Course unit title:	Biophysics and Radiology		
Course unit code:	NUR103		
Type of course unit:	Compulsory		
Level of course unit:	Bachelor (1st Cycle)		
Year of study:	1		
Semester when the unit is delivered:	1 (Fall)		
Number of ECTS credits allocated :	5		
Name of lecturer(s):	Dr. Yiannis Parpottas		
Learning outcomes of the course unit:	1. Describe the optics phenomena of refraction and total reflection, explain the mechanism of vision, the refractive anomalies of vision and their corrective lenses, and demonstrate knowledge of the physical principles of three optical instruments in the medical sector. 2. Describe the human motion and balance, recognize and explain the forces (e.g. friction at the human joints) and torques (e.g. levers of the body and of medical instruments) exerted to or from the body. 3. Define the concepts of heat and temperature, explain the heat balance - heat transfer - body temperature, the phenomena of expansion and contraction in terms of atoms thermal motion, the physical principle of the medical thermometer, recognize the temperature scales, demonstrate knowledge of thermal radiation applications in medicine (e.g. thermography). 4. Describe the wave motion, the wave phenomena (reflection, refraction, and diffraction), the characteristics of sound waves, the hearing mechanism, the mechanism of ultrasound (production-propagation-detection), recognize the Doppler effect, explain the sound biological effects and the interaction mechanism of ultrasound with tissues, demonstrate knowledge of ultrasound applications in medicine. 5. Identify the basic concepts in electricity and magnetism used in medicine and biomedical technology, explain the biological effects of electricity on the human body, and demonstrate knowledge of electromagnetic applications in medicine, their electric hazards and the safety rules necessary to apply in hospitals. 6. Describe the atomic phenomena of excitation, de-excitation and ionization, demonstrate knowledge of the physical principles, characteristics and applications of LASER and X-ray in medicine, recognize their biological effects and describe precautions and safety rules necessary to apply in hospitals. 7. Describe the three types of radiation emitted from the nucleus, explain the concept of a radioactive nucleus half-life, recognize and describe the biological effects of ionizing radiation, demonstrate knowledge of organs allowed doses, the safety rules necessary to apply in hospitals for the ionizing radiation, and recognize the use of external and internal (radiopharmaceuticals) radiation in nuclear medicine for diagnosis and therapy. 8. Search, prepare, and present in small groups, the physical functioning principle of a medical instrument/machine and the necessary precautions.		
Mode of delivery:	Face-to-face		
Prerequisites:		Co-requisites:	None
Recommended optional program components:	None		
Course contents:	• **Optics:** optics phenomena, mechanism of vision, refractive anomalies of vision and corrective lenses, optical instruments in the medical sector.		

	• **Mechanics:** motion and balance of the human body, forces and torques exerted to or from the human body. • **Heat:** heat and temperature, heat balance, heat transfer, body temperature, thermometers, temperature scales, expansion and contraction in terms of atoms thermal motion, thermography. • **Waves:** wave motion, wave phenomena (reflection, refraction, diffraction), sound waves, hearing mechanism, biological effects of sound, Doppler effect, ultrasound mechanism, ultrasound interactions with tissues and applications in medicine. • **Electromagnetism:** applications of electricity and magnetism in medicine and biomedical technology, biological effects - hazards and precautions in hospitals, bioelectricity • **Atomic physics:** atom structure, atomic physics phenomena (excitation, de-excitation, ionization), LASER and X rays (mechanism, characteristics, biological effects, precautions in hospitals). • **Nuclear Physics:** nucleus structure, type of radiation, half-life, ionizing radiation (biological effects, dosimetry, detectors, radiation protection), nuclear medicine (external radiation and radiopharmaceuticals). • **Case study:** search, prepare, and present (interview, computer presen-tation, instrument display) in small groups, the physical functioning principle of a medical instrument/machine and the necessary precautions.
Recommended and/or required reading:	
Textbooks:	Jay Newman, Φυσική για τις επιστήμες της ζωής, Μετάφραση και επιμέλεια Ελληνικής Έκδοσης από Κ. Μπεθάνη κ.α., Εκδόσεις Δίαυλος, Αθήνα, 2013
References:	1. Α. Σαχίνη-Καρδάση, Φυσική Επιστημών Υγείας, ΒΗΤΑ Ιατρικές Εκδόσεις ΕΠΕ, Β' Έκδοση, Αθήνα, 1995 2. I.P. Herman, Φυσική ιατρική του ανθρωπίνου σώματος, Μετάφραση και επιμέλεια Ελληνικής Έκδοσης Β. Γεωργίου, Ιατρικές Εκδόσεις Π.Χ. Πασχαλίδη, Αθήνα, 2009 3. J. R. Cameron et al., Φυσική του ανθρώπινου σώματος, Επιμέλεια Ελληνικής Έκδοσης Ε. Γεωργίου κ.α., Επιστημονικές Εκδόσεις Παρισιάνου Α.Ε., Αθήνα, 2002 4. P.G. Hewitt, Οι Έννοιες της Φυσικής, Μετάφραση Ελληνικής Έκδοσης από Ε. Σηφάκη κ.α., Πανεπιστημιακές Εκδόσεις Κρήτης, Ηράκλειο, 2004 5. Κ. Ψαράκος κ.α., Ιατρική Φυσική, Τόμοι Α και Β, University Studio Press, Θεσσαλονίκη, 2005 6. Θ. Πλουμής, Τεχνολογία Οργάνων και Ιατρικών Εργαστηρίων: Βασικές Αρχές, University Studio Press, Θεσσαλονίκη, 2002
Planned learning activities and teaching methods:	Lectures are delivered to the students by means of computer presentations including images, simulations, and videos. Lecture notes and presentations are available through the web for students to use in combination with the textbooks. Lectures begin with real-life observations challenging the students for explanations to guide them to physics concepts and then proceed to medical and biomedical applications, emphasizing the necessity of undertaking precautions and apply safety rules for staff and patients.
Assessment methods and criteria:	• Participation: 10% • Assignment: 15% • Test: 25% • Final Exam: 50%
Language of	Greek

instruction:	
Work placement(s):	No