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## PHYSICS I F - O

FIS/01 - 9 CFU - 2° Semester

### Teaching Staff

#### SILVIO CHERUBINI

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### DETAILED COURSE CONTENT

MECHANICS. Physical quantities: Introduction. The scientific method. Laws of Physics and Principles. Models in Physics. physical quantities. measurement methods. Dimensions of physical quantities. the unit of measurement systems. Errors. Significant digits. Time. Length. Mass. Measures and uncertainty. Vectors algebra and calculus. Kinematics: Introduction. Motion and reference systems. The material point scheme. Vector equation of motion. Speed concept vs velocity vector. Acceleration. Classification of elementary motions. The Principles of Dynamics: Introduction. Interactions. Operational definition of the forces. Introduction to the Principles of Dynamics. Work and Energy: Introduction. Work of a force. Kinetic energy. Conservative forces fields. Some conservative fields: weight force, elastic force. non-conservative forces. Conservation of mechanical energy. Dynamic of Systems: Introduction. center of mass. Momentum and motion of the mass center. Conservation of momentum. Angular momentum. Cardinal equations. Work and energy. Scattering phenomena. Rigid Bodies: Introduction. Kinematics of rigid systems. Moment of inertia. Dynamics of a rigid body with a fixed axis. physical pendulum. Conservation of the axial angular momentum. Kinetic energy of a rigid system. Work of the forces acting on a rigid body. Energy and motion of rigid systems. Dynamics of pure rolling. Rolling friction. Statics of rigid systems. Elements of Fluid-dynamics as an application of the Dynamics of Systems, Bernoulli's Theorem. OSCILLATIONS. Simple harmonic oscillator. Damped oscillations. Forced oscillations and resonance. THERMODYNAMICS Thermodynamic as a consequence of Dynamic of Systems. Introduction. thermodynamic coordinates. Thermodynamic work. kinetic theory of gases. First Law of Thermodynamics: Energy and thermodynamic systems. First Principle and heat. Second Law of Thermodynamics: Introduction. Equivalence of the two statements. reversible machines and the Carnot cycle. Carnot's theorem. Absolute temperature thermodynamics. Carnot efficiency of machines. Clausius theorem. Entropy. Degradation of energy. Entropy and probability.

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## **TEXTBOOK INFORMATION**

Alonso-Finn, "Elementi di Fisica Generale", English edition, Addison Wesley

Focardi, Massa, Uguzzoni: "Fisica Generale. Meccanica e Termodinamica." (CEA)

Mazzoldi, Nigro, Voci: "Elementi di Fisica Vol. 1 - Meccanica e Termodinamica." (EdiSES)

Rosati, Casali: "Problemi di Fisica Generale. Meccanica, Termodinamica, Teoria cinetica dei gas." (CEA)

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