

**MIAMI UNIVERSITY  
SCHOOL OF ENGINEERING AND APPLIED SCIENCE  
DEPARTMENT OF ENGINEERING TECHNOLOGY**

**ENT 416** **TOPICS IN MECHANICAL VIBRATIONS** **3**

Course Number Title Credit hours

**DESCRIPTION:** This course provides a study of mechanical vibrations topics with emphasis on mathematical analyses methods that may be applied to the solution of industrial type engineering technology problems. Computer analysis software and experimental methods are introduced within the laboratory portion of the course.

**PREREQUISITES:**  
ENT 301, ENT 333

**TEXT MATERIAL- REFERENCE BOOKS:**

1. *Fundamentals of Mechanical Vibrations* 2<sup>nd</sup> Ed., S. Graham Kelly, McGraw Hill, 2002.
2. *Engineering Vibrations I*, by J. Earl Foster, University of Illinois at Chicago, 2004.

**COURSE OBJECTIVE:**

Upon Completion of this course, students will be able to:

1. Analyze complex mechanical systems for vibration isolation, monitoring, and control
2. Setup experimental testing procedures for vibration monitoring
3. Mathematically model vibration systems
4. Use computer-aided design tools for mechanical design and analysis

**COURSE OUTCOMES:**

- Outcome 3** The ability to apply creative technical skills to the analysis and design of mechanical components and systems
- Outcome 10** Mathematical and physical science skills necessary for the successful application of engineering concepts to design projects
- Outcome 13** Fundamental knowledge of instrumentation used to measure parameters in fluid mechanics, heat transfer, and mechanical vibrations
- Outcome 14** Fundamental knowledge of effective data presentation and technical report writing.

**TOPICAL OUTLINE:**

| Week | Description  | Lab/ HW Assignments          |
|------|--|------------------------------|
| 1    | Review of Dynamics   | HW 1.1, 1.2, Lab Visit       |
| 2    | Introduction to springs and viscous dampers                                  | HW 1.3 to 1.7                |
| 3    | Introduction to single DOF vibrations<br><b>Section 2.1 to 2.3</b>           | HW 2.1 to 2.4, <b>QUIZ 1</b> |
| 4    | Single DOF – Undamped free vibration, <b>Section 2.4</b>                     | HW 2.5, 2.6                  |
| 5    | Single DOF – Free vibration with viscous/coulomb damping: <b>Section 2.5</b> | Lab 1                        |
| 6    | Single DOF – Free vibration with viscous/coulomb damping: <b>Section 2.5</b> | Lab 2, HW 2.7, 2.8           |
| 7    | Introduction to harmonic excitation of 1-DOF, <b>Section 3.1, 3.2</b>        | Lab 3, HW 3.1, <b>QUIZ 2</b> |
| 8    | Introduction to harmonic excitation of 1-DOF, <b>Section 3.3</b>             | HW 3.2, 3.3                  |
| 9    | Introduction to harmonic excitation of 1-DOF, <b>Section 3.4</b>             | HW 3.4 - 3.7                 |
| 10   | Vibration Monitoring – Measurements, <b>Displacement, velocity</b>           | Lab 4, <b>QUIZ 3</b>         |
| 11   | Vibration Monitoring - Measurements, <b>Acceleration</b>                     | Reading Assignments          |
| 12   | Vibration Monitoring - Measurements, <b>Acc. and Frequency Spectrum</b>      | Lab 5                        |
| 13   | Vibration Monitoring - Measurements, <b>Fourier Analysis</b>                 | Lab 6                        |

|    |   |                     |
|----|---|---------------------|
| 14 | Vibration Control, <b>Filtering Noise</b> | Lab 7               |
| 15 | Vibration Isolation                       | Reading Assignments |
| 16 | Viscous Damping                           | Reading Assignments |
| 17 | Final Examination (12/13/2005 at 7:30 PM) |                     |

**METHOD OF EVALUATION:**

The following is the distribution of credit for the required tasks:

|                                     |     |
|-------------------------------------|-----|
| Notebook with completed assignments | 20% |
| Laboratory Projects                 | 25% |
| Three Quizzes                       | 30% |
| Final Examination                   | 15% |
| Attendance and punctual             | 10% |

**Ethics and Academic Conduct**

It is expected that all members of the Department of Engineering Technology (faculty, staff and students) will adhere to the highest ethical standards in all matters. The Department endorses the Code of Ethics for Engineers proposed by the National Society of Professional Engineers (<http://www.nspe.org/ethics/eh1-code.asp>) and strongly defends the rights and responsibilities that accompany academic freedom which are at the heart of the intellectual integrity of Miami University.

It is expected that students will actively conduct themselves in an ethical fashion, for example, by only possessing and using materials authorized by the instructor during examinations, submitting assignments which are the student's original work (carefully referencing sources of information), protecting the integrity of assignments by adhering to prescribed procedures, and carefully utilizing the University's educational resources of materials and equipment.

Any activity that tends to compromise the academic integrity of the institution or subvert the educational process is defined as academic misconduct. Cheating and other forms of academic misconduct undermine the value of a Miami education for everyone, especially for the person who cheats.

The ENT department regards the adhering to academic ethical standards as a very serious issue and will follow the procedures and penalties for academic misconduct (dishonesty) as prescribed in Part V of The Student Handbook, pp. 10-12.

**Miami University Learning Community**

Miami University is committed to fostering a supportive learning environment for all students irrespective of individual differences in gender, race, national origin, religion, handicapping condition, sexual preference, or age. Students should expect, and help create, a learning environment free from all forms of prejudice. Disparaging comments, sexist or racist humor, or questioning the academic commitment of students based upon these individual differences are behaviors that undermine our learning community. If such behaviors occur in class, please seek the assistance of your instructor or department chair.

**University Statement Asserting Respect for Human Diversity**

Miami University is a multicultural community of diverse racial, ethnic, and class backgrounds, national origins, religious and political beliefs, physical abilities, ages, genders, and sexual orientations. Our educational activities and everyday interactions are enriched by our acceptance of one another; and, as members of the University community, we strive to learn from each other in an atmosphere of positive engagement and mutual respect.

Because of the necessity to maintain this atmosphere, bigotry will not go unchallenged within this community. We will strive to educate each other on the existence and effects of racism, sexism, ageism, homophobia, religious intolerance, and other forms of invidious prejudice. When such prejudice results in physical or psychological abuse, harassment, intimidation, or violence against persons or property, we will not tolerate such behavior nor will we accept jest, ignorance, or substance abuse as an excuse, reason, or rationale for it. All who work, live, study, and teach in the Miami community should be committed to these principles which are an integral part of Miami's focus, goals, and mission.