# ME 441 A1: MECHANICAL VIBRATIONS

**Staff:**
Professor: Kamil Ekinci (ekinci@bu.edu)
Lecture: MW 2:30-4:15 pm (PHO 211)
No Discussion
Office hours for Ekinci: By appointment (ENG 401)

**Textbook:**
*Mechanical Vibrations*, Sixth Edition, Singiresu S. Rao
ISBN-13: 978-0134361307
ISBN-10: 013436130X

**Supplemental Resources:**
Handouts and quizzes will be given during class.

**Course Topics:**
One- and multi-degree-of-freedom systems. Natural frequencies and modes of vibrations, resonance, beat phenomenon, effect of damping, applications to practical problems, and methods to avoid excessive vibrations. Lagrange's equations.

**Grading:**

| | |
|---|---|
| HW+Lab: | 10% |
| Quizzes: | 20% |
| Midterm Exam: | 30% |
| Final Exam: | 40% (comprehensive; date determined by registrar) |

**Make-up Policy:**
If you miss an exam or a quiz without a valid excuse, you will get a zero. If you have to miss an exam with an excuse, I prefer to give you an oral exam. Since I grade on the curve and no two exams are identical, please understand that taking a written make-up exam will put you at a huge disadvantage.

**Attendance Policy:**
You are required to attend every class. Attendance will be taken. You will fail if you miss more than 3 classes without a valid excuse. You must arrive to class on time; you may not arrive late without a valid excuse.

**Electronics Policy:**
You are encouraged to use a scientific calculator. You are not allowed to use any other electronics, including cell phones, lap top computers and so on, during class. You cannot record video or sound during the lectures, without my prior consent.

**Assignments:**
(1) Homework problems will be assigned weekly on blackboard. **Please check promptly.**
(2) The lab will serve as a platform for students to apply principles learned in class to real-world scenarios. Further information will be given later in the semester.

**Collaboration:**
Needless to say, you may not collaborate with anyone on quizzes or exams. For the lab, you will perform the experiment in a group but prepare your own report. When in doubt, please ask.

# ME 441 Syllabus
# Fall 2019

| WK | DATES | BOOK | TOPIC |
|---|---|---|---|
| 1 | 9/4 | 1.4-1.9 | Basic concepts |
| 2 | 9/9<br>9/11 | 1.10-1.11 | Harmonic motion |
| 3 | 9/16<br>9/18 | 2.1-2.3<br>2.5 | Free vibration of undamped single DOF systems<br>Rayleigh's Energy Method |
| 4 | 9/23<br>9/25 | 2.6<br>2.9-2.10<br>2.11 | Free vibration of viscously damped SDOF systems<br>Free vibration of damped SDOF systems with Coulomb and hysteretic damping<br>Stability |
| 5 | 9/30<br>10/2 | 3.1-3.5 | Harmonically excited SDOF systems |
| 6 | 10/7<br>10/9 | | Harmonic motion of the base, rotating unbalance<br>Forced vibrations of Coulomb-damped and hysteresis-damped SDOF systems, self-excited vibrations |
| 7 | 10/15<br>10/16 | | Periodically forced vibrations (4.2–4.3)<br>Non-periodically forced vibrations (4.4–4.5) |
| 8 | 10/21<br>10/23 | | Response spectrum, Laplace transforms (4.6–4.7) |
| 9 | 10/28<br>10/30 | | Review |
| 10 | 11/4<br>11/6 | | **Midterm Exam on 11/4**<br>Free vibration of 2 DOF systems |
| 11 | 11/11<br>11/13 | | Free vibration of 2 DOF systems |
| 12 | 11/18<br>11/20 | | Forced vibration of 2 DOF systems |
| 13 | 11/25 | | Forced vibration of 2 DOF systems |
| 14 | 12/2<br>12/4 | | Continuous Systems |
| 15 | 12/9<br>12/11 | | Random Vibrations and Noise |

Note: Syllabus will be updated as the semester goes by.