Course: ME 147 Dynamic Systems Vibration and Control
Semester: Fall 2016
Prerequisites: Grade of “C-” or better in ME 130 (undergraduate students only)
NOTE: Department Requirement ‘You must turn in an unofficial transcript with the prerequisites highlighted by the second class period, or you will be dropped from the class.’
Credit Units: 3, Lecture
Class Codes: 40243
Class Hours: M W 16:30 - 17:45, Room E341
Instructor: Dr. Fred Barez, Room E310B, 408-924-4298, fred.barez@sjsu.edu
Office Hours: Mondays 15:15 - 16:15

Course Description

Textbook: Dynamic Systems Vibration and Control, by F. Barez, Fall 2016
References: Fundamentals of Mechanical Vibrations, by S. G. Kelly
Control Systems Engineering by N. S. Nise
Homework: Homework will be assigned weekly as a set and is due on the Wednesday of each week following the week assigned.

Examinations: Two 75-minute exams and one 2-1/4 hour final examination.
Grading: Homework 30% Due on Wednesday before lecture
Test 1 20% 09/28/2016
Test 2 20% 11/02/2016
Final 30% 12/16/2016

Final Exam Date: Friday December 16, 2016, 14:45 – 17:00

Additional Information
- The University Senate Policy on Academic Integrity (S98-1), http://www2.sjsu.edu/senate/S04-12pdf requires that students to be honest in their academic course work.
- University Policy F69-24 suggests that students should attend all meetings of their classes to maximize benefits to all members of the class.
- This class would comply with the Americans with Disability Act.

Letter Grading Guidelines: Course grade is based on a cumulative point system along with indicators of continuous improvement. A>94, 93>A->90, 89>B->85, 84>B>80, 79>B->76, 75>C->72, 71>C>69, 68>C->65, 64>D->62, 61>D>59, 58>D->56, F>55.
Course Goals
1. To learn fundamentals of vibration systems analysis and design.
2. To learn fundamentals of control systems analysis and design.
3. To gain an overview of the basic vibration control methods.
4. To gain an overview of the basic stability and controller design.

Student Learning Objectives
1. The student will demonstrate an ability to analyze simple vibratory systems.
2. The student will demonstrate an ability to obtain vibratory system transient and steady-state responses.
3. The student will demonstrate an ability to design a vibratory system for reduced amplitude of vibration and/or reduced transmitted forces.
4. The student will demonstrate an ability to analyze multi-degree of freedom systems.
5. The student will demonstrate an ability to develop a mathematical model of a mechanical, hydraulic, or electrical system.
6. The student will demonstrate an ability to analyze simple control systems
7. The student will demonstrate an ability to design controllers to meet control system goals.
8. The student will demonstrate an ability to predict system performance including stability.

ME 147 Course Topics and Schedule

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<thead>
<tr>
<th>Week#</th>
<th>Lecture Topic(s)</th>
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<tbody>
<tr>
<td>1.</td>
<td>Principles of Mechanics/Intro to Vibrations/Equation of Motion/Free Vibrations</td>
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<tr>
<td>2.</td>
<td>Natural Circular Frequency/Period of Oscillations/Energy Method/Damped Systems</td>
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<td>3.</td>
<td>Forced Vibrations/Undamped and Damped Vibrations/Transmissibility</td>
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<td>4.</td>
<td>Multi-degree of Freedom System/Eigenvalues and Eigenvectors</td>
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<td>5.</td>
<td>Vibration Isolation</td>
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<td>6.</td>
<td>Absorbers/Design for Vibration Control</td>
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<td>7.</td>
<td>Distributed Mass Systems/Wave equation/Longitudinal &amp; Transverse Vibrations</td>
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<td>8.</td>
<td>Flow-Induced Vibrations</td>
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<td>9.</td>
<td>Intro to Control Systems/ Open-loop and Closed-loop systems/Transfer Function</td>
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<td>10.</td>
<td>Mathematical Modeling of Physical Systems/Mechanical, Hydraulic, Electrical</td>
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<td>11.</td>
<td>S-Plane/Pole and Zero/System Stability Analysis/Routh-Hurwitz Criterion</td>
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<td>12.</td>
<td>Time Domain Analysis/Transient and Steady-State Responses/Root Locus</td>
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<td>13.</td>
<td>State-Variable Method/Controller Types and Control Laws/Controller Design</td>
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<td>14.</td>
<td>Frequency Domain Analysis/Nyquist Stability Analysis/Bode Diagrams</td>
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<td>15.</td>
<td>Review</td>
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