

THE UNIVERSITY OF TEXAS-PAN AMERICAN

College of Engineering and Computer Science

Department of Mechanical Engineering

MECE 6375 Engineering Acoustics – 3 Credits – Spring 2014

Room: ENGR 1.242

Time: F 4:00-6:40 pm

Instructor: Dr. Constantine Tarawneh **Office:** ENGR 3.228 **Phone:** (956) 665-2607

Office Hours: MTWR 1:00-2:25 pm **Strict**, or by Appointment

Email: tarawneh@utpa.edu **Website:** <http://faculty.utpa.edu/tarawneh/>

Course Prerequisites:

MECE 3315 (Fluid Mechanics) and MECE 3450 (Engineering Analysis II) or equivalents.

Textbook: “Fundamentals of Acoustics” by Kinsler, Frey, Coppens, and Sanders, 4th Edition.

[ISBN 0-471-84789-5]

Course Objectives:

1. Develop an understanding of the fundamentals of vibrations and traveling waves through the analysis of the lumped parameter oscillator, transverse waves on a string, longitudinal waves in a bar, and transverse waves on a stretched membrane.
2. Develop an understanding of the derivation and nature of the fundamental fluid acoustic equations.
3. Develop an understanding of the phenomena associated with the reflection, transmission, radiation, reception, absorption, and attenuation of sound.
4. Develop an understanding of the phenomena associated with acoustic cavities and waveguides, including sound propagation in pipes, resonators, and filters.
5. Become familiar with the complex exponential method of solving differential equations.

Examinations:

Each exam will consist of two parts: a short answer closed book, closed notes part, and a problem solution open book, closed notes (except for one standard 8.5"×11" sheet of paper) part. The final exam is comprehensive. If a question about the scoring of an exam arises (addition of points, assignment of partial credit, etc...), the student should write out a note describing the discrepancy, attach the note to the exam, and resubmit the exam to the instructor for review. This must be done within one week of return of the exam. After one week, exam scores will not be changed.

- ❖ Selected Nonlinear Acoustic Effects (Chapter 16).
- ❖ Shock Waves and Explosions (Chapter 17).

In order to demonstrate knowledge and proficiency in the selected advanced topic, the student must, on or before the last day of regularly scheduled classes (Wednesday April 30th), present a **ten page** Powerpoint presentation on the topic chosen. The Powerpoint presentation must also include material obtained from **at least four** published journal articles on the subject, which the student must obtain through a literature review. A **minimum four page** term paper summarizing the four articles chosen must be provided to the Instructor the day of the presentation. For grading purposes, the student must provide the Instructor with an **electronic** copy of the presentation and the term paper in addition to the hard copy of the paper and the four journal articles selected.

Note: Every graduate student must select a different advanced topic. No duplicates will be allowed without consent from the Instructor.

Course Outline:

CHAPTER	TOPIC
1	<i>Lumped Parameter Oscillations</i>
2	<i>One-Dimensional Transverse Traveling Waves on a String</i>
3	<i>One-Dimensional Longitudinal Traveling Waves within a Thin Bar</i>
4	<i>Two-Dimensional Transverse Traveling Waves on a Thin Membrane</i>
EXAM #1	
5	<i>The Acoustic Wave Equation of Fluids and Simple Solutions</i>
6	<i>Acoustic Wave Reflection and Transmission</i>
7	<i>The Radiation and Reception of Sound</i>
EXAM #2	
8	<i>The Absorption and Attenuation of Sound</i>
9	<i>Acoustic Cavities and Waveguides</i>
10	<i>Sound Propagation in Pipes, Resonators, and Filters</i>
TERM PAPER PRESENTATION <i>(Wednesday April 30th)</i>	
FINAL EXAM <i>(Wednesday May 7th at 4:00 pm)</i>	

Mechanical Engineering Department Classroom Policies

Attendance:

1. Attendance will be taken every time the class meets. Any student arriving to class **5 minutes** after the class has started will not be allowed in class. Students will be allowed a **maximum** of 5 absences for the whole semester for classes meeting three times a week, 3 absences for classes meeting twice a week, and 2 absences for classes meeting once a week. A **point** will be deducted from the total (100%) for each **unexcused** absence exceeding the maximum allowable.
2. Students **will not** be permitted to leave the classroom during lectures and exams except for **extreme emergencies**.

Homework and Exams:

1. **Absolutely no late** assignments will be accepted.
2. Make-ups for in-class exams for **extreme emergencies** will be scheduled at the end of the semester.

Plagiarism:

Any instance of cheating or plagiarism will result in **loss of credit** for the work, and will be reported to the Chair of the ME Department and/or the Dean of Students for appropriate action which may include **loss of credit** for the course or **dismissal** from the University.

Drop Policy:

Students can withdraw from a course through the *Office of the Registrar* on or prior to:

- January 29th, 2014, Wednesday: Twelfth class day (Census date), courses dropped by this date do not count toward six course drop limit.
- February 11th, 2014, Tuesday: Last day to change course to non-credit.
- April 23th, 2014, Wednesday: Last day to drop courses or withdraw from the University with a grade of “DR” or “W” recorded. After this date, student remains enrolled in course(s) and receives whatever letter grade(s) he/she earns.

American Disabilities Act Statement:

Students with disabilities are encouraged to contact the Disability Services office for a confidential discussion of their individual needs for academic accommodation. It is the policy of the University of Texas-Pan American to provide flexible and individualized accommodation to students with documented disabilities that may affect their ability to fully participate in course activities or to meet course requirements. To receive accommodation services, students must be registered with the Disability Services office (DS), University Center #108, 665-7005 or disabilityservices@utpa.edu.

Program Educational Outcomes

It will be demonstrated that the student:

1. Is able to use knowledge of mathematics, basic sciences and engineering to analyze (identify, formulate, and solve) problems in mechanical engineering.
2. Is able to design and conduct experiments and interpret the results.
3. Is able to design mechanical devices, systems or processes that meet given specifications.
4. Is able to function in multi-disciplinary teams.
5. Is able to communicate ideas effectively in graphical, oral and in written media.
6. Understands the professional responsibility of an engineer and how engineering solutions impact safety, economics, ethics, politics, and societal, cultural and contemporary issues.
7. Understands the need for life long learning to keep abreast of current practice.
8. Is able to use state of the art computational hardware and software for analysis, design and documentation (techniques, skills, and modern engineering tools necessary for engineering practice).

Program Specific Outcomes for Mechanical Engineering

Fundamentals in Science and Mathematics: It will be demonstrated that the student:

- S1) Has knowledge of chemistry and calculus-based physics with depth in at least one.
- S2) Has the ability to apply advanced mathematics to problems involving thermal and mechanical systems.
- S3) Has the ability to apply statistics and linear algebra to problems involving thermal and mechanical systems.

Fundamentals in Engineering: It will be demonstrated that the student:

- E1) Has the ability to create and annotate two-dimensional drawings, and generate three dimensional computer based solid models of mechanical components.
- E2) Has the ability to design and analyze components and systems for mechanical and energy performance.
- E3) Has the ability to specify and evaluate materials and manufacturing steps for mechanical components.
- E4) Has the ability to conceive and conduct experiments to measure the performance of materials, components and systems and to communicate the results.
- E5) Has the ability to acquire new skills and specialized knowledge from published sources.

Course Evaluation:

Mandatory Course Evaluations period (April 9 – April 30): Students are required to complete an *ONLINE* evaluation of this course, accessed through your UTPA account (<https://my.utpa.edu/>); you will be contacted through email with further instructions. The evaluation window closes at 11:59 pm on April 30th, the last day of spring classes. Students who complete their evaluations by April 30th will have priority access to their grades.

ACKNOWLEDGEMENT OF RECEIPT OF SYLLABUS

By signing below, I hereby affirm that I have received a copy of the syllabus for **MECE 6375 Engineering Acoustics** and have been informed by the **Instructor** that it is my responsibility to **carefully** read and understand this document.

Student ID Number

Printed Name

Signature

Date