

Academic Year/course: 2021/22

## 29745 - Vibration and Noise at Machines

### Syllabus Information

**Academic Year:** 2021/22

**Subject:** 29745 - Vibration and Noise at Machines

**Faculty / School:** 110 - Escuela de Ingeniería y Arquitectura

**Degree:** 434 - Bachelor's Degree in Mechanical Engineering

**ECTS:** 6.0

**Year:** 4

**Semester:** First semester

**Subject Type:** Optional

**Module:**

### 1. General information

### 2. Learning goals

### 3. Assessment (1st and 2nd call)

### 4. Methodology, learning tasks, syllabus and resources

#### 4.1. Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. It is based on participation and the active role of the student favors the development of communication and decision-making skills. A wide range of teaching and learning tasks are implemented, such as lectures, guided assignments, laboratory sessions, autonomous work, and tutorials.

Students are expected to participate actively in the class throughout the semester.

Further information regarding the course will be provided on the first day of class.

#### 4.2. Learning tasks

The course includes 6 ECTS organized according to:

- Lectures (1.2 ECTS): 45 hours.
- Laboratory sessions (0.6 ECTS): 15 hours.
- Group work (1.4 ECTS): 35 hours.
- Autonomous work (2 ECTS): 50 hours.
- Tutorials.

**Lectures:** the professor will explain the theoretical contents of the course and solve illustrative applied problems. These problems and exercises can be found in the problem set provided at the beginning of the semester. Lectures run for 3 weekly hours. Although it is not a mandatory activity, regular attendance is highly recommended.

**Laboratory sessions:** sessions will take place every 2 weeks (5 sessions in total) and the last 3.0 hours each. Students will work together in groups actively doing tasks such as practical demonstrations, measurements, calculations, and the use of graphical and analytical methods.

**Guided assignments:** students will complete assignments, problems, and exercises related to concepts seen in laboratory sessions and lectures. They will be submitted at the beginning of every laboratory session to be discussed and analyzed. If assignments are submitted later, students will not be able to take the assessment test.

**Autonomous work:** students are expected to spend about 90 hours to study theory, solve problems, prepare lab sessions,

and take exams.

Tutorials: the professor's office hours will be posted on the degree website to assist students with questions and doubts. It is beneficial for the student to come with clear and specific questions.

### 4.3. Syllabus

**The course will address the following topics:**

#### Theoretical sessions

- 1. Vibration and Noise.
- 2. Introduction to the theory of vibrations.
- 3. Vibrations of discrete systems of one and n degree of freedom. Modal analysis
- 4. Vibrations in continuous systems: Shafts and beams.
- 5. Fundamental concepts of noise.
- 6. Instrumentation for measurement and analysis of vibration and noise.
- 7. Sources of vibration and noise on machines.
- 8. Troubleshooting machines.
- 9. Noise and vibration control.
- 10. Practical cases.

#### Practical sessions

- 1. Data acquisition and processing ~~noise~~ and vibration signals. **System analysis with a degree of freedom in free oscillation.**
- **2. System analysis of a degree of freedom in forced oscillation.**
- **3. System analysis with two degrees of freedom.**
- ~~4~~ 2. Modal testing of a beam
- ~~5. Determination of sound power of a machine and / or equipment~~
- ~~5~~ 4. Vibration analysis of a cantilevered rotor.
  - Setting up a measurement system
  - Failure frequency Identification
  - Interpretation and discussion of the measures

### 4.4. Course planning and calendar

For further details concerning the timetable, classroom and further information regarding this course please refer to the "Escuela de Ingeniería y Arquitectura " website (<https://eina.unizar.es/>)