Mechanics C

Calendar: 1st day semester

Contact Hours: 22,5h T + 22,5h TP + 7,5h OT

Scientific Area: Matérias Complementares

Learning outcomes of the curricular unit
General goals - learn the fundamentals and key concepts of mechanics; solve problems analytically, numerically or graphically. Specific objectives - perform unit conversions; perform vectorial calculations; apply the main Newton's Laws; calculate mechanical variations of energy ; solve problems involving the equilibrium of particles and rigid bodies; define absolute and relative motion and relative velocity; characterize the pressure force acting on a surface in the interior of a liquid in equilibrium; be able to apply the fundamental law of hydrostatics, the Law of Archimedes to equilibrium and motion situations of bodies in a fluid liquid and the Archimedes Principle; defining a fluid, laminar and turbulent flows and their properties; identify and characterize a flow pattern; apply Bernoulli 's Law; determine the pressure and velocity at any point in a flow and identify and characterize the flow pattern.

Syllabus
Chapter 1 - 0.5 weeks
International System of Units. Fundamental unit measurements.
Chapter 2 - 1.0 weeks
Significant algarisms and Dimensional Analysis .
Chapter 3 - 1.0 week
Introduction to vectorial calculus.
Chapter 4 - 2.0 weeks
Fundamental concepts of statics . Newton's laws. Principle of transmissibility.
Chapter 5 - 2.0 weeks
Fundamental concepts of kinematics.
Chapter 6 - 2.0 weeks
Fundamental concepts of dynamics.
Chapter 7 - 2.0 weeks
Notion of fluid. Density. Viscosity. Capillarity. Vapor Pressure. Compressibility. Relative and Absolute Pressure.
Chapter 8 - 2.0 weeks
Hydrostatic. Fundamental Law of Hydrostatic for compressible fluids. Atmospheric pressure. Pressure gauges. Pascal's Law. Impulsion and Archimedes' Principle.
Chapter 9 - 1.0 weeks
Fluid Dynamics. Equation of Continuity. Bernoulli's equation.

Demonstration of the syllabus coherence with the curricular unit's objectives
With chapter 1 and 2, students acquire the ability to understand and convert quantities units used in mechanics. In chapter 3, students learn to work with vectorial measurements. In chapter 4 and 5 the students acquire the ability to solve problems involving the equilibrium of particles and rigid bodies and in motion (rectilinear or curvilinear movement). In Chapter 6, students learn the basics of dynamics, especially the concept of force, mass and acceleration. In Chapter 7 and 9, fluid nature is explained as well as its properties and dynamics. In chapter 8, students learn concepts of hydrostatic.

Teaching methodologies (including evaluation):
The curricular unit is organized in lectures, theoretical and practical. The lectures are taught using the lecture-participatory method (supported by slides). The practical classes are taught through exercise solving by students under the supervision of the teacher. The final grade will be determined by one of two modes of evaluation: two tests (2x 50%) and Final Exam (100%).
Due to the limited number of students enrolled and none of them in the first enrollment, the Director and CTC of ESTBarreiro/IPS took the decision of replacing the theoretical-practical classes into a system of tutorial orientation with half of the contact hours. In this system the lecturer helps the students as they try to autonomously solve exercises applying the syllabus content.

Demonstration of the coherence between the teaching methodologies and the learning outcomes.

The teaching methods include lectures that use a strategy of exposure the UC contents in the classroom with the goal of passing concepts, definitions and mechanisms for exercise interpretation. Lectures pretend to transmit to students the knowledge necessary for the pursuit of the objectives of the course. The teaching methodologies also include classes that use a strategy of exercise resolution under the supervision of the teacher. With practical classes is intended that the students acquire competence to understand, describe and relate knowledge. The evaluation through assignments and tests was established for a measurement of acquired skills followed over the semester. Exam evaluation allows the assessment of knowledge integration by the teacher.