Stephen F. Austin State University
ABET SYLLABUS
ENGR 4343.001 – Mechanical Vibrations

Course Description:
The course covers the fundamental concepts of the vibration of mechanical systems, including a review of systems with one degree of freedom, Lagrange’s equations of motion for multiple degrees of freedom systems, an introduction to matrix methods, transfer functions for a harmonic response, impulse response and step response, convolution integrals for response to arbitrary inputs, principle frequencies, and modes, applications to critical speeds, measuring instruments, isolation, torsional systems, and introduction to nonlinear problems. Prerequisite: ENGR 3421

Prerequisites: ENGR 3421  Co-Requisites: None

Credits: 3 Hours  (Lecture: 3 Hours, Laboratory: 0 Hours)

Instructor: Rick McDaniel


Topics Covered:
Applications of energy methods in engineering; conservation of mass and energy; energy transfer by heat, work and mass; thermodynamic properties; analysis of open and closed systems; the second law of thermodynamics; and entropy, gas, vapor and refrigeration cycles.

Course Learning Outcomes
By the end of the course, a successful student will be able to:
1. Model real and physical dynamic systems in terms of mathematical models. (SO-1)
2. Apply principles of mechanical vibrations such as Newton’s second law, and the principle of conservation of energy to the mathematical models to obtain their governing equations of motion. (SO-1)
3. Solve the obtained equations of motion to understand the behavior of oscillatory systems to various excitations such as harmonic excitation, and impulse excitation. (SO-1)
4. Demonstrate the ability to determine the linearity, time invariance, causality, and stability of systems. (SO-1)

Student Outcomes
Graduates of the program will show:
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives

R. McDaniel  ENGR 4343 – Mechanical Vibrations  Rickey.McDaniel@sfasu.edu
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.
Course Outline

Engineering 4343 – Fall 2023

Mechanical Vibrations

Department of Physics, Engineering, and Astronomy; Stephen F. Austin State University

Instructor: Rick McDaniel, PhD
Email: Rickey.McDaniel@sfasu.edu
Office: Cole STEM Building, 207A
Phone: 936-468-4688

Student Hours: Mon Wed & Thur: 1-2pm, Tues: 1-2pm, or by appointment
Class Meetings: TR 9:30 – 10:45, STEM 306 in-person only
Course Home Page: http://d2l.sfasu.edu

Course Description
Course covers the fundamental concepts on the vibration of mechanical systems, including a review of systems with one degree of freedom, Lagrange’s equations of motion for multiple degrees of freedom systems, introduction to matrix methods, transfer functions for a harmonic response, impulse response and step response, convolution integrals for response to arbitrary inputs, principle frequencies, and modes, applications to critical speeds, measuring instruments, isolation, torsional systems, and introduction to nonlinear problems. Prerequisite: ENGR 3421

Text and Materials

Mechanical Vibrations:

Other materials needed in the course:
Engineering paper that is grid-ruled (assignment submission)
Scientific calculator or better (for exams and homework)

Grading Policy

Exams 60%
Homework 10%
In-Class Problem Solving 10%
Final Comprehensive Exam 20%

Letter grades are based on the following ranges:

A 90.0 – 100%  B 80.0 - 89.9%  C 70.0 - 79.9%  D 60.0 - 69.9%  F < 60.0%

Exams will be graded on a 100 point scale, including the final. It is expected that the student will keep a notebook for this course.

Attendance Policy

Attendance will be taken at the beginning of class by instructor. If you have 3 unexcused absences then your final grade will be reduced one letter grade. If you have 4 unexcused absences, you will receive an “F” in the course. A written and signed notice is required for an excused absence within three class days of the absence. Instructor checks for attendance at the beginning of class according to the official NIST US CST time: http://www.time.gov/. Failure to show up to class on time results in a tardy (which can be excused if you show excuse for your tardy to instructor that day). Accruing 2 tardy marks results in an unexcused absence.
Students who miss class without approval of their instructor will receive a grade of zero on the missed assignment. Authorized absences must be approved by your instructor in advance of the absence, unless you have an emergency or illness. Make-up work must be completed outside of normal class hours within one week following an excused absence. It is your responsibility to see the instructor to make arrangements for make-up work if you have an excused absence.

Course Requirements

This class assumes that you will be spending at least 6 hours per week outside of course time working on course material. A required 150 minutes of asynchronous material will be covered using course lectures and a course project.

Exams
There will be chapter exams and a final, each covering a specific set of lecture, text, and homework material that will be communicated to the students in class. The final exam will be comprehensive to the material covered in the course. The tentative dates of these exams are listed in the course outline shown in this document.

Students will have one week after each exam to review the exams and discuss the grades. No make-up exams will be given except in the case of an excused absence. An official written notice is required for an excused absence within three days of the exam. Any makeup exam must be taken within three days of the missed exam. The style of exam as well as allowed materials for the four exams will be communicated to the students in class.

In Class Problem Solving
All in-class assignments must be completed by the end of the class period. This may include working out example or homework problems. Problems assigned in this manner will be graded by the instructor during the same class period. The grades for these assignments will be averaged together to give 10% of your final grade. It is the discretion of the instructor to grant additional time if deemed necessary.

Email Communication
All official course communication will be made using your SFA email account. You must use your SFA email account for all communications. You will be notified via your SFA email account about grades and attendance. You can look up your SFA email account or setup email forwarding using this link: http://www.sfasu.edu/mysfa/o365/forwarding-email/

It is important to practice good email communications in college courses. Use "ENGR 3301" in the subject of your email messages. Use complete sentences and capitalization when appropriate. The body of your email messages should begin with your instructor's name and end with your name.

The following is required as per policy:

Academic Integrity (4.1)
The Code of Student Conduct and Academic Integrity outlines the prohibited conduct by any student enrolled in a course at SFA. It is the responsibility of all members of all faculty, staff, and students to adhere to and uphold this policy.

Articles IV, VI, and VII of the new Code of Student Conduct and Academic Integrity outline the violations and procedures concerning academic conduct, including cheating, plagiarism, collusion, and misrepresentation. Cheating includes, but is not limited to: (1) Copying from the test paper (or other assignment) of another student, (2) Possession and/or use during a test of materials that are not authorized by the person giving the test, (3) Using, obtaining, or attempting to obtain by any means the whole or any part of a non-administered test, test key, homework solution, or computer program, or using a test that has been administered in prior classes or semesters without permission of the Faculty member, (4) Substituting for another person, or permitting another person to substitute for one's self, to take a test, (5) Falsifying research data, laboratory reports, and/or other
records or academic work offered for credit, (6) Using any sort of unauthorized resources or technology in completion of educational activities.

Plagiarism is the appropriation of material that is attributable in whole or in part to another source or the use of one’s own previous work in another context without citing that it was used previously, without any indication of the original source, including words, ideas, illustrations, structure, computer code, and other expression or media, and presenting that material as one’s own academic work being offered for credit or in conjunction with a program course or degree requirements.

Collusion is the unauthorized collaboration with another person in preparing academic assignments offered for credit or collaboration with another person to commit a violation of any provision of the rules on academic dishonesty, including disclosing and/or distributing the contents of an exam.

Misrepresentation is providing false grades or résumés; providing false or misleading information in an effort to receive a postponement or an extension on a test, quiz, or other assignment for the purpose of obtaining an academic or financial benefit for oneself or another individual or to injure another student academically or financially.

**Withheld Grades Semester Grades Policy (5.5)**

Ordinarily, at the discretion of the instructor of record and with the approval of the academic chair/director, a grade of WH will be assigned only if the student cannot complete the coursework because of unavoidable circumstances. Students must complete the work within one calendar year from the end of the semester in which they receive a WH, or the grade automatically becomes an F. If students register for the same course in future terms the WH will automatically become an F and will be counted as a repeated course to compute the grade point average. For additional information, go to [https://www.sfasu.edu/policies/course-grades-5.5.pdf](https://www.sfasu.edu/policies/course-grades-5.5.pdf).

**Students with Disabilities**

To obtain disability-related accommodations, alternate formats, and/or auxiliary aids, students with disabilities must contact the Office of Disability Services (ODS), Human Services Building, and Room 325, 468-3004 / 468-1004 (TDD) as early as possible in the semester. Once verified, ODS will notify the course instructor and outline the accommodation and/or auxiliary aids to be provided. Failure to request services promptly may delay your accommodations. For additional information, go to [http://www.sfasu.edu/disabilityservices/](http://www.sfasu.edu/disabilityservices/).

**Student Wellness and Well-Being**

SFA values students’ overall well-being, mental health and the role it plays in academic and overall student success. Students may experience stressors that can impact both their academic experience and their personal well-being. These may include academic pressure and challenges associated with relationships, emotional well-being, alcohol and other drugs, identities, finances, etc.

If you are experiencing concerns, seeking help, SFA provides a variety of resources to support students' mental health and wellness. Many of these resources are free, and all of them are confidential.

**On-campus Resources:**

**The Dean of Students Office** (Rusk Building, 3rd floor lobby)

[www.sfasu.edu/deanofstudents](http://www.sfasu.edu/deanofstudents)

936.468.7249
dos@sfasu.edu

**SFA Human Services Counseling Clinic** Human Services, Room 202

[www.sfasu.edu/humanservices/139.asp](http://www.sfasu.edu/humanservices/139.asp)

936.468.1041

**The Health and Wellness Hub** “The Hub”

Location: corner of E. College and Raguet St.

To support the health and well-being of every Lumberjack, the Health and Wellness Hub offers comprehensive services that treat the whole person – mind, body and spirit. Services include:

- Health Services
- Counseling Services
- Student Outreach and Support
- Food Pantry
- Wellness Coaching
- Alcohol and Other Drug Education

[www.sfasu.edu/thehub](http://www.sfasu.edu/thehub)

936.468.4008
Crisis Resources:
- Burke 24-hour crisis line: 1.800.392.8343
- National Suicide Crisis Prevention: 9-8-8
- Suicide Prevention Lifeline: 1.800.273.TALK (8255)
- johCrisis Text Line: Text HELLO to 741-741
### ENGR 3301 – Principles of Thermodynamics Class Schedule

Course schedule is *tentative* and subject to change depending on pace of the class.

<table>
<thead>
<tr>
<th>Week</th>
<th>Date (Monday)</th>
<th>Topic</th>
<th>Reading</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>8/29/2023</td>
<td>Fundamentals of Vibrations</td>
<td>CH 1</td>
</tr>
<tr>
<td>2</td>
<td>9/5/2023</td>
<td>Fundamentals of Vibrations</td>
<td>CH 1</td>
</tr>
<tr>
<td>3</td>
<td>9/12/2023</td>
<td>Free Vibration of one DOF Systems</td>
<td>CH 2</td>
</tr>
<tr>
<td>4</td>
<td>9/19/2023</td>
<td>Free Vibration of one DOF Systems</td>
<td>CH 2</td>
</tr>
<tr>
<td>5</td>
<td>9/26/2023</td>
<td>Harmonically Excited Vibration</td>
<td>CH 3</td>
</tr>
<tr>
<td>6</td>
<td>10/3/2023</td>
<td>Harmonically Excited Vibration</td>
<td>CH 3</td>
</tr>
<tr>
<td>7</td>
<td>10/10/2023</td>
<td>Vibration under General Forcing Conditions</td>
<td>CH 4</td>
</tr>
<tr>
<td>8</td>
<td>10/17/2023</td>
<td>Vibration under General Forcing Conditions</td>
<td>CH 4</td>
</tr>
<tr>
<td>9</td>
<td>10/24/2023</td>
<td>Two DOF Systems</td>
<td>CH 5</td>
</tr>
<tr>
<td>10</td>
<td>10/31/2023</td>
<td>Two DOF Systems</td>
<td>CH 5</td>
</tr>
<tr>
<td>11</td>
<td>11/7/2023</td>
<td>Multi-degree of Freedom Systems</td>
<td>CH 6</td>
</tr>
<tr>
<td>12</td>
<td>11/14/2023</td>
<td>Multi-degree of Freedom Systems</td>
<td>CH 6</td>
</tr>
<tr>
<td>11/21/2023</td>
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<tr>
<td>14</td>
<td>12/5/2023</td>
<td>Numerical Methods in Vibration Analysis</td>
<td>CH 11</td>
</tr>
<tr>
<td>12/14/2023</td>
<td>Final Exam, Comprehensive, 8-10 am</td>
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