



### Course description:

This course focuses on the following topics, such as simple harmonic motion, damped simple harmonic motion, forced oscillators, coupled oscillators and transverse wave motion.

### Aims of the course:

- 1) To gain a deep understanding of physics of vibrations for different electrical and mechanical systems.
- 2) To learn how to derive out the govern equations of motions for different oscillating systems.
- 3) To understand the mutual energy exchange between the components of a coupled oscillating systems.
- 4) To build mathematical skills to solve the equation of motions for oscillating systems having different number of oscillating components (i.e masses with of different size of learn how the waves propagates in the medium.
- 5) To learning how to find the vibration modes and their frequencies for discrete and continues oscillated medium
- 6) To learn how the wave propagates in the different media.

### Intended Learning Outcomes: (ILOs)

#### A. Knowledge and Understanding

**A1. Concepts and Theories:** Use the principles of energy conservation, Newton's law and superposition of multi- waves and fundamental calculus (matrix, 2<sup>nd</sup> differential equations, ...).

**A2. Contemporary Trends, Problems and Research:** Damped simple harmonic oscillator, LCR circuits analysis and large number oscillating system.

**A3. Professional Responsibility:** Use electronic lab, graphical and algebraic tools to analyze the analog circuits.

#### B. Subject-specific skills

**B1. Problem solving skills:** Students solve problems related to wave propagation in different media and coupled oscillators (mechanical and electrical).

**B2. Modeling and Design:** Not applicable.

**B3. Application of Methods and Tools:** Use the special techniques to solve different vibrating systems (isolation and damping of vibrations in different fields (infrastructure, automotive.....)).

#### Critical-Thinking Skills

**C1. Analytic skills:** Assist the technical factors that affect the damping of vibrations and increasing the quality factor for the materials in service.

**C2. Strategic Thinking:** Formulate plans designed to achieve maximum quality factor for different materials while they are being used in applications.

**C3. Creative thinking and innovation:** Think to apply easy methods to minimize the vibration transfer from medium to another.



## D. General and Transferable Skills (other skills relevant to employability and personal development)

### D1. Communication:

1. Students will be able to communicate with teacher, ask questions, solve problems, and use computers.
2. Students ask questions during the lecture, work in groups, and communicate with each other and with me electronically.

### D2. Teamwork and Leadership:

1. I encourage the student to attend lectures regularly by different means driving their positive attentions toward the course.
2. Mutual respect is between the lecturer and students and among students themselves. I deal with them as young mature people, responsible for their actions and schedules.
3. I apply educational standards when they work in groups where I assess the response of students as a whole and the team spirit and good character.
4. I enable students to have an open communication environment for relevant discussion helping them to overcome some technical problems.

### Course structures:

Week	Credit Hours	ILOs	Topics	Suggested problem
1,2	6	A1,B3	Simple harmonic oscillations	1,2,5,6,.11
3,4,5	9	A2,D1 and D2, B3,C1	Damped simple Harmonic Motion	1,3,4,8,11,12,13,
6,7,8	9	A1,C2,C3, D1	The force Oscillators	1,3,5,7,12,13
9,10,	6	A3,B1,B3,C2,	coupled Oscillation	2,4,7,10,11,12
11,12,13	9	A3,B1,B3,C2,	Transverse wave motion	1,3,7,9,10,11,15

### References:

#### Main Textbook:

A. The Physics of Vibrations and Waves.H.jpain.6th edition (John wiley&Sons,Ltd)

B. Supplementary Textbook(s): Vibrations and Waves( A.P. French)

#### Assessment Methods:

Exams	Grade	Date
1st	20	TD
2nd	20	TD
Final	50	TD
Homework's	10	TD

