UNIT INFORMATION

Program	Mechanical Sciences (53001010053P0)
Course unit	MECHANICAL VIBRATIONS
Unit code	PCMEC
Unit number	364062
Credit points	4
Period	01/01/2012 -
Professor	Aline Souza de Paula/Adriano Todorovic Fabro
Prerequisites	No

UNIT OUTLINE

Objective:

This course aims to develop the ability to understand and analyze the dynamic behavior of mechanical structures and components subjected to vibrations, whether caused by internal or external sources, and applied either continuously or intermittently.

Purpose:

The course provides theoretical foundations and presents analytical, numerical, and experimental methodologies for analyzing the vibratory dynamic behavior of mechanical systems. Upon completion, the student is expected to:
i) evaluate the vibratory behavior of discrete and continuous oscillators using analytical and numerical solutions;
ii) identify critical situations and propose solutions either to mitigate or amplify vibrations in dynamic systems;
iii) estimate properties of discrete oscillators such as damping, natural frequencies, among others, using experimental data.

Contents:

1) Introduction: Components of discrete systems; modeling. 2) LINEAR OSCILLATOR – 1 DOF: Free vibrations; Harmonic vibrations (undamped and damped); Vibrations under harmonic excitation; Vibration isolation; Vibrations under non-harmonic excitation; Periodic excitation: Fourier series; Impulse response; Step response; Arbitrary excitation: Convolution integral; Laplace transform. 3) DISCRETE SYSTEMS – n DOF: Natural frequencies and modes; Coordinate transformation: Normal coordinates;

	Damped systems; Response of discrete systems; Dynamic vibration absorber. 4) CONTINUOUS SYSTEMS: Wave equation; Beams. 5) Extra topics.
Assessment:	Assessment will be based on: Exercise sets (25% of the final grade); Two exams (50% of the final grade); and a final project (25% of the final grade). Mentions will be given to students based on their final grades, according to UnB's grading criteria. Any omitted cases will be resolved by the course professors.
References:	1. M. A. Savi & A. S. de Paula, Vibrações Mecânicas, LTC, 2017. 2. Inman, D. J. (1995), Engineering Vibration, 1st Edition, Prentice Hall. 3. Meirovitch, L. (2001), Fundamentals of Vibration, McGraw Hill. 4. Savi, M. A., Dinâmica Não-linear e Caos, 2nd Edition, E-papers, 2017. 5. J. P. Den Hartog, Mechanical Vibration, Crastre Press, 2007.