Course Syllabus for Mechanical Vibrations

EMEC 4315 Fall 2014-2015

Instructor
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Course Description
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.

Learning Outcomes
i. Become proficient in the modeling and analysis of one-DoF systems - free vibrations, transient and steady-state forced vibrations, viscous and hysteric damping. (A, E, L)
ii. Become proficient in the modeling and analysis of multi-Dof systems - Lagrange's equations, reduction to one-DoF systems for proportionally damped systems, modal analysis, vibration absorbers, vibration transmission, Fourier transforms. Use of Matlab for matrix computations.

Prerequisite
ENG ME 302: Engineering Mechanics II

Lectures
• Lectures are held in PSY B37 on Mondays and Wednesdays from 10:00 a.m.-12:00 p.m.
• You are strongly encouraged to ask questions during lecture and to offer answers to questions asked by the professor, even if you are not sure they are correct.
• Attendance will be taken at these lectures and used as one indicator of your level of effort.
• Ringers on cell phones should be turned off during lecture.

Course Materials
## Topic

<table>
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<tr>
<th>week</th>
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| 1+2+3 | 7th Sep. - 25th Sep. | .Fundamentals of vibration systems  
. Fundamental concepts  
. Vibration system elements  
. Mathematical molding  
. Harmonic analysis |
| 4+5+6 | 28th Sep. - 16th Oct. | .Single DoF free vibrating system  
. Equation of motion derivation _ derivation_ damped system  
. Tensional system  
. Logarithmic decrement method |
| 7+8+9 | 19th Oct. - 6th Nov. | .Harmonically excited vibrating system  
. Damped and un-damped system  
. Beating phenomena  
. Base – excitation  
. Unbalance as the main cause of vibration |
| 10+11+12 | 9th Nov. - 27th Nov. | .Vibration under general forcing conditions  
. Periodic force  
. Convolution  
. Laplace transform |
| 13+14+15 | 30th Nov. - 18th Dec. | .Multi-degree of Freedom system  
. 3-degree of freedom system  
. 3-degree of freedom  
. Molding continues system as multi DoF system  
. Dunkerlys Formula |

### Grading

Your final course grade is calculated according to the following distribution:

- Quizzes: 20%
- Presentation: 10%
- Midterm Examination: 30%
- Final Examination: 40%

### Quizzes

Quizzes will be given roughly once a week. The lowest quiz grade will be dropped.

### Examinations

The midterm examination will be given in class on Saturday, October 19th.

The final examination is tentatively scheduled for Thursday, January 2nd, 11:30-13:30 a.m. Early examinations will not be given.

### Missed Quizzes and Examinations

Here is the policy regarding a missed quiz or examination:
• If you know ahead of time that you will miss the event, you must notify the instructor in writing and describe your reason for missing the event.
• If you do not know ahead of time that you will miss the event, you must notify the instructor in writing as soon as possible after the event and describe your reason for missing the event.
• If the instructor determines that the reason is appropriate, you will be excused from the event and the grade will not count in determining your course grade. If the instructor determines that the reason is not appropriate, you will receive a zero for that event.
• The following reasons are not appropriate: oversleeping, working on an assignment for another course, travel for pleasure.