SEMESTER LEARNING ACTIVITY PLANS (SLAP)

SEMESTER EVEN 2022/2023

Physics Undergraduate Study Program

Physics Department

Electromagnetics II

MFF 2410/ 2 Credits

Lecturer Coordinator:

Moh. Adhib Ulil Absor, S.Si., M.Sc., Ph.D
Dr. Juliasih Partini, M.Si.

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 :** ……

SEMESTER LEARNING ACTIVITY PLANS (SLAP)

Code	Course Name	Credits (Credits)		Semester	Status	Prerequisite
MFF 2410	*Electromagnetics II*	*T: 2*	*P: …*	*EVEN*	*Compulsory*	*Mathematics of Physics II (MFF1021), Electromagentics I (MFF2415)*

Short Description	This course is in the 4th semester of the Physics Study Program learning program and is a continuation of the Electromagnetics I course, which is in the 3rd semester. Before taking this course, students must have passed the Mathematics Physics II (MFF 2021) and Electromagnetics I (MFF 2415) courses. This course contains a discussion of particular methods in electrostatics, Maxwell's equations, Poynting's theorem, electromagnetic momentum, electromagnetic waves in a vacuum and matter (matter), electromagnetic wave polarization, refraction and reflection of electromagnetic waves, electromagnetic fields in waveguides and resonators, Kirchhoff's laws and electromagnetic oscillations in RLC circuits, transmission lines, electromagnetic radiation, and vector-4 formulations for electromagnetics. The learning of this course is carried out using face-to-face lectures and discussions in class for 3 hours of lectures per week for 14 weeks. Assessment of learning outcomes is carried out through the Mid-Semester Examination, Final Semester Examination), and giving Classwork or Homework.	
Program Learning Outcomes (PLO) Imposed on the Course	***PLO 2***	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.
	PLO 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.
Course Outcomes (CO)	**After completing this course, students are expected to be able to:**	
	CO1	Students have the ability in Physics Skills to formulate and describe (to describe) electromagnetic phenomena and reveal important information contained in these physics problems through various tricks or specific mathematical procedures and utilize various approximations.
	CO2	Students have the ability in Analytical Skills to pay attention to the problems of electromagnetic phenomena in detail (detail), analyze problems, and build arguments logically and carefully.
	CO3	Students have the ability in Problem-Solving Skills to solve a problem related to electromagnetic phenomena with well-defined solutions, formulating a problem carefully.

The Correlation of CO to Learning Materials and		Learning Materials	Learning Methods	Time Allocation
	CO 1, CO 2, CO 3	Unique methods in electromagnetics: Reflection method	TCL-SCL mixed	***2X50 minutes***
	CO 1, CO 2, CO 3	Solving Laplace's equation using the variable separation method in	TCL-SCL mixed	***2X50 minutes***

Methods, and Time Allocation		Cartesian coordinate systems and spherical coordinates		
	CO 1	Shift flow meeting. General Maxwell's equations in differential and integral form. Boundary condition equations	TCL-SCL mixed	***2X50 minutes***
	CO 1, CO 2, CO 3	Material (medium) isotropic linear, homogeneous. Poynting's theorem. Electromagnetic momentum.	TCL-SCL mixed	***2X50 minutes***
	CO 1, CO 2, CO 3	Scalar potential and general vector potential. Scalar potential and vector potential for homogeneous isotropic linear substances. Terra transformation	TCL-SCL mixed	***2X50 minutes***
	CO 1, CO 2, CO 3	Electromagnetic wave fields in non-conducting and conducting materials	TCL-SCL mixed	***2X50 minutes***
	CO 2, CO 3	Electromagnetic waves are fields within an electrically charged substance. Electromagnetic wave polarization	TCL-SCL mixed	***2X50 minutes***
	Midterm exam/Project Task Results/Case Analysis Results			
	CO 1, CO 2, CO 3	The law of reflection and refraction. Reflection and refraction in normal incident cases. Reflection and refraction in oblique incidents. Snell's Law. Total bounce	TCL-SCL mixed	***2X50 minutes***
	CO 1, CO 2, CO 3	The relationship between reflection, refraction, and electromagnetic energy. Reflection on the surface of the conductor. Propagation in the waveguide. Fields in the waveguide. Rectangular waveguide	TCL-SCL mixed	***2X50 minutes***
	CO 1, CO 2, CO 3	The fields in the resonant cavity (resonator). Kirchhoff's law. Series RLC circuit	TCL-SCL mixed	***2X50 minutes***
	CO 1, CO 2, CO 3	Transmission lines (transmission lines). Potentially delayed. Multipole expansion for an oscillating harmonic source.	TCL-SCL mixed	***2X50 minutes***
	CO 1	Electric dipole radiation. Magnetic dipole radiation. Linear electric quadrupole radiation. Antenna	TCL-SCL mixed	***2X50 minutes***
	CO 1, CO 2, CO 3	Introduction to the particular theory of relativity. Lorentz transformation. Lorentz transforms -4 Vectors and general Tensors.	TCL-SCL mixed	***2X50 minutes***
	CO 2, CO 3	Lorentz Transforms, Vector-4, and General Tensor. Vector formulation -4 for electromagnetics in vacuum	TCL-SCL mixed	***2X50 minutes***
	Final exams/ Project Task Results/Case Analysis Results			

<table>
<tr><td>Learning Methods</td><td colspan="6">SCL (Student Centered Learning): Project-based learning (Team-based Project)/Case-based learning/PBL/other SCL methods</td></tr>
<tr><td>Student Learning Experience</td><td colspan="6">Learn to study and examine physical systems as well as examples of problem-solving procedures</td></tr>
<tr><td>Access to Learning Media/ LMS and Offline and Online Percentage</td><td colspan="6">Offline (LCD, PPT Slide, Whiteboard, Laptop) and Online (Zoom Meeting, Google Meet, Google Classroom)</td></tr>
<tr><td rowspan="10">Assessment Methods and Synchronization with CO</td><td>Assessment Methods</td><td>Assessment Percentage</td><td>Criteria/ Indicators</td><td>CO1</td><td>CO2</td><td>CO3</td></tr>
<tr><td>Participatory Activity*</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Project Results/ Case Study Results/ PBL Results*</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="6">Cognitive</td></tr>
<tr><td>Assignment</td><td>30</td><td></td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>Midterm Exam</td><td>35</td><td></td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>Final Exam</td><td>35</td><td></td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>Total</td><td>100</td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="6">*) 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%.</td></tr>
<tr><td>References</td><td colspan="6">Main References;
1. Ronald K. Wangsness, 1986, Electromagnetic Fields, Edisi ke-2, Penerbit: John Wiley & Sons..
2. Griffiths, D. J., 1989, Introduction to Electrodynamics, Edisi ke-2, Penerbit: Prentice Hall..
3. Reitz, J.R., Milford, F. J. dan Christy, R. W., 1992, Foundations of Electromagnetic Theory, Edisi ke-3, Penerbit: Addition-Wesley.</td></tr>
<tr><td>Lecturers (Team Teaching)</td><td colspan="6">1. Moh. Adhib Ulil Absor, S.Si., M.Sc., Ph.D
2. Dr. Juliasih Partini, M.Si.</td></tr>
<tr><td rowspan="2">Authorization</td><td>Date of Drafting</td><td colspan="2">Lecturer Coordinator</td><td>Head of Curriculum Committee</td><td colspan="2">Head of Study Program</td></tr>
<tr><td></td><td colspan="2">Moh. Adhib Ulil Absor, S.Si., M.Sc., Ph.D</td><td></td><td colspan="2">Dr. Eng. Ahmad Kusumaatmaja, S.Si., M.Sc.</td></tr>
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