UNIVERSITÀ DI PAVIA

Anno Accademico 2018/2019

PARTICLE ACCELERATORS AND NUCLEAR REACTORS

Enrollment year	2018/2019
Academic year	2018/2019
Regulations	DM270
Academic discipline	FIS/04 (NUCLEAR AND SUBNUCLEAR PHYSICS)
Department	DEPARTMENT OF PHYSICS
Course	
Curriculum	Fisica biosanitaria
Year of study	1°
Period	1st semester (01/10/2018 - 18/01/2019)
ECTS	6
Lesson hours	48 lesson hours
Language	Italian
Activity type	ORAL TEST
Teacher	ALTIERI SAVERIO (titolare) - 2 ECTS BRAGHIERI ALESSANDRO - 4 ECTS
Prerequisites	Knowledge of Nuclear and Particle Physics, Quantum Physics, Electromagnetism.
Learning outcomes	ACCELERATORS: Braghieri The course is intended to provide extensive knowledge of Particle accelerators used in Experimental Physics and for medical applications. The course should provide students with the following skills: - explain and describe the Physical operating principle of the different machines; - develop the mathematical design calculations; - define the scope and the limitations on their use. NUCLEAR REACTORS Altieri To learn basic knowledge of nuclear reactors working principles and

	problems related to electric nuclear energy production; the student should reach a scientific awareness of the nuclear energy safety
Course contents	ACCELERATORS: Braghieri Electrostatic accelerators, Linac, circular accelerators, colliders. Beam production: stability, focusing and cooling. Presentation of modern laboratories and their accelerators. NUCLEAR REACTORS Altieri Neutron transport theory and diffusion equation; solution of diffusion equation in simple geometries; introduction to multigroup methods. Criticality equation solution using one group diffusion equation for bare thermal reactors. Reactor kinetics; the Triga reactor. Problems related to electric nuclear energy production, safety and radioactive waste.
Teaching methods	ACCELERATORS: Braghieri Lectures. The course is a timeline of major particle accelerators, starting with first machines developed in the early 1900s. For each step the experimental requirements which led to the design and development of a new machine, the physical principles on which it is based, the technologies used, the scope and the restrictions on the use, are highlighted and discussed. NUCLEAR REACTORS Altieri Presentation and comments of projected slides; possibility for students to ask questions and discuss specific topics during the lecture
Reccomended or required readings	ACCELERATORS: Braghieri Bibliography: 1) E. Persico et al., Principles of Particle Accelerators, Benjamin Inc. (1968) 2) E. J. N. Wilson, An Introduction to Particle Accelerators, Oxford U. Press (2001) 3) P. Germain, Introduction aux Accélérateurs de Particules, CERN 89?07 NUCLEAR REACTORS Altieri J. R. Lamarsh, Anthony J. Baratta Introduction to Nuclear Engineering Prentice-Hall International (UK) Limited, London J. R. Lamarsh Introduction to nuclear reactor theory.Addison-Wesley Publishing Company
Assessment methods	Oral examination. We recommend to mainly focus on the Physics (qualitative assessments, graphs, physical methods …) rather than on detailed calculations.
Further information	Additional texts (available in photocopy and electronic form) will be used.

Sustainable development goals - Agenda 2030	$lbl_legenda_sviluppo_sostenibile