# Department of Physics

# College of Science

# University of Salahaddin

# Subject: Practical Physics (Nuclear Physics Lab)

# Academic Year: 2022/2023

# Subject: Nuclar Lab.

# Course Book – (Year 3 - Medical)

1. Lecturer's name:Dr . Mohammed Issa Hussein
Email: Mohmmed.Issa@su.edu.krd

2. Instructor: assit.Lecturer: Rozhan Dilshad Haider

Email: rozhan.haider@su.edu.krd

## Course Book

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| **1. Course name** | **Nuclar Lab.** |
| **2. Lecturer in charge** | **Rozhan Dilshad Haider** |
| **3. Department/ College** | **Physics-General / Science** |
| **4. Contact** | **e-mail:Rozhan.haider@su.edu.krd**<br>**Tel:07504729809** |
| **5. Time (in hours) per week** | **Laboratory**: Monday 8:30 – 4:30 am, |

<table>
<tr><td>6. Office hours</td><td>4</td></tr>
<tr><td>7. Course code</td><td></td></tr>
<tr><td>8. Teacher's academic profile</td><td>My Academic studies starts with the acceptance in the B.Sc. program in 2012 as an undergraduate student in Physics department and extended as I finished the following education degrees<br><br><u>Education:</u><table><tr><td>B.Sc, 2007</td><td>Physics- College of Science</td></tr><tr><td>M.Sc.2009</td><td>Nuclear reaction</td></tr></table>As I awards my first Academic title in 1993 and later on<br><u>Academic titles attained:</u><table><tr><th>Academic title</th><th>Date of attainment</th></tr><tr><td>Assistant Lecturer</td><td>2013</td></tr><tr><td>Lecturer</td><td>-</td></tr></table>I starts my Academic role as a staff member giving lectures in my specialization through theoretical and practical modules to the students in different undergraduate stages<br><br><u>Main Teaching Areas:</u><ul><li>Nuclear lab</li><li>General physics</li><li>Mechanics and Properties of matter</li><li>Academic skill</li><li>Environmental Radiation</li><li>General physics lab.</li><li>Atomic lab.</li></ul></td></tr>
<tr><td>9. Keywords</td><td>This course aims at providing an introduction to some basic concepts in nuclear Physics. These include nuclear properties; Energy calibration of the scintillation on spectromete; nuclear models; detector; nuclear reaction ...</td></tr>
<tr><td colspan="2">.</td></tr>
<tr><td colspan="2">11. Course objective:<br><br>To introduce the principle of nuclear instrumentation and electronics that helps the student to understand the theoretical ideas given within the theoretical lectures. Throughout the experiments several fundamental applications of nuclear science becomes familiar to the students, the</td></tr>
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applications extends from the detection of nuclear radiations, types of nuclear detectors, nuclear electronics, gamma ray spectrometry, toward industrial applications of nuclear science. Within the first week of Lab. study the student will become aware about the safe usage and treatment with the available radioactive sources and know how to use shielding and precautions during doing the experiments inside the lab.

**12. Student's obligation**

The class attendance on time is the first obligation of the student. The lab. as a whole accommodates seven experiments per a week, since each group consists of at least 14 students, then every two student make one experiment altogether in one week. In this manner the student will complete the experiments cyclically in the course. For each performed experiment the student should prepare a scientific report given to the staff in the next week. The student will asks to make at least one seminar relevant to the nuclear laboratory experiments in which all the students will participate in the discussions and evaluations.

**13. Forms of teaching**

In Nuclear laboratory, the staff members of within the first week will explain the outlines of the lab. and all experiments as well as the regulation and policies to be followed by the student inside the lab. to perform the experiment safely. The lab. as a whole accommodates seven experiments per a week, since each group consists of at least 14 students, then every two student make one experiment altogether in one week. In this manner the student will complete the experiments cyclically in the course. For each performed experiment the student should prepare a scientific report given to the staff in the next week. The student will asks to make at least one seminar relevant to the nuclear laboratory experiments in which all the students will participate in the discussions and evaluations.

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**14. Assessment scheme**

**Grade**

1- 10 % (reports and quizzes)

2- 10 % examination

3- Final examination 30 %

**15. Student learning outcome:**

Nuclear physics or what well know condensed matter plays a very important role in the Physics field, during the years I teaching nuclear physics, I have notices that students generally find it easier to learn its underlying ideas than to handle the practical aspects of the formalism. On completion successful students will be able to:

1. Identify the properties of the nuclear radiation and how can deal with it .
2. measure nuclear radiation by different type of detectors.

The direct application of nuclear physics have a major overlap with the priorities of the nation: improvement in human health, the environment, the efficiency of industrial process, energy production , the exploration of space, and national security. Beyond these direct application is the general benefit that rises from pressing forward the frontiers of high technology development.

Some of the most pervasive application of nuclear radiation in medicine .medical imaging techniques now widely used, such as positron emission tomography(PET) and nuclear magnetic resonance imaging (MRI ), provide information in three dimensions about the structure and biochemical activity of the human interior . Radioactivity isotopes produced by accelerators and reactors are routinely used in medical diagnostic procedures , in treatment, and medical research. Cancer radiation therapy mainly uses electron accelerators and radioactive sources.

پرکردنەوەی ئەم خانەیە زۆر گرنگە، مامۆستا دەرئەنجامەکانی فێربوون دەنووسێت. بۆ نموونە: ڕوونی ئامانجە سەرەکیەکانی کۆرسەکە (بابەتەکە) بۆ خوێندکار
گونجاندنی ناوەرۆکی کۆرسەکە بە پێویستی دەرەوە و بازاڕی کار
قوتابی چی نوێ فێردەبێت لە ڕێگەی پێدانی ئەم کۆرسەوە؟

**16. Readings:**

1. **K. Mahesh and S.M. Mustafa, "Nuclear Radiation, Detectors and Experiments", Mosul-Iraq (1976).**
2. **E.B. Podgorsak (Technical editor), Radiation Oncology Physics,**

**IAEA, Austria, (2005).**

3. **1. G. F. Knoll, Radiation Detection and Measurement, John Wiley and Sons, New York (1979).**

| **17. The Topics:** | **Lecturer's name** |
|---|---|
| Exp.No.1<br>Activity measurement of gamma –source (relative method) | **Mohammed issa**<br>**Rozhan Dilshad**<br>weeks (1) |
| Exp. No. (2)<br>Verification of inverse square law for gamma-Ray | **Mohammed issa**<br>**Rozhan Dilshad**<br>weeks (2) |
| Exp.No. (3)<br>Absorption coefficient for γ-rays | **Mohammed issa**<br>**Rozhan Dilshad**<br>weeks (3) |
| Exp.No. (4)<br>Determination of operating voltage for scintillation detector | **Mohammed issa**<br>**Rozhan Dilshad**<br>weeks (4) |
| Exp .No. (5)<br>Foundation of material height in a closed container. | **Mohammed issa**<br>**Rozhan Dilshad**<br>weeks (5) |

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| Exp.No.6<br><br>Counting statistics | **Mohammed issa**<br>**Rozhan Dilshad**<br><br>weeks (6) |
| Exp.No. (7)<br><br>Determination of dead time (resolving time) of G.M counters by two –source method. | **Mohammed issa**<br>**Rozhan Dilshad**<br><br>weeks (7) |
| Exp.No. (8)<br><br>Deflection of Beta-ray in Magnetic Fields | **Mohammed issa**<br>**Rozhan Dilshad**<br><br>week (8) |
| **18. Practical Topics (If there is any)** | |
| In this section The lecturer shall write titles of all practical topics he/she is going to give during the term. This also includes a brief description of the objectives of each topic, date and time of the lecture | |
| **19. Examinations** | |
| **20. Extra notes:**<br>Here the lecturer shall write any note or comment that is not covered in this template and he/she wishes to enrich the course book with his/her valuable remarks. | |
| **21. Peer review** **پێداچوونەوەی هاوەڵ**<br>This course book has to be reviewed and signed by a peer. The peer approves the contents of your course book by writing few sentences in this section.<br>*(A peer is person who has enough knowledge about the subject you are teaching, he/she has to be a professor, assistant professor, a lecturer or an expert in the field of your subject).*<br>ئەم کۆرسبووکە دەبێت لەلایەن هاوەڵێکی ئەکادیمیەوە سەیر بکرێت و ناوەرۆکی بابەتەکانی کۆرسەکە پەسەند بکات و جەند ووشەیەک بنووسێت لەسەر شیاوی ناوەرۆکی کۆرسەکە و واژووی لەسەر بکات.<br>هاوەڵ ئەو کەسەیە کە زانیاری هەبێت لەسەر کۆرسەکە و دەبیت پلەی زانستی لە مامۆستا کەمتر نەبێت. | |