**Dynamics**

***Goals:***

The aim of this course is to teach students the fundamental principles of Particle Dynamics and Mechanical System Dynamics, in order to help students to master the basic theorems and laws of Mechanical System Dynamics along with the basic concepts of linear vibration of a particle and elements of Analytical Mechanics, and to teach students how to solve problems in different engineering and scientific fields.

***Theoretical teaching includes the following topics:***

Linear Momentum of a Particle and a Mechanical System; Impulse; Impulse-Linear Momentum Theorem and Law of Conservation of Linear Momentum; Angular Momentum of a Particle and a Mechanical System; Angular Impulse-Angular Momentum Theorem and Law of Conservation of Angular Momentum; Differential and Total Work of a Force. Force Field; Force Function; Conservative Force; Kinetic Energy of a Particle and a Mechanical System; Work-Kinetic Energy Theorem and Law of Conservation of Kinetic Energy of a Particle and a Mechanical System; Central Force; Conservation of the Areal Velocity; Differential Equations of Motions for a Particle subjected to Central Force; Binet Equation; Motion of a Particle subjected to Newtonian Gravity; Kepleras Laws; Dynamics of Relative Motion of a Particle; Linear Vibration of a Particle; Free and Forced; Damped and Undamped Vibration of a Particle; D'Alamber Principle; Differential Equation of Motions of a Rigid Body (Translation, Rotation about a Fixed Axis, Planar and Spherical Motion of a Rigid Body); Basics of Analytical Mechanics.