EEA	Semester: S5

EU objectives

At the end of this course, students will be able to:

- To know and understand the "high current" energy chain in a number of industrial applications (wind power, rail, automotive, etc.) and the associated electronic systems.
- Master the operating principles of various sensors used in mechanical engineering;
- Use these sensors in an appropriate measurement chain;
- Interpret the results obtained from a metrological point of view;
- Optimise the measurement system to suit the conditions of use;
- Define the limits of the system, particularly in terms of sensitivity.
- Analyse the most common physical signals;
- Use signal processing tools to extract the relevant frequency parameters from a system or signal;
- Use appropriate filtering processes.

Description of the ECUEs

ELECTROTECHNICS

Concepts of production, transmission, distribution and quality of electrical energy.

- Presentation and description of the energy chain in a wind turbine.
- Presentation and description of a train's energy chain.
- Understanding and application of the model of synchronous machines with unsaturated smooth poles, whether in generator mode (production of energy, etc.) or in generator mode (production of electricity, etc.).

electric) or in engine operation.

SENSORS FOR MECHANICAL ENGINEERING

- Basics of Sensor Physics ;
- Deformation, position and displacement sensors ;
- Force, weighing and torque transducers ;
- Accelerometer ;
- Signal conditioning.

MECHANICAL SIGNAL PROCESSING
- Fundamentals of signal processing for vibration analysis ;
- Signals and systems: time studies: linear systems, time invariance, stability, convolution, correlation, etc.
- Frequency analysis of signals and systems: Fourier series and Fourier and Laplace transforms, energy and power spectral density;
- Frequency analysis of systems: filtering, transfer function: examples of low-pass, high-pass, etc. filters of order 1, 2, etc.
- Examples of the application of signal processing to vibration analysis.

Prerequisites

Basic mathematics and physics, electrokinetics and electromagnetism,

Bibliography

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Digital signal processing: course and corrected exercises. Author: Bellanger, Maurice, , Publisher: Dunod, (available in B.U) Mathématiques pour le traitement du signal, Author: Maïtine Bergounioux, Editions Dunod, (available in B.U)
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