UNIVERSITÀ DI PAVIA

Anno Accademico 2015/2016

FOUNDATIONS OF PHYSICS

Enrollment year	2015/2016
Academic year	2015/2016
Regulations	DM270
Academic discipline	FIS/08 (DIDACTICS AND HISTORY OF PHYSICS)
Department	DEPARTMENT OF PHYSICS
Course	
Curriculum	DIDATTICA E STORIA DELLA FISICA
Year of study	1°
Period	1st semester (12/10/2015 - 22/01/2016)
ECTS	6
Lesson hours	48 lesson hours
Language	ITALIAN
Activity type	ORAL TEST
Teacher	INTROZZI GIANLUCA (titolare) - 6 ECTS
Prerequisites	Basic concepts of Classical and Quantum Physics, usually thought during a three years degree in Physics.
Learning outcomes	To reach the capacity to analyze and appreciate - by means of case studies in Classical and Modern Physics - the complex process of formulation of physical theories, their experimental corroboration, consequent acceptance by the scientific community, and the possible final obsolescence due to the formulation of alternative theories.
Course contents	Case studies in Classical Physics: Ptolemy and the scholastic geocentrism - Copernicus and the heliocentric revolution - Kepler and the celestial mechanics - Galileo and the scientific method - Newton and the system of the universe - Laplace and the mechanical determinism - Carnot and thermodynamics - Helmholtz and the conservation of energy - Boltzmann and the statistical approach - Maxwell and the EM fields - Poincaré and the

	dynamical instability - Einstein: the denial of ether and the early days of modern physics - Einstein epistemologist and philosopher of science. Topics on Quantum Mechanics: Plank quanta - Einstein quanta - Bohr atomic model - de Broglie material waves - Schroedinger equation - Optical and quantum interferometry - Copenhagen probabilistic interpretation - Bohm causal interpretation - Uncertainty relations (Fourier, Heisenberg, Kennard, Robertson, Bohm, Puri, Ozawa) - Bohr complementarity and duality (Greenberger/Yasin and Englert) - Different interpretations of the wave/particle dilemma - Other peculiar aspects of quantum mechanics: Entanglement, Schroedinger cat, EPR paradox, Bell inequalities and quantum decoherence.
Teaching methods	Oral teaching and discussion. Some relevant documents are shown using slide presentation.
Reccomended or required readings	Written material covering the different topics is available. Suggested readings: Cini M., "Un paradiso perduto", Feltrinelli (1994) (a conceptual history of physics, from Galileo to complexity) Laudisa F., "Albert Einstein - Un atlante filosofico", Bompiani (2009) (an interesting reconstruction of Einstein's epistemology) Kumar M., "Quantum - Einstein, Bohr, and the Great Debate about the Nature of Reality", Icon Books (2008) (a historical introduction to quantum mechanics) Gribbin J., "Science - A History - 1543-2001", Allen Lane (2002) (the story of the people who made science, their discoveries and the turbulent times they lived in)
Assessment methods	Oral exam.
Further information	
Sustainable development goals - Agenda 2030	$lbl_legenda_sviluppo_sostenibile