

MASTER MODULE	SUBJECT	COURSE	SEMESTER	ECTS	CHARACTER
Radiation physics and technology	Radiation-matter interaction	1º	1º	6	Optional
LECTURERS			CONTACT		
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			TUTORING SCHEDULE		
			Prof. Lallena Rojo - L,Mi: 9 - 11; M: 17 - 19 Prof. Porras Sánchez - L,Mi: 18 - 20; V: 11 - 13 (Profs. Salvat Gavaldá y García Pareja will maintain personal tutoring during the teaching period of the part of the course they will impart and will attend students by e-mail)		
MASTER DEGREE					
University Master in Physics: Radiations, Nanotechnology, Particles and Astrophysics, University of Granada					
REQUISITES AND/OR RECOMMENDATIONS					
Basic knowledge of atomic and nuclear physics and radioactivity					
BRIEF DESCRIPTION OF CONTENTS					
Interaction of photons and particles with mass (charged and neutral) with matter. Monte Carlo simulation of the radiation-matter interaction.					
CONTENTS OF THE COURSE					



1. Interaction of heavy charged particles with matter.

Mechanisms of energy loss. Maximum energy transfer in a single collision. Spectra of energy lost in single collisions. Stopping power. Mean excitation energies. Range.

2. Interaction of electrons and positrons with matter.

Mechanisms of energy loss. Collisional and radiative stopping powers. Radiation yield. Range.

3. Phenomena related to charged particle interaction with matter.

Delta rays. Restricted stopping power. Linear energy transfer. Specific ionization. Energy and range straggling.

4. Interaction of photons with matter.

Interaction mechanisms. Photoelectric effect. Compton effect. Pair production. Photonuclear reactions. Attenuation, energy-transfer and energy-absorption coefficients.

5. Neutrons.

Neutron sources. Neutron-matter interaction. Elastic scattering. Spectra of energy lost in neutron-proton interaction. Reactions with neutrons. Neutron activation. Fission.

6. Monte Carlo simulation of the radiation transport in material media.

Basic concepts of Monte Carlo simulation. Simulation of the radiation transport. Statistical averages and uncertainties. Variance reduction techniques. Codes for Monte Carlo simulation of the radiation transport in material media. The PENELOPE code. Applications.

REFERENCES

J.E. Turner. Atoms, radiation, and radiation protection. Wiley-VCH, 2007.

H. Nikjoo, S. Uehara, D. Emfietzoglou. Interaction of radiation with matter. CRC Press, 2012.

C. Leroy, P.-G. Rancoita. Principles of radiation interaction in matter and detection. World Scientific, 2009.

F. Salvat, J.M. Fernández-Varea, J. Sempau. PENELOPE, a code system for Monte Carlo simulation of electron and photon transport. NEA, 2014.

W.R. Leo. Techniques for nuclear and particle physics experiments: A how-to approach. Springer-Verlag, 1994.

G.F. Knoll. Radiation detection and measurement. John Wiley & Sons, 2010.

K.S. Krane. Introductory nuclear physics. Wiley, 1987. Técnicos en Radiología (AETR). Ronda, 2007.

USEFUL LINKS

<http://www.iaea.org/>
<http://www.icru.org/>
<http://www.icrp.org/>
<http://www.oecd-neo.org/>

