



**Department of: Radiology**

**Institute of: Erbil Medical Technical Institute**

**University of: Erbil Polytechnic University**

**Subject: Radiation Protection Course Book**

**Lecturer's name, Dr. Sarwar Ibrahim Saleh**

**Academic Year: 2022-2023**

# Course Book

<b>1. Course name</b>	<b>Protection from radiation (radiation protection)</b>
<b>2. Lecturer in charge</b>	<b>Sarwar Ibrahim Saleh</b>
<b>3. Department/ College</b>	<b>Radiology</b>
<b>4. Contact</b>	<b>Sarwar.ibrahim@epu.edu.iq</b>
<b>5. Time (in hours) per week</b>	<b>Theoretical: 2 hours per week Practical :6 hours per week</b>
<b>6. Office hours</b>	<b>4</b>
<b>7. Course code</b>	<b>RAP 304</b>
<b>8. Teacher's academic profile</b>	I got a Bachelor degree in physics; I graduated in 1995-1996 of the physic department of faculty of Education at Salahadden university then I take MSc degree in KOYA University college of science in 2008. I got a PhD degree in medical physics in 2018-2019 at the Sutcu Imam University in Turkey.
<b>9. Keywords</b>	Radiation protection, ionizing radiation, interacted ionizing radiation with matter, biological effects, shielding,
<b>10. Course overview:</b>	This course Providing the philosophical and scientific background for radiation protection in medicine. Discussing units and tools used in radiation protection. Introducing concepts of radiation protection in the workplace and necessary shielding for work place. Also understanding of the biological effects of radiation.
<b>11. Course objective:</b>	The purpose of this course to understand the students of the effect of ionizing radiation on human health, and how to protect themselves of these effects, also understand the radiation units. Show theoretically and practically how we can decrease the risk of ionizing radiation. Teaching the students how to protect themselves from radiation in the workplace and protect patients. The students will get to know with those tools which are used for radiation protection.
<b>12. Student's obligation</b>	At the end of this course the students will understand; the concept of radiation protection, the risk of exposed radiation doses, and how to protect themselves from hazard radiation. They obligation through theory and practical lecture, report, quiz, and exam.
<b>13. Forms of teaching</b>	Data show, work sheet, white board, and experiment in laboratory.
<b>14. Assessment scheme</b>	1 <sup>st</sup> and 2 <sup>nd</sup> Semester 60% (theoretical and Practical with quizzes& reports) Final 40% (theoretical and Practical)
<b>Total: 100%</b>	

## **15. Course Reading List and References:**

**1. Radiation protection, ionizing radiation, biological effects of ionizing radiation, shielding,**

**2. Useful references:**

- **Radiation Protection A guide for scientists, Regulators, and physicians  
Jacob Shapiro**
- **Atoms, Radiation, and Radiation Protection  
James E. Turner**
- **An Introduction to Radiation Protection in Medicine  
Jamie V. Trapp & Tomas Kron**
- **Radiation Proteomics The effects of ionizing and non-ionizing radiation  
on cells and tissues**
- **Radiation Safety Officer Nevada Technical Associates  
P. Andrew Karam, Ph.D.**
- **Structural Shielding Design and Evaluation for Megavoltage X- and Gamma-  
Ray Radiotherapy Facilities (N.C.R.P) 2005**
- **The relative biological effectiveness of radiation of different quality  
(N.C.R.P)**

## **16. Methods of Instruction**

In the lectures, first of all, explain the subject then discusses the main scopes in the lectures with students and indication to practical if there is exist any connection between theoretical and practical.

**17. Theoretical and practical Course outline:****Theoretical outline**

n.	Outline	Weeks
1	<b>A brief history of radiation protection Atom structure and radiation</b> <b>Type of radiation (ionizing, non-ionizing radiation)</b> <b>Ionizing radiation (x-ray, gamma ray, alpha particle, beta particle, and neutron) half life</b> <b>Radiation units (Rad, Roentgen, Rem, Becquerel)</b>	1 <sup>st</sup>
2	<b>The radiation weighting and quality factor</b> <b>Tissue weighting factors and the Effective dose</b> <b>Basic principle for protection</b> <b>1- Time</b> <b>2- distance</b> <b>3- shielding</b>	2 <sup>nd</sup>
3	<b>Equipment's used for radiation protection in medicine</b> <b>Physical → Chemical → Biological Effects of ionizing radiation</b>	3 <sup>rd</sup>
4	<b>The biological Effects of ionizing radiation</b> <b>1-Direct effect</b> <b>2-Indirect effect</b> <b>External exposure</b> <b>Internal exposure</b>	4 <sup>th</sup>
5	<b>Radiation detectors and dosimeters</b> <b>Personal radiation dosimeter</b>	5 <sup>th</sup>
6	<b>Gamma Radiation Shielding</b> <b>Radiation shielding</b>	6 <sup>th</sup>
7	<b>Nucleus Radiation Detectors</b> <b>Ionizing radiation and public health</b>	7 <sup>th</sup>
8	<b>Radiation Protection in Diagnostic and Interventional Radiology</b>	8 <sup>th</sup>
9	<b>Radiation protection in nuclear medicine</b> <b>Time exposure</b>	9 <sup>th</sup>

	<b>Cancer effect</b>	
<b>10</b>	<b>Bone cancer Lung cancer Other type of cancer</b>	<b>10<sup>th</sup></b>
<b>11</b>	<b>Time Averaged Dose-Equivalent Rates</b>	<b>11<sup>th</sup></b>
<b>12</b>	<b>Patrol medical examination for workers who working in radiation field</b>	<b>12<sup>th</sup></b>

**Practical outline**

No	Outline	Weeks
<b>1</b>	<b>Studying of gamma ray absorption, using Aluminium</b>	<b>1<sup>st</sup></b>
<b>2</b>	<b>Lamberts law attenuation</b>	<b>2<sup>nd</sup></b>
<b>3</b>	<b>The invers square law of light</b>	<b>3<sup>rd</sup></b>
<b>4</b>	<b>Finding the linear absorption coefficient</b>	<b>4<sup>th</sup></b>
<b>5</b>	<b>Studying of gamma ray absorption use copper</b>	<b>5<sup>th</sup></b>
<b>6</b>	<b>Studying of gamma ray using lead</b>	<b>6<sup>th</sup></b>
<b>7</b>	<b>Studying of beta ray absorption using Aluminium</b>	<b>7<sup>th</sup></b>
<b>8</b>	<b>Studying of beta particle absorption using copper</b>	<b>8<sup>th</sup></b>
<b>9</b>	<b>Studying of beta particle absorption using lead</b>	<b>9<sup>th</sup></b>
<b>10</b>	<b>Relation between voltage current and radiation intensity</b>	<b>10<sup>th</sup></b>
<b>11</b>	<b>Measuring of ionizing current using G.M counter</b>	<b>11<sup>th</sup></b>
<b>12</b>	<b>Measuring of ionizing current proportional counter</b>	<b>12<sup>th</sup></b>

**18. Examinations:**

**1. Compositional:** In this type of exam the questions usually starts with Explain how, definition or compare

**2- True or false:** mark the following True or false

**3. Multiple choices:** choose the right answers

What is the difference between Sievert and Gray

The three factors of protection is ..... and.....

The material which is block the ionizing material is.....

How you can protect yourself from ionizing radiation

How can we handle radioactive material in a laboratory

**20. Extra notes:**

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**21. Peer review:**

دوایی پیداچونهوی کورس بوکی م. نه به زاحمد له بابته تی خو پاراستن له تیشک و له نه نجامدا بوم دمرکه وت بابته و ناویشانی وانه کان به گشتی له روی زانستی و پزشکیه وه گونجاوه له گهل وانه که و زانیاری قوتابیان پرده کاته وه له و بواره که قوتابیان سوودی لی ببینن له پیشه که یاندا

م. چیمن بکر اسماعیل

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