SEMESTER LEARNING ACTIVITY PLANS (SLAP)

SEMESTER EVEN 2022/2023

Physics Undergraduate Study Program

Physics Department

Radiation Protection

MFF 3288/ 2 Credits

Lecturer Coordinator:

Dr. Dwi Satya Palupi
Dr. Mitrayana

UNIVERSITAS GADJAH MADA
FACULTY OF MATHEMATICS AND NATURAL SCIENCE
2022

	Universitas Gadjah Mada Faculty of Mathematics and Natural Science Physics Department / Physics Undergraduate Study Program Semester EVEN 2022/2023	**Document Number :** …………

<table>
<tr><th colspan="7">SEMESTER LEARNING ACTIVITY PLANS (SLAP)</th></tr>
<tr><th>Code</th><th>Course Name</th><th colspan="2">Credits (Credits)</th><th>Semester</th><th>Status</th><th>Prerequisite</th></tr>
<tr><td>MFF 3288</td><td>Radiation Protection</td><td>T: 2</td><td>P: …</td><td>EVEN</td><td>Elective</td><td>Nuclear and Particle Physics I (MFF 2205)</td></tr>
<tr><td>Short Description</td><td colspan="6">The Radiation Protection course is an elective course in the Physics Study Program, Physics Department, FMIPA, UGM. The Radiation Protection course aims to provide the basics of radiation protection for undergraduate students of the Physics Study Program. Ionizing radiation has enormous benefits but also has risks that can be harmful Radiation protection is an effort to guarantee the safety of workers and the public from the dangers that the use of radiation can cause.
The contents of this course cover radiation units used in radiation protection, types of harmful ionizing radiation, as well as the interactions and range of radiation in a material. Radiation protection material also includes the biological effects of radiation at the cellular, tissue, and organ levels. The following material is a radiation hazard which includes the danger of radiation from outside the body and radiation from within the human body, along with radiation protection for both of these hazards. The following material is radiation detection methods and radiation protection in industry and medicine. The last material is emergency radiology. This course aims to equip graduates who are policymakers in the field of nuclear radiation so that policy-making includes the safety of workers and the public. For graduates who work as researchers, radiation protection courses are a provision so that these researchers can avoid research methods that endanger safety. Besides that, this course material can provide insight into researching topics related to radiation protection, such as radiation detection. As for graduates who work as workers in the radiation field, Radiation Protection courses provide them with the provision to think about safety aspects at work.</td></tr>
<tr><td rowspan="2">Program Learning Outcomes (PLO) Imposed on the Course</td><td>PLO 2</td><td colspan="5">Knowledge. Able to explain theoretical concepts and principles of classical and modern physics and able to apply basic concepts of physics and related mathematical methods in finding solutions to physical problems.</td></tr>
<tr><td>PLO 5</td><td colspan="5">Long Life Learning. Able to analyze various alternative solutions to physical problems and conclude them for appropriate decision-making, both in familiar and new problems.</td></tr>
<tr><td rowspan="5">Course Outcomes (CO)</td><td colspan="6">After completing this course, students are expected to be able to:</td></tr>
<tr><td>CO1</td><td colspan="5">Able to name the types of ionizing radiation, explain the radiation's interaction with matter, explain the radiation's penetrating power in a material, and then arrange the order of matter in a material so that radiation does not penetrate the material.</td></tr>
<tr><td>CO2</td><td colspan="5">Able to name units of radiation used in radiation protection and explain the biological effects of radiation at the cellular, tissue, and organ level, the difference between stochastic and deterministic effects, as well as explain radiation sources and the principles of radiation protection.</td></tr>
<tr><td>CO3</td><td colspan="5">Able to explain the principles of radiation detection for various types of radiation and the working principles of radiation detection devices.</td></tr>
<tr><td>CO4</td><td colspan="5">Able to mention the dangers of radiation from outside and inside the body, then explain and arrange radiation protection procedures for radiation hazards from outside and inside the body.</td></tr>
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	CO5	Able to explain the use of radiation in industry and its radiation protection and able to explain the use of radiation in the medical field and its radiation protection.		
The Correlation of CO to Learning Materials and Methods, and Time Allocation		**Learning Materials**	**Learning Methods**	**Time Allocation**
	CO 1	Types of ionizing radiation: radiation from charged particles such as alpha and beta, photon radiation such as gamma and x-rays, and neutron radiation.	TCL-SCL mixed	***2X50 minutes***
	CO 1	The interaction of radiation of photons (gamma and x-rays), charged particles (alpha and beta), and neutrons and the radiation range of photons (gamma and x-rays), charged particles (alpha and beta), and neutrons in a material.	TCL-SCL mixed	***2X50 minutes***
	CO 2	Radiation units are used in radiation protection.	TCL-SCL mixed	***2X50 minutes***
	CO 2	Radiation biological effects, stochastic effects, and deterministic effects	TCL-SCL mixed	***2X50 minutes***
	CO 2	Radiation sources and the principle of radiation protection. (according to ICRP).	TCL-SCL mixed	***2X50 minutes***
	CO 4	Radiation hazards from outside the body, controlling and monitoring radiation for radiation hazards from outside the body.	TCL-SCL mixed	***2X50 minutes***
	CO 4	Radiation hazards from outside the body, controlling and monitoring radiation for radiation hazards from outside the body.	TCL-SCL mixed	***2X50 minutes***
	Midterm exam/Project Task Results/Case Analysis Results			
	CO 4	Radiation hazards from within the body, radiation control, and monitoring for radiation hazards from within the body.	TCL-SCL mixed	***2X50 minutes***
	CO 4	Principles of radiation detection for various types of radiation, and radiation detection devices and their working principles.	TCL-SCL mixed	***2X50 minutes***
	CO 3	Radiation detection principles for various types of radiation, and radiation detection tools and their working principles.	TCL-SCL mixed	***2X50 minutes***
	CO 5	The use of radiation in industry and radiation protection in the industry, as well as the use of radiation in the medical field and its radiation protection.	TCL-SCL mixed	***2X50 minutes***

	CO 5	The use of radiation in industry and radiation protection in the industry, as well as the use of radiation in the medical field and its radiation protection.	TCL-SCL mixed	***2X50 minutes***
	CO 5	The use of radiation in industry and radiation protection in the industrial sector, as well as the use of radiation in the medical field and its radiation protection.	TCL-SCL mixed	***2X50 minutes***
	CO 5	Emergency radiology	TCL-SCL mixed	***2X50 minutes***
	Final exams/ Project Task Results/Case Analysis Results			
Learning Methods	**SCL (Student Centered Learning): Project-based learning (Team-based Project)/Case-based learning/PBL/other SCL methods**			
Student Learning Experience	**Listening, discussing, and doing assignments independently**			
Access to Learning Media/ LMS and Offline and Online Percentage	Offline (LCD, PPT Slide, Whiteboard, Laptop) and Online (Zoom Meeting, Google Meet, Google Classroom)			

Assessment Methods and Synchronization with CO

Assessment Methods	Assessment Percentage	Criteria/ Indicators	CO1	CO2	CO3	CO4	CO5
Participatory Activity*	**20**	**Attendance**	√	√	√	√	√
Project Results/ Case Study Results/ PBL Results*							
Cognitive							
Assignment	**20**		√	√	√	√	√
Midterm Exam	**30**		√	√		√	
Final Exam	**30**				√	√	√
Total	**100**						

*) can also be obtained from the Midterm or Final Exam as the result of participatory activities or project/ case study results. According to IKU 7, the percentage of project results/ case study/ PBL results is at least 50%.

References

Main References;

1. Martin, Alan, Sam Harbison, Karen Beach, dan Peter Cole, (2012), An Introduction to Radiation Protection, 6th ed., Hodder Arnold, Hodder Education, UK..
2. Ahmed, Syed Naeem, (2015), Physics and Enginering of Radiation Detection, 2nd ed., Elsevier Inc., USA.

<table>
<tr><td rowspan="1">Lecturers
(Team Teaching)</td><td colspan="4">1. Dr. Dwi Satya Palupi
2. Dr. Mitrayana</td></tr>
<tr><td rowspan="2">Authorization</td><td>Date of Drafting</td><td>Lecturer Coordinator</td><td>Head of Curriculum Committee</td><td>Head of Study Program</td></tr>
<tr><td></td><td>Dr. Dwi Satya Palupi</td><td></td><td>Dr. Eng. Ahmad Kusumaatmaja, S.Si., M.Sc.</td></tr>
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