FACULTY OF **ENGINEERING**

DEGREE COURSE: **INDUSTRIAL ENGINEERING**

MASTER DEGREE: **INDUSTRIAL ENGINEERING / DESIGN**

SUBJECT: STRUCTURAL DYNAMICS AND VIBRATION TESTING

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OBJECTIVES:
Provide the students the basic principles describing the structural dynamics and vibration theory.

Apply the learned vibration theory to solve engineering problems as vibration isolation and structural modification.

Develop skills in instrumentation, data acquisition and processing for vibration and modal testing.

Provide the students a basic knowledge on experimental modal analysis methods for modal parameters estimation.

CONTENTS:
One Degrees-Of-Freedom systems. Free and forced vibration, Damped Systems, Examples and Applications. Multi Degrees-Of-Freedom Systems. Mode shapes and natural frequencies. Unbalanced rotors and balancing methods. Vibration isolation.

Signal acquisition and digital signal processing: Periodic, transient and random signals. Time and frequency domain processing. Statistical properties, auto and cross correlation and power spectral density functions. Fourier transform.

Joint time-frequency analysis e wavelets. Filter basic theory. Frequency Response Function and Coherence Function.

Modal testing: Structure preparation and constraints, Excitation systems, Response function measurement.

Experimental modal analysis for modal parameter estimation: Single- and Multi-Degrees-Of-Freedom in time and frequency domain.

LEARNING OUTCOMES

Students will learn the basic principles for describing the structural dynamics and vibration theory.

Students will be able to apply the learned vibration theory to solve engineering problems as vibration isolation and structural modification.

Students will have the theoretical and practical means to design measurement procedures for vibration and modal testing.

Students will understand the basic modal analysis methods for modal parameters estimation.

ASSESSMENT

Written exam: multiple choice and open questions

RECOMMENDED TEXTBOOKS

The material provided by the multimedia teaching platform is sufficient for a complete comprehension of the concepts treated within the course.
The student can deepen his knowledge by reading the following books:

1. D. J. Ewins, "Modal testing: theory and practice", Research Studies Press.

2. E. Doebelin, “Measurement systems: application and design”, McGraw-Hill International Edition.