

Ministry of Higher Education and Scientific research



**Department of Physics**

**College of Education**

**University of Salahaddin**

**Subject: Instrumentation Physics**

**Course Book: (4<sup>th</sup> Year Student – 2<sup>nd</sup> course)**

**Lecturer's name: Dr. Kasim Fawzy Ahmed**

**Academic Year: 2023-2024**

**Course Book**

<b>1. Course name</b>	<b>Instrumentation Physics</b>
<b>2. Lecturer in charge</b>	<b>Dr. Kasim Fawzy Ahmed</b>
<b>3. Department/ College</b>	<b>Physics/ Education</b>
<b>4. Contact</b>	<b>e-mail: <a href="mailto:kasim.ahmed@su.edu.krd">kasim.ahmed@su.edu.krd</a></b>
<b>5. Time (in hours) per week</b>	<b>Theory: 2 Hours</b>
<b>6. Office hours</b>	Thursday 08.30 AM - 12.30 PM or By appointment  <b>Class Time:</b> <b>Thursday: From 10:30am To 12:30pm</b> <b>Thursday: From 12:30am To 2:30pm</b>
<b>7. Course code</b>	<b>EdPh2406</b>
<b>8. Teacher's academic profile</b>	<p>Dr. Kasim is from Kurdistan Region-Iraq. M.Sc. in High power Microwave tubes. Researcher &amp; Lecturer at Salahaddin University, 44002 Erbil, Kurdistan Region-Iraq since 2002. His PhD, has been received at the Salahaddin University in Material Science. Current research interests are solid-laser glasses, Photons, Raman spectroscopy and energy levels in rare earth materials. His research activities mainly involve in the fabrication and characterization of solid laser glass active mediums.</p> <p>He had 24 research (National and International publications) items with more than 130 citations (h-index:5, i10-index:2) and Research Interest Score of (208.5)</p> <p>According to ResearchGate website, he has a 10 RG score with more than 42,000 reads.</p> <p>Dr.Kasim was a registrar at College of Education for about three years (2002-2005) and he was the programmer at its examination committee. At 2012 he was the planer of the College for two years.</p> <p>He joined the split-site program between Salahaddin University and University of Technology, Malaysia during his PhD study.</p> <p>He is a very active member in a lot committees at his college and University level specially in preparing a conference planning.</p> <p>He is a Muslim, Kurdish and a beloved person.</p> <p>my ORCID is (0000-0003-4308-6185)</p>
<b>9. Keywords</b>	<b>Physics, Instruments, Laboratory.</b>

**10. Course overview:**

This course will through one semester. The students will study many physical aspects of instrumental physics during that. In this course, students will also learn about how to fix or change the specification of some apparatuses scientifically for the laboratory specific purposes.

**11. Course objective:**

The aim of the study of instrumental physics is to make the student familiar with the fundamentals of devices in physics. Basically, instrumentation engineering means automation of machine in which include the measurement and control the processing variable etc. Physical quantities Soo in instrumentation physics is most imp. Part because all physical quantity is measured and proceed in automation. For example...In water motor there is electric motor which exert the pressure on water and throw far away in this... we can control the flow rate which depend on the rpm (revolution per minute) of the electric motor ...this is the use of physics in instrumentation

**12. Student's obligation**

Students should attend all the lectures and they may take notes during the lectures. In addition, in class participation would be an advantage for them to extend their knowledge and understand the module systematically. Attending the lectures regularly would be a crucial point for the students to consider. If the students missed a few lectures, they would have difficulty getting back on track. Furthermore, all exams and tests are done with books closed, and, students have to take at least two compulsory exams with few class tests and quizzes during the semester of study.

**13. Forms of teaching**

During this course, I am using some ways to make the students engage with the lecture like PowerPoint slides explanation view, the whiteboard in the class, and videos and animations to explain the theory of the subject with the explanation in the class. If there were slides that needed more explanation, or, if the slide needed a long, explanation and I thought that the students must know all of that, I would distribute the printed-out version of the description to the students to widen their knowledge of the subject.

**14. Assessment scheme**

In this system the maximum mark is (50%). The grading system is based on the summation of two categories of evaluations:

**First**, (15%) of the mark is based on the academic year effort of the student which includes:

- A- 10% for two monthly examinations,  $(5\% \times 2) = 10\%$ , for the semester.
- B- 5 % of marks for the homework's, quizzes and class room activity.

**Second**, (50%) of the mark is based on final examination that is comprehensive for the whole of the study material reviewed during the semester.

Note: 35% is based on the practical part in the laboratory.

#### **15. Student learning outcome:**

After successful completion of the courses, the students learn:

1. The comprehensive understanding of the fundamental concepts of physical instruments.
2. Complete knowledge of the fundamental laws behind these instruments.

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

The main textbooks are:

- 1- *Physics for Scientists and Engineers*, Volume 1 & 2, Raymond A. Serway, John W. Jewett, 2013.
- 2- *Essentials of Nuclear Medicine Physics and Instrumentation* By Rachel A. Powsner, Matthew R. Palmer, Edward R. 2013.
- 3- *Ultrasound Physics and Instrumentation*, 5<sup>th</sup> edition, Frank Miele, Jr. Miele Enterprises, 2013.
- 4- *Physical Principles of Astronomical Instrumentation*, Peter A. R. Ade, Matthew J. Griffin, Carole E. Tucker, CRC Press, 2021.
- 5- *Building Scientific Apparatus*, John H. Moore, Christopher C. Davis, Michael A. Coplan, Cambridge University Press, 2009.

<p>6- <i>PET: Physics, Instrumentation, and Scanners</i>, Michael E. Phelps, Springer Science &amp; Business Media, 2006.</p> <p>7- <i>Physics Laboratory Experiments</i>, Jerry D. Wilson, Cecilia A. Hernández-Hall, Cengage Learning, 2014.</p> <p>8- <i>Fundamentals of Physics I and II Lab Manual</i>, Matthew Ware Kendall Hunt Publishing Company, 2019.</p>	
17. The Topics:	Lecturer's name
<p>A tentative lecture schedule is:</p> <ul style="list-style-type: none"> <li>• <b>Week 1: Introduction with syllabus</b></li> <li>• <b>Week 2-3: Chapter 1 Electric and Electronic instruments</b></li> </ul> <p>Galvanometer</p> <p>Ammeter</p> <p>Voltmeter</p> <p>Ohmmeter</p> <p>Rheostat</p> <p>Potentiometer</p> <p>Power supply</p> <ul style="list-style-type: none"> <li>• <b>Week 4: Chapter 2 Laboratory balance and scales</b></li> </ul> <p>Vernier Callipers</p> <p>Micrometer</p> <p>Triple Beam Balance</p> <p>Triple beam scales (<a href="https://tacticalgearhut.com/best-triple-beam-scales/">https://tacticalgearhut.com/best-triple-beam-scales/</a>)</p> <p>Calliper (<a href="https://nuclearwaste101.wordpress.com/2011/12/10/meter-centimeter-millimeter/">https://nuclearwaste101.wordpress.com/2011/12/10/meter-centimeter-millimeter/</a>)</p> <p>Micrometer (<a href="https://www.slideshare.net/klakshminarayanan/micrometer-45577974">https://www.slideshare.net/klakshminarayanan/micrometer-45577974</a>)</p>	<p>Dr. Sardar Pirkhider Yaba</p>

• **Week 5-6: Chapter 3 Weather Apparatus**

Hygrometers

Anemometer

Barometers

Rain gauges

• **Week 7-8: Chapter 4 Optical instruments**

Lenses

Mirrors

Prisma

Spherometer

Telescope

Microscope

• **Week 9-10: Chapter 5 Atomic & Nuclear Apparatus**

X-ray apparatus

Geiger-Müller counter tube

• **Week 11: Examination**

**19. Examinations:**

Different types of questions will be provided to the student as an exercise and also in examinations such as given them in the question banks which contain each of the following ones:

1. Mathematical derivation and explanation questions for different subjects in calculus are provided.
2. Multiple choices questions for every subject that is given in calculus topics are also provided to them.
3. Explaining and Definition
4. Finally, the true and false questions are also given to them for several mathematical subjects.

Each of these mentioned question types will be seen clearly in the question banks that are given to the quality assurance committee of our physics department.

**20. Extra notes:**

There are too many unnecessary holidays that reduce topics given to students. Due to a number of unforeseen reasons that may lead to the shifting of the academic year program, it may be subjected to modifications. Also, extra curriculum hours may be needed to cover all the topics mentioned above.

**21. Peer review**

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