

**AME 420**  
**Instructor: Firdaus E. Udwardia**  
**430K Olin Hall**  
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**Syllabus**

Students will be required to use Matlab, Maple, and/or Mathematica in this course.

- Week 1:** Single Degree of Freedom, Degrees of Freedom, Undamped Single Degree of Freedom (SDOF) Systems, Free Vibrations (Introduction, Chapter 1)
- Week 2:** Undamped Single Degree of Freedom (SDOF) Systems, Free Vibrations (Chapters 2 and 3)
- Week 3:** Damped SDOF Systems, Free Vibrations, Harmonic Excitation of Damped SDOF Systems, Resonance (Chapters 4 and 5)
- Week 4:** Isolation of Instruments and Foundations, Motion Sensing Instrumentation (Chapters 5 and 6)
- Week 5:** Response of Damped SDOF Systems to General Excitations (Chapters 6 and 7)
- Week 6:** Damping in Structural and Mechanical Systems, Viscous, Structural, Coulomb Damping, Illustrative Examples of SDOF Systems; (Chapters 8)
- Week 7:** **Midterm Exam (1hr. 10 mins.);** Introduction (Physical and Mathematical) to Multi-degrees of freedom Systems
- Week 8:** Laplace Transforms, Complex Frequency Response; Elements of Structural Feedback Control. [We might skip this topic, if most of you have seen this in your other courses!] (Chapters 9 and 10)
- Week 9:** Two Degree of Freedom Systems, Eigenvalues, Mode Shapes, Modal Frequencies (Chapters 10 and 11)
- Week 10:** Two Degree of Freedom Systems, Eigenvalues, Mode Shapes, Modal Frequencies; Classically damped Multi-degree of freedom Systems (Chapters 11 and Appendices)
- Week 11:** Classically Damped Multi-degree of Freedom Systems (MDOF) (Chapter 11 and Appendices)
- Week 12:** General Systems that May Not be Classically Damped. Examples and Applications of Nonclassically Damped Systems
- Week 14:** Lagrange's Equations and their Use in Vibrations Analysis
- Week 15** Applications of Lagrange's Equations. Course Review

## Week 16      **Final Exam**

**Office Hours:**            Tuesday, 2:00-3:30 PM, or by appointment

**Text:**                        *Elements of the Theory and Applications of Linear Vibrations*, by F. E. Udawadia, 2016

**Reference Texts:**        *Fundamentals of Vibrations*, by L. Meirovitch  
*Mechanical Vibrations*, by S. Rao

**Recitation Session:**    A 50 min. recitation session will be held **every Friday at 11:00-11:50 AM in OHE 136** in which additional course material will be discussed to supplement the lectures, and problems will be solved. The recitation session is considered an integral part of the course. Like the Tuesday lectures, the Recitation Sessions will be available for view on DEN. Attention to what is done in this session could influence your grade appreciably.

**Teaching Asst (TA):**    Mr. Nami Mogharabin    Email: [namimogh@usc.edu](mailto:namimogh@usc.edu)    Room: VHE 202

**Office Hours for TA:**    The tentative schedule (to be finalized) is:  
M-Tu-W-Th: 9:00-9:45 AM & 1:00-1:45PM.    Fri: 3:00-4:00pm.

**Homework (HW) Policy:**    Homework problems will be assigned each week from the text. Each homework assignment must be submitted exactly one week after it is assigned, and at the beginning of class. DEN students please take note.

Students can get help from any one on how to solve the homework assignments. **Each student is required to write every homework assignment independently.**

**Grading:**                    25% Homework; 35% Mid-Term Exam; 40% Final Exam

**Final Exam:**                Final Exam will be held as per the University's Final Exam Schedule

### **Class Policy on Cheating**

Any student found cheating on any exam (Midterm, Final) will be given an 'F' grade on the course.

If two students turn in identical HWs, they will both be given a warning once. If this repeats, they both will get a zero on the Homework portion of the course grade for the entire course (25% of the course grade).