EMEC 491: Acoustics, Engineering and the Environment

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Catalog Data (3 Credit Professional Elective)
This course will give students exposure to engineering acoustics and noise and vibration control. Learn about sub-disciplines within acoustical engineering. Environmental (interior and exterior) acoustics, human perception, designing sound absorbers, diffusers and isolation assemblies, acoustics within spaces, noise and vibration prediction (modeling) and mitigation, impact on wildlife and specifically-acoustic measurements. OSHA & EPA noise limits, various noise metrics as they apply to industry, HVAC, automotive and aerospace. Project work.

Textbook
Foundations of Engineering Acoustics, Frank Fahy

Entrance Expectations
PREREQUISITE:
- ME and MET Majors = Completion of All 100 – 200 Level Courses
Students are expected to be familiar with basic physics, algebra and logarithmic functions, as well as have a working understanding of computer software commonly used in engineering. This course requires completion of regular homework assignments, project work and reports and sufficient performance on written examinations.

Course Objectives
EMEC 491 Acoustics, Engineering and the Environment is designed to introduce students to engineering acoustics and its impact on environments. The goal is to give students the conceptual, analytic, experimental and practical knowledge required to pursue a career as an acoustical engineer, or to take graduate studies in acoustics. Upon completion of the course, students should be able to:
- describe the various fields of acoustical engineering
- quantify human perception of sound and vibration
- be aware of wildlife perception of sound
- utilize parameters important in acoustical analysis and design
- conceptualize sound and its propagation in different environments
- design sound absorbers, diffusers and isolation assemblies to solve acoustical problems
- analyze noise and vibration problems and design mitigation measures
- predict (calculate) noise sources and propagation
- perform acoustical measurements (per standards)
- assess the results of acoustical measurements
- apply conceptual, theoretical and experimental knowledge to complete a course project
Course Topics
- Fundamentals of acoustics
- Human (and some wildlife) perception of sound
- Sources and propagation of sound
- Evaluating sound
- Measuring sound
- Environmental acoustics
- Noise and vibration control
- Sound in enclosed spaces

Course Outcomes
Upon completion of this course, students will have the ability to:
1. Demonstrate understanding of the production and propagation of sound and vibration
2. Be familiar with human (and some wildlife) perception of sound and vibration
   a. Including common metrics and ordinances
3. Apply analytical tools to solve acoustic engineering problems
4. Design sound absorbers, diffusers and isolation assemblies
5. Design vibration isolation systems
6. Acquire and analyze measured data

Schedule
CLASS Tuesday and Thursdays, Somewhere, Sometime (1 hr., 15 min.)
ASSIGNMENTS See D2L for course schedule, HW and project assignments

To facilitate dealing with the inevitable variability, the course schedule is often subject to minor changes throughout the semester. A tentative course schedule is posted on D2L including: reading assignments, exam times and project due dates. Homework will be assigned in class. Students are expected to check this schedule and D2L announcements at least weekly for changes and updates.

Course Website
All course information will be posted on Desire2Learn (D2L). D2L announcements and eCat registered email accounts will serve as the official university means of communication. Per MSU policy, students are expected to check their email at least twice weekly to stay current with University-related communications. Certain communications (e.g. scheduling) may be time-sensitive. Failure to process your email effectively is not an acceptable excuse for missing official communications.

Special Needs Information
Students with special needs or requiring special accommodations should contact the instructor or the campus Disabled Student Services Office at (406) 994-2824 at their earliest opportunity.
Student Conduct

Students are expected to conduct themselves in accordance with the MSU Student Conduct Guidelines with particular attention to the areas of academic honesty, behavior, and responsibilities. As mentioned above and in conjunction with Section 310 of the Student Handbook, students are expected to be prompt and prepared for class. Late work will not be accepted.

Assessment and Evaluation

The course outcomes will be evaluated based upon homework assignments, project reports and exams. The final letter grades will be weighted as follows:

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<thead>
<tr>
<th>Component</th>
<th>Weight</th>
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<tbody>
<tr>
<td>Exams (3)</td>
<td>60%</td>
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<tr>
<td>Project</td>
<td>20%</td>
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<tr>
<td>Homework</td>
<td>20%</td>
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</tbody>
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Homework grading will be based on the following criteria: half credit will be given for seriously attempting all assigned problems and one to two problems will be fully graded for the remaining half credit. *Exams missed due to unexcused absences cannot be made up.* Three equally weighted exams will be administered according to the class schedule with the final exam scheduled according to the registrar. For exams, no grading curve will be employed and students’ final grades are not based on the respective performance of peers. Homework and project reports must be turned in on time as *late homework will not be accepted.* Point totals required to receive a particular letter grade will be determined by the instructor at the conclusion of the course and the use of plus and minus grades will be at the discretion of the instructor. Inappropriate conduct, late arrival to lecture, poor class participation, cheating and plagiarism will affect the final grade.

Cheating

Cheating will not be tolerated. Phones, laptops, tablets and all other connected devices are not allowed during tests or quizzes. If your calculator is your phone or other connected device, get another calculator. Calculators are sometimes available to be loaned from the library and M&IE office.

Attendance

Class attendance is very important. In-class interactions are vital to the learning process. Your performance in the course is closely linked to your participation in classroom activities.

General Background Information

This course will give students exposure to engineering acoustics and noise and vibration control. The goal is to give students the conceptual, analytic, experimental and practical knowledge required to pursue a career as an acoustical engineer, or to take graduate studies in acoustical engineering. Students will learn about the many sub-disciplines within acoustical engineering and learn the theory and skills to work or study further in some of these fields. There is a demand for good acoustical engineers and for some students this can be a very suitable career. As populations become denser and the conserving the environment increases in importance, opportunities in this field grow.