

Physics

Biomedical Engineering

2020/2021 Course

Program

1. Introduction

1. Introduction

- Physics as Fundamental Science.
- Scalar and Vector Quantities: Units and Dimensions.
- Algebra and Vector Analysis.

2. Mechanics and Waves

1. Kinematics

- Displacement, Velocity and Instantaneous Acceleration.
- Acceleration in Intrinsic Coordinates.
- Applications to different motions.

2. Particle Dynamics

- Newton's Laws.
- Types of forces: gravitational, normal, frictional, tension.
- Linear and Angular Momentum.
- Impulse.

3. Energy and Work

- Definition of Work and Energy.
- Work-energy theorem.
- Conservative and non-conservative forces: Potential energy.
- Power.
- 4. Dynamics of systems of particles
 - Dynamics of a system of particles, Rigid-body Dynamics. Center of Mass.
 - Moment of a force. Central Forces.
 - Second Newton's Law for the Rigid-body: Moment of Inertia and rotational energy.

- Conservation of Linear and Angular Momentum.
- 5. Oscillations and Waves
 - Simple Harmonic Motion.
 - Oscillations in Physical systems.
 - Damped and Forced Oscillations, Resonance.
 - Waves and wave motion.
 - Principle of superposition and Wave Interference. Standing waves.

3. Fluid Physics

1. Fluid Statics

- Concept of fluid.
- Density and Pressure.
- Hydrostatic. Pascal's Principle.
- Buoyant Force and Archimedes' Principle.
- Methods for measuring pressure.

2. Fluid Dynamics

- Introduction and fundamentals.
- Continuity Equation.
- Euler's and Bernoulli's equations.
- Bernoulli's equations applications. Torricelli's theorem. Venturi tube.
- Viscous fluids: viscosity concept. Laminar and Turbulent Regimes.
- Diffusion in fluids.
- Viscometer.

BIBLIOGRAPHY

Theory

- Hans C. Ohanian and John T. Markert. Physics for Engineers and Scientists (Third Edition) (Vol. 1). W. W. Norton & Company, 2006.
- 2. Wolfgang Bauer and Gary Westfall. University Physics with Modern Physics (WCB Physics). McGraw-Hill Education, 2013.
- 3. Paul A. Tipler and Gene Mosca. Physics for Scientists and Engineers, 6th Edition. W. H. Freeman, 2007.
- 4. Paul Davidovits. Physics in Biology and Medicine. Editorial: Academic Press (2007).

Problems

- 1. Santiago Burbano de la Ercilla y otros. Problemas de física (Vols I, II y III). Ed. Tébar, 2006. (27^a ed.)
- Olga Alcaraz, José López y Vicente López. Física: Problemas y ejercicios resueltos. Ed. Prentice Hall 2005.
- 3. Nathan Newbury and John Ruhl. Princeton Problems in Physics with Solutions. Princeton University Press, 1991.