thomson	Chapter 3
Week 6	Transient Vibration (SDOF) Convolution	Thomson	Chapter 4
Week 7	Transient Vibration (SDOF) Numerical Integration	Thomson	Chapter 4
Week 8	Systems with Multiple Degrees of Freedom Newton's Method (MDOF)	Thomson	Chapter 5
Week 9	Systems with Multiple Degrees of Freedom Newton's Method (MDOF)	Thomson	Chapter 5
Week 10	SDOF Applications Newton's Method (SDOF) Nonlinear Vibrations (If Time)	Thomson Allemang	Chapter 5 Notes
Week 11	Exam Week - Final Exam Thursday, August 28, 7:00 - 9:00 pm		

Homework Assignments:

Use MATLAB wherever possible to work the problem or check your work on a problem. The answer book, as well as problems that have been worked completely by the faculty, is available in my office. You must show your attempt to work the problem to be granted access to the answer book. In general, the answer book shows a very abbreviated answer and may not be useful to understanding of the problem. **Whenever the requested problem asks you to plot or sketch the answer, you must use MATLAB to do your work.**

Vibrations I - Homework Schedule		
Date	Homework Assignment	Thomson Reference
Week 1	1,2,3,4,5,6,7,8,13,22 Extra Assignment	Chapter 1
Week 2	1,2,4,7,8,22,24,26,32 Extra Assignment	Chapter 2
Week 3	34,35,38,39,40,41,50,55 Extra Assignment	Chapter 2
Week 4	1,3,6,13,20,21,24 Extra Assignment	Chapter 3
Week 5	25,26,27,28,28 Extra Assignment	Chapter 3
Week 6	Extra Assignment	Chapter 4
Week 7	Extra Assignment	Chapter 4
Week 8	1,2,4,5,6 Handout Sheet of Problems	Chapter 5
Week 9	9,10,20,24	Chapter 5
Week 10	Extra Assignment	Chapter 5