

COURSE OUTLINE “RADIOBIOLOGY”

1. GENERAL

SCHOOL	HEALTH SCIENCES		
DEPARTMENT	MOLECULAR BIOLOGY AND GENETICS		
STUDY LEVEL	ISCED LEVEL 6		
COURSE CODE	MBG503	SEMESTER	5 th
COURSE TITLE	RADIOBIOLOGY		
TEACHING ACTIVITIES		HOURS/WEEK	ECTS CREDITS
<i>If the ECTS Credits are distributed in distinct parts of the course e.g lectures, labs, etc. If the ECTS Credits are awarded to the whole course, then please indicate the teaching hours per week and the corresponding ECTS Credits.</i>			
		2	3
COURSE TYPE	SCIENTIFIC AREA		
<i>Background, General Knowledge, Scientific Area, Skill Development</i>			
PREREQUISITES:	NO		
TEACHING & EXAMINATION LANGUAGE:	GREEK		
COURSE OFFERED TO ERASMUS STUDENTS:	NO		
COURSE URL:	https://eclass.duth.gr/courses/HEALTH133/		

2. LEARNING OUTCOMES

<p>Learning outcomes</p> <p><i>Please describe the learning outcomes of the course: Knowledge, skills and abilities acquired after the successful completion of the course.</i></p>		
<p>The objectives of the course are:</p> <p>a) To make known to the students the biological effects of different types of radiation and the matter, at the level of nucleus, molecules, cells, tissues and organisms, as well as the radiation protection rulesb) The definition of safe doses for labeling various biomolecules with radioactive elements for the diagnosis and treatment of various diseases.</p> <p>c) The assimilation of new technologies for the imaging and treatment of patients, through the use of radiolabeled biomolecules.</p> <p>d) To create a trigger for more research and study in the applications of Radiobiology in Molecular Biology and Genetics.</p>		
<p>General Skills</p> <p><i>Name the desirable general skills upon successful completion of the module</i></p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;"> <i>Search, analysis and synthesis of data and information, ICT Use, Adaptation to new situations Decision making, Autonomous work, Teamwork, Working in an international environment, Working in an interdisciplinary environment,</i> </td> <td style="width: 50%; vertical-align: top;"> <i>Production of new research ideas, Project design and management, Equity and Inclusion, Respect for the natural environment, Development of social, professional and moral responsibility and sensitivity to gender issues Promoting free, creative and inductive thinking</i> </td> </tr> </table>	<i>Search, analysis and synthesis of data and information, ICT Use, Adaptation to new situations Decision making, Autonomous work, Teamwork, Working in an international environment, Working in an interdisciplinary environment,</i>	<i>Production of new research ideas, Project design and management, Equity and Inclusion, Respect for the natural environment, Development of social, professional and moral responsibility and sensitivity to gender issues Promoting free, creative and inductive thinking</i>
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<p>Autonomous work Production of new research ideas Project design and management Demonstration of social, professional and moral responsibility and sensitivity to gender issues Critical thinking Promoting free, creative and inductive reasoning</p>		

3. COURSE CONTENT

A. INTRODUCTION

1. Atom
 - 1.1. Nucleus
 - 1.2. Atomic mass
 - 1.3. Distribution of orbital electrons
2. Atom ionization–Isotopes
3. Electromagnetic Radiation
4. Radiation
 - 4.1. Natural Radiation
 - 4.1.1. Radon and derivatives: biological effects on public health
 - 4.2. Artificial Radiation
 - 4.2.1. Radioactive decay
 - 4.2.2. Modes of radioactive dimensions
 - 4.2.3. Units of measurement of radioactive dimensions
 - 4.2.4. Nuclear Reactions
5. Radiation-Matter Interaction
 - 5.1. Photoelectric effect
 - 5.2. Compton effect
 - 5.3. Twin birth
 - 5.4. Interaction with charged particles
6. X Radiation
 - 6.1. Braking phenomenon
 - 6.2. Characteristic X-radiation
 - 6.3. X-ray energy spectrum
7. Dosimetry
 - 7.1. Ionizing chambers
 - 7.2. Other ways to measure Absorbed Dose
8. Dose Distribution in Medical Applications
 - 8.1. Radiology
 - 8.2. Nuclear Medicine– Radiopharmaceuticals–Biological Effects
 - 8.3. Radiotherapy
9. Organology

B. ELEMENTS OF RADIOBIOLOGY

1. Radiation absorption by mass
 - 1.1. α particles
 - 1.2. β particles
 - 1.3. Photons (γ radiation)
 - 1.4. Neutrons
2. Chemical changes upon ionizing radiation absorption – Free Radicals
3. Effects of radiation at the molecular level. Biological defects.
 - 3.1. Proteins
 - 3.2. Enzymes
 - 3.3. Nucleic Acids
 - 3.4. Lipids
 - 3.5. Carbohydrates
4. Effects of radiation at the cellular level. Biological defects.
 - 4.1. Cell Membrane
 - 4.2. Cytoplasm
 - 4.3. Lysosomes
 - 4.4. Mitochondria

C. CLINICAL APPLICATIONS

5. Effects of radiation at the cellular proliferation level.
 - Mutations
6. Effects of radiation at tissue level and the human organs
 - 6.1. Clinical Syndromes
 - 6.1.1. Hemopoietic Syndrome

6.1.2. Gastrointestinal Syndrome 6.1.3. CNS Syndrome 6.1.4. Survival curves of red blood cells 6.2. Effects on organs 6.2.1. Reproductive system 6.2.2. Lymphatic system 6.2.3. Skin 6.2.4. Eyes 6.2.5. Lungs 6.2.6. Heart 6.2.7. Liver 6.2.8. Kidneys 6.2.9. Embryo 7. Early and Late-Onset effects of radiation 8. Radiolabeling - Chromatography 8.1. Peptide labeling 8.2. Monoclonal Antibody labeling 8.3. Radiopharmaceuticals – Absorbed doses – biological effects 8.4. Clinical applications 9. Effects of radiation on malignant tumors. Radiotherapy – Clinical applications 10. Molecular Nuclear Medicine – PET – Clinical applications 11. Radiation protection (radioprotection) – Radiation legislation

4. TEACHING & LEARNING METHODS - EVALUATION

TEACHING METHOD <i>Face-to-face, Distance learning, etc..</i>	Face to face										
USE OF INFORMATION & COMMUNICATIONS TECHNOLOGY (ICT) <i>Use of ICT in Teaching, in Laboratory Education, in Communication with students</i>	Use of ICT in Teaching Use of ICT in Communication with students										
TEACHING ORGANIZATION <i>The ways and methods of teaching are described in detail. Lectures, Seminars, Laboratory Exercise, Field Exercise, Bibliographic research & analysis, Tutoring, Internship (Placement), Clinical Exercise, Art Workshop, Interactive Learning, Study / creation, project, etc.</i> <i>The supervised and unsupervised workload per activity is indicated here, so that total workload per semester complies to ECTS standards.</i>	<table border="1"> <thead> <tr> <th style="background-color: #d9ead3;">Activity</th> <th style="background-color: #d9ead3;">Workload/semester</th> </tr> </thead> <tbody> <tr> <td>Lectures</td> <td>30</td> </tr> <tr> <td>Laboratory practicals and demonstration of clinical applications</td> <td>20</td> </tr> <tr> <td>Bibliographic research & analysis</td> <td>40</td> </tr> <tr> <td>Course Total</td> <td>90</td> </tr> </tbody> </table>	Activity	Workload/semester	Lectures	30	Laboratory practicals and demonstration of clinical applications	20	Bibliographic research & analysis	40	Course Total	90
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STUDENT EVALUATION <i>Description of the evaluation process</i> <i>Assessment Language, Assessment Methods, Formative or Concluding, Multiple Choice Test, Short Answer Questions, Essay Development Questions, Problem Solving, Written Assignment, Essay / Report, Oral Exam, Presentation in audience, Laboratory Report, Clinical examination of a patient, Artistic interpretation, Other/Others</i> <i>Please indicate all relevant information about the course assessment and how students are informed</i>	Student evaluation language Greek Method (Formative or Concluding) Summative (concluding) Student evaluation method Written exam (100%)										

5. SUGGESTED BIBLIOGRAPHY

Συγγράμματα

Τίτλος: Ιατρική Φυσική, **Συγγραφείς:** Ψαρράκος Κ., Μολυβδά-Αθανασοπούλου Ε., Γκοτζαμάνη-Ψαρράκου Α., Σιούντας Α., **Εκδοτικός Οίκος:** University Studio Press
Τόπος & Χρόνος Έκδοσης: Θεσσαλονίκη 2010, **ISBN:** 978-960-12-1420-7
Κωδικός ΕΥΔΟΞΟΣ: 17332

Τίτλος: Κλινικές Εφαρμογές Πυρηνικής Ιατρικής, **Συγγραφείς:** Ζησιμόπουλος Αθανάσιος
Εκδοτικός Οίκος: BROKEN HILL PUBLISHERS LTD
Τόπος & Χρόνος Έκδοσης: Αθήνα 2004, **ISBN:** 978-960-39-9244-8
Κωδικός ΕΥΔΟΞΟΣ: 13256705

Σημειώσεις

Τίτλος: Σημειώσεις Ραδιοβιολογίας, **Συγγραφείς:** Α. Ζησιμόπουλος
Τόπος & Χρόνος Έκδοσης: Αλεξανδρούπολη 2011