SEMESTER LEARNING ACTIVITY PLANS (SLAP) SEMESTER ODD/EVEN 2022/2023



Electrodynamics MFF5411 / 3 Credits

Lecturer Coordinator:

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UNIVERSITAS GADJAH MADA FACULTY OF MATHEMATICS AND NATURAL SCIENCE 2022

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Universitas Gadjah Mada Faculty of Mathematics and Natural Science Physics Department / Study Program Master Physics Semester Odd/Even 2022/2023

SEMESTER LEARNING ACTIVITY PLANS (SLAP)

Code	Course Name	Credits (credits)	Semester	Status	Prerequisite		
MFF5411	Electrodyna mics	3	Odd/Even	Compulsory	None		
Short Description	mics Electrodynamic Study Program, The syllabus of Coulomb's law, density of elect energy, energy the shadow me boundary condi moment in a vac Biot-Savart's L equations in vec are generated b boundary plane tera transformat	mics course is Compulsory course 3 credits (Theory) in the 2022 Curriculum Master Physics am, Faculty of Mathematics and Natural Science UGM. s of this course is as follows: aw, electric field and potential caused by electric charge. Gauss's law for electricity and the lectrical energy in a vacuum, Green's Theorem. Electrostatic potential energy, configuration gy density. Boundary condition problems include solving boundary condition problems using method if there is a source. Solve Laplace's equations and Poisson's equations with specific inditions. Multipole moment, electric field, and electric potential are generated by a multipole vacuum and a medium. The induced magnetic field is generated by current density distribution, s Law, and Ampere's Law. Faraday's law and induced EMF, vector potential, differential vector potential form, and how to solve them. Magnetic moments and magnetic induced fields d by magnetic moments in a vacuum and a linear isotropic medium. The magnetic field at the ane. Maxwell's equations in differential, integral, scalar potentials and vector potentials form, mations. A simple application of Maxwell's equations: electromagnetic waves. are held in class for 14 weeks, each week's session last for 3 x 50 minutes. Four weeks of d is used for Midterm Exam and Final Exam, each held for two weeks as scheduled					
	Student evalua evaluation is im minutes. The fo of completing a the course, such in completing in	action for course assessments is performed summative and formative. The summative implemented as written exams, both Midterm and Final Exam, which take a maximum of 120 formative evaluation is implemented as individual assignments for each student in the form g an assignment individually. Monitoring is carried out by observing student activities during ch as attendance, Q&A and discussion about the material presented, and student performance rindividual assignments.					
Program		<u> </u>					
Learning Outcomes (PLO) Imposed on	PLO 3	Mastering further relationship with physics specialize research develop	r knowledge of other discipli ation that allo ments.	of classical and modern phy nes, and has mastered an a ows him to keep up with the	vsics theory, and its dvanced field of e latest international		
ule Course	PLO 4	Mastering variou physics, and able computational to problems related	s mathematic to develop pl ols with an in to an advance	al disciplines related to an hysical models using vario ter or multidisciplinary app ed field of physics.	advanced field of us mathematical and proach to solving		
	PLO 6	Able to apply kno problems compre experimental or t conclusions about	owledge to an ehensively in heoretical res at their finding	alyze, synthesize, formulatione of advanced field of phearch, then be able to class gs for the development of s	te problems and solve hysics, through ify and draw cience and technology.		

Course	Upon comple	etion of this course, students should h	be able to:					
Outcomes	<u> </u>	Explain, calculate and analyze the magnetic field generated by the current						
(CO)		distribution and changes in the electr	ic field flux.					
	CO2	Explain and formulate the magnetic	field generated by the follow	ing electric				
		multipole distribution.						
	CO3	Formulate, explain the use of Maxwell's	equations, and express Maxwel	l's equations in				
		the form of electric potential and vector	potential, as well as the propaga	tion of				
		electromagnetic waves.	ama and their houndary condition					
	C04	Explain and solve static electricity proble	electric potentials caused by ale	ons.				
	05	distributions.	electric potentials caused by ele					
	<i>CO6</i>							
	<i>C07</i>							
	<i>CO8</i>							
The		Learning Materials	Learning Methods	Time				
Correlation of				Allocation				
CO to								
Learning	CO1	Coulomb's law, electric field and	Lecture, discussion	3 x 50				
Materials and		potential caused by electric		minutes				
Methods, and		charges.						
Allocation	<i>CO1</i>	Gauss's law for electricity and the	Lecture, discussion	3 x 50				
Anocation		density of electrical energy in a		minutes				
	<u> </u>	Vacuum, Green's Theorem.	Lesture discussion	2 - 50				
	01	electrostatic potential energy,	Lecture, discussion	3 X 50				
		density		minutes				
	<u>C02</u>	Boundary conditions problems	Lecture discussion	3 x 50				
	002	include: solving boundary		minutes				
		conditions problems using the						
		shadow method if there is a source.						
	<i>CO2</i>	Hamiltonian formulation, phase	Lecture, discussion	3 x 50				
		space, Legendre transformation,		minutes				
		Hamiltonian mechanical relations						
		with symmetry and the law of						
		sustainability.						
	<i>CO2</i>	Multipole moment, electric field,	Lecture, discussion	3 x 50				
		potential generated by multipole		minutes				
	<u> </u>	moment in vacuum.	Testan diamanian	2 - 50				
	02	Multipole moments, electric fields,	Lecture, discussion	3 X 50				
		moments in the medium		minutes				
		moments in the medium.						
	<i>C</i> 03	Magnetic induction field generated	Loctura discussion	3 x 50				
	005	by a current density distribution	Lecture, discussion	J A JU minutes				
		Bio-Sayart's Law Ampere's Law		minutes				
		Dio-Davaito Law, Ampere S Law.						

		1							
	<i>CO3</i>	Farada	ay's law and ind	luced emf, as	Lecture	e, discussi	on	3 x 5	0
		well a	s vector potenti	al. vector				minut	es
		potent	ial differential	equations in					
		vootor	notantial form	and how to					
		vector		and now to					
		solve	them.		_				
	<i>CO3</i>	Magn	etic Moment an	d Magnetic	Lecture	e, discussi	on	3 x 5	0
		Induct	tion Fields creat	ted by				minut	es
		magne	etic moments in	a vacuum.					
	<i>CO4</i>	Magn	etic moment an	d magnetic	Lecture	e. discussi	on	3 x 5	0
		induct	ion field genera	ated by a		,		minut	es
		magn	tic moment in	a linoor				mmut	05
				a IIIIcai					
		Isotro	pic medium.		_				
	<i>CO4</i>	Magn	etic field in the	boundary	Lecture	e, discussi	on	3 x 5	0
		plane						minut	es
	<i>CO4</i>	Maxw	ell's equations	are in	Lecture	e, discussi	on	3 x 5	0
		differe	ential, integral f	orm, as well				minut	es
		as in t	he form of scale	ar notentials					
		and w	etor potontials	toro					
		tronof.	ettor potentials,	leia					
	604		ormations.		T .				0
	<i>CO4</i>	Simpl	e application of	Maxwell's	Lecture	e, discussi	on	3 x 5	0
		equati	ons: electromag	gnetic waves.				minut	es
		Fin	al Exam/ Proj	ect Task Resu	lts/ Case .	Analysis l	Results		
Learning Methods	Lecture, discu	ission							
Student	Learn to analyz	e and re	view: Coulomb's	law. electric fiel	ld and pote	ntial cause	d by electri	c charges	
Learning	Gauss's law for	electrici	ty and the densit	v of electrical er	ergy in a v	acuum. Gr	een's Theor	rem	
Evnerience	Electrostatic po	otential e	nergy, configurat	ion energy, ener	gy density	., Boundary	v conditions	s problems	
Experience	include: solvin	g bounda	ry conditions pro	blems using the	shadow m	ethod if the	ere is a sour	rce.	
	Hamiltonian fo	rmulatio	n, phase space, L	egendre transfor	mation, Ha	amiltonian	mechanical	l relations w	vith
	symmetry and	the law o	of sustainability.,	Multipole mome	ent, electric	field, pote	ential gener	ated by	
	multipole mom	ent in va	cuum., Multipole	e moments, elect	ric fields, j	potentials g	enerated by	y multipole	
	moments in the	medium	n., Magnetic indu	ction field gener	ated by a c	urrent dens	sity distribu	ition, Bio-	
	Savart's Law, A	Ampere's	Law., Faraday's	law and induced	emf, as w	ell as vecto	r potential,	vector	
	potential, differ	rential eq	uations in vector	potential form a	and how to	solve them	n., Magnetio	c Moment a	ind
	Magnetic Indu	ction Fiel	ds created by ma	ignetic moments	in a vacuu	ım., Magne	tic momen	t and magne	etic
	induction field	generate	d by a magnetic	moment in a line	ar isotropi	c medium.,	Magnetic 1	field in the	
	boundary plane	, Maxwe	ell's equations are	in differential,	integral for	m, as well	as in the fo	rm of scala	r
	potentials and	vector po	tentials, tera tran	sformations., Si	mple applie	cation of M	laxwell's eq	uations:	
	electromagneti	c waves.					-	-	
Access to	Powerpoint								
Learning	_								
Media/LMS									
and Offline									
and Online									
anu Omme									
Percentage									
Assessment			1		r			-	
Methods and	Assessment		Assessment	Criteria/In					
Synchronizati	Methods		Percentage	dicators	CO1	CO2	CO3	CO4	
on with CO	D		I ci centage						-
	Participato	ry							
	Activity*						1		

	Project Resu Case Study Results/ PBI Results*	ılts/ L					
	Cognitive						
	Assignment	30%	7,5% 7,5	% 7,5%	7,5%		
	Quiz						
	Midterm Ex	xam 35%	17,5% 17,5	5%			
	Final Exam	35%		17,5%	17,5%		
	^{*)} 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%.						
	Main references: Jackson, J. D, 1999, Classical Electrodynamics, edisi3, John Wiley & Sons.						
Lecturers (<i>Team</i> <i>Teaching</i>)	1. Dr. Dwi Sa 2. 3. 4.	tya Palupi, S.Si., M.Si.					
Authorization	Date of Drafting	Lecturer Coordinator	Head of Curriculu Committee	m Hea P	Head of Study Program		
		Dr. Dwi Satya Palupi, S.Si., M.Si.	Dr.Ing. Ari Setiawa	Mirza Sa	ıtriawan, M.Si Ph.D		