

## Universitas Negeri Surabaya Faculty of Mathematics and Natural Sciences Undergraduate Physics Study Program

Document Code

Courses			CODE				Co	ourse	Famil	ly		Cred	dit We	ight		SEME	STER	Co	mpilat te	tior
Mathematica	l Physics I		45201040	70			Co	ompul:	sory S	Study	'	T=4	P=0	ECTS	=6.36		2	Jul	y 17, 2	202
AUTHORIZA	TION		SP Devel	oper			· Pi	ogran	<del>i əubj</del>	eus	Cours	se Clu	ster C	oordin	ator	Study	Progr	am Co	ordin	ato
			Nugrahan	i Prima	ary Pu	tri, M.	.Si.				Dr. Z.	A. Ima	am Suļ	oardi, M	1.Si.	Prof. [	Or. Mur	nasir, S	S.Si., M	1.S
Learning model	Case Studies																			
Program Learning	PLO study p	rogran	n that is cha	rged t	o the	cou	rse													
Outcomes	PLO-9	Ab	le to work as a	ın indiv	vidual	or tea	ım eff	ective	ly, hav	/e er	ntrepre	neuria	l skills,	and ca	re abo	ut envi	ronmei	ntal iss	ues.	
(PLO)	PLO-10																			
	Program Obj	Program Objectives (PO)  Students are able to formulate simple physical systems related to machining and the machinesis into mathematical																		
	PO - 1		Students are able to formulate simple physical systems related to mechanics and thermodynamics into mathematical models using relevant symbolic/numeric language.																	
	PO - 2	Stu	udents are able to solve problems in simple physical systems related to mechanics and thermodynamics using athematical physics and computational approaches.																	
	PO - 3	Stu	dents are able	e to ar outatio	alyze nal ap	a sin proac	nple p	hysica	al syst	tem	related	l to m	echani	cs and	therm	odynam	nics us	ng ma	thema	ıtic
	PLO-PO Mat	rix																		
											_									
			P.O		PLO	<b>D-9</b>		PL	.O-10											
			PO-1	PO-1																
			PO-2																	
			PO-3																	
	PO Matrix at	the er	nd of each le	arninç	y stag	je (Sı	ub-P0	0)												
		-																		
			P.O		1	1	1					Wee	k	1		1				
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
			PO-1																	
			PO-2																	
			PO-3																	
	This course excombining the	xamine method	s infinite serie ds of discussio	s, par n, que	tial dif stions	feren and a	tials, answe	ordina ers, als	ary dif so ass	ferei signr	ntial eq nents u	quatior ising Ι	ns, and T.	l vecto	r analy	sis thro	ough a	ctive l	earnin	g
Short Course Description																				
Course	Main :																			

Dr. Zainul Arifin Imam Supardi, M.Si. Prof. Dr. Munasir, S.Si., M.Si. Nugrahani Primary Putri, S.Si., M.Si. Arie Realita, M.Si. Dr. Fitriana, S.Si. Dr. Muhimmatul Khoiro, S. Si.

Supporting lecturer

Week-	Final abilities of each learning stage	Eval	uation	Lear Stude	elp Learning, rning methods, ent Assignments, stimated time]	Learning materials [ References	Assessment Weight (%)
	(SuĎ-PO)	Indicator	Criteria & Form	Offline ( offline )	Online ( online )	1	J ( )
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	1.Students are able to formulate simple physical systems related to mechanics and thermodynamics into mathematical models using infinite series 2.Students are able to solve problems of simple physical systems related to mechanics and thermodynamics into mathematical models using infinite series and computational tools 3.Students are able to analyze problems of simple physical systems related to mechanics and computational tools 4.Students are able to analyze problems of simple physical systems related to mechanics and thermodynamics into mathematical models using infinite series and computational tools.	<ul> <li>1.1. Students are able to undertake convergence test of a series.</li> <li>2.2. Students are able to analyze a function into power series.</li> <li>3.3. Students are able to solve mechanics and thermodynamics problems using series concept.</li> </ul>	Criteria: Students will get full marks if they meet the assessment indicators Form of Assessment: Participatory Activities	Lectures, discussions, assignments 4 x 50	Lectures, discussions, assignments 4 x 50	Material: Ch 1 Bibliography: Mary L. Boas. 2006. Mathematical Methods in the Physical Science. 3rd edition. New York: John Wiley & Sons.	2%

2	1.Students are able to formulate simple physical systems related to mechanics and thermodynamics into mathematical models using infinite series 2.Students are able to solve problems of simple physical systems related to mechanics and thermodynamics into mathematical models using infinite series and computational tools 3.Students are able to analyze problems of simple physical systems related to mechanics and thermodynamics into mathematical models using infinite series and thermodynamics into mathematical models using infinite series and computational tools.	1.1. Students are able to undertake convergence test of a series. 2.2. Students are able to analyze a function into power series. 3.3. Students are able to solve mechanics and thermodynamics problems using series concept.	Criteria: Students will get full marks if they meet the assessment indicators Form of Assessment: Participatory Activities, Practice/Performance	Lectures, discussions, assignments 4 x 50	Lectures, discussions, assignments 4 x 50	Material: Ch 1 Bibliography: Mary L. Boas. 2006. Mathematical Methods in the Physical Science. 3rd edition. New York: John Wiley & Sons.	2%
3	1.Students are able to formulate simple physical systems related to mechanics and thermodynamics into mathematical models using infinite series 2.Students are able to solve problems of simple physical systems related to mechanics and thermodynamics into mathematical models using infinite series and computational tools 3.Students are able to analyze problems of simple physical systems related to mechanics and thermodynamics into mathematical models using infinite series and thermodynamics into mathematical models using infinite series and computational tools.	1.1. Students are able to undertake convergence test of a series. 2.2. Students are able to analyze a function into power series. 3.3. Students are able to solve mechanics and thermodynamics problems using series concept.	Criteria: Students will get full marks if they meet the assessment indicators  Form of Assessment: Participatory Activities, Practice/Performance	Lectures, discussions, assignments 4 x 50	Lectures, discussions, assignments 4 x 50	Material: Ch 1 Bibliography: Mary L. Boas. 2006. Mathematical Methods in the Physical Science. 3rd edition. New York: John Wiley & Sons.	5%

4	4	4	Outrain.	14	Lastinas diasinas in in	Matarial Old	F0/
4	1.Students are	1.1. Students are	Criteria: Students will get full	Lectures,	Lectures, discussions,	Material: Ch 4	5%
	able to	able to execute	marks if they meet the	discussions,	assignments 4 x 50	Bibliography:	
	formulate simple	partial differential	assessment indicators	assignments 4 x 50	4 X 50	Mary L. Boas. 2006.	
	physical	using chain		4 X 30		Mathematical	
	systems related	rules.	Form of Assessment :			Methods in	
	to mechanics	<ol><li>2.2. Students are</li></ol>	Portfolio Assessment,			the Physical	
	and	able to execute	Practice / Performance			Science, 3rd	
	thermodynamics	implicit				edition. New	
	into	differentiation,				York: John	
	mathematical	change variables				Wiley & Sons.	
	models using	and limit				116) & 556.	
	partial	requirements					
	differentiation	3.3. Students are					
	2.Students are	able to look for					
	able to solve	minimum and					
	problems of	maximum value					
	simple physical	of a function					
	systems related	4.4. Students are					
	to mechanics	able to solve					
	and	mechanics and					
	thermodynamics	thermodynamics					
	into	problems using					
	mathematical	partial differential					
	models using	concepts					
	partial	001100pt0					
	differentiation						
	and						
	computational						
	tools.						
	3.Students are						
	able to analyze						
	problems of						
	simple physical						
	systems related						
	to mechanics						
	and						
	thermodynamics						
	into						
	mathematical						
	models using						
	partial						
	differentiation						
	and						
	computational						
	tools.						

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5	1.Students are able to formulate simple physical systems related to mechanics and thermodynamics into mathematical models using partial differentiation 2.Students are able to solve problems of simple physical systems related to mechanics and thermodynamics into mathematical models using partial differentiation and computational tools. 3.Students are able to analyze problems of simple physical systems related to mechanics and thermodynamics into mathematical models using partial differentiation and thermodynamics into mathematical models using partial differentiation and computational tools.	1.1. Students are able to execute partial differential using chain rules. 2.2. Students are able to execute implicit differentiation, change variables and limit requirements 3.3. Students are able to look for minimum and maximum value of a function 4.4. Students are able to solve mechanics and thermodynamics problems using partial differential concepts	Criteria: Students will get full marks if they meet the assessment indicators Form of Assessment: Practice / Performance	Lectures, discussions, assignments 4 x 50	lectures, discussions, assignments 4 x 50	Material: Ch 4 Bibliography: Mary L. Boas. 2006. Mathematical Methods in the Physical Science. 3rd edition. New York: John Wiley & Sons.	5%

6	1.Students are able to formulate simple physical systems related to mechanics and thermodynamics into mathematical models using partial differentiation 2.Students are able to solve problems of simple physical systems related to mechanics and thermodynamics into mathematical models using partial differentiation and computational tools. 3.Students are able to analyze problems of simple physical systems related to mechanics and thermodynamics into mathematical models using partial differentiation and thermodynamics into mathematical models using partial differentiation and computational tools.	1.1. Students are able to execute partial differential using chain rules. 2.2. Students are able to execute implicit differentiation, change variables and limit requirements 3.3. Students are able to look for minimum and maximum value of a function 4.4. Students are able to solve mechanics and thermodynamics problems using partial differential concepts	Criteria: Students will get full marks if they meet the assessment indicators Form of Assessment: Practice / Performance	Lectures, discussions, assignments 4 x 50	lectures, discussions, assignments 4 x 50	Material: Ch 4 Bibliography: Mary L. Boas. 2006. Mathematical Methods in the Physical Science. 3rd edition. New York: John Wiley & Sons.	6%
7	Students are able to formulate simple physical systems related to mechanics and thermodynamics into mathematical models using ordinary differential equations	1.1. Students are able to identify first and second order differential equations related to physics concepts particularly mechanics and thermodynamics. 2.2. Students are able to solve first order differential equations. 3.3. Students are able to find solutions for first order differential equations in physics problems.	Criteria: Students will get full marks if they meet the assessment indicators  Form of Assessment: Participatory Activities, Practice/Performance	Lectures, discussions 4 x 50	Lectures, discussions 4 x 50	Material: Ch 8 Bibliography: Mary L. Boas. 2006. Mathematical Methods in the Physical Science. 3rd edition. New York: John Wiley & Sons.	0%

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8	1.Students are	1.1. Students are	Criteria:	UTS	UTS	Material: Ch	20%
	able to	able to	Students will get full	2 x 50	2 x 50	1, 4	
	formulate simple	undertake	marks if they meet the			Bibliography:	
	physical	convergence test	assessment indicators			Mary L. Boas.	
	systems related	of a series.	Form of Assessment :			2006. Mathematical	
	to mechanics	<ol><li>2.2. Students are</li></ol>	Test			Methods in	
	and	able to analyze a				the Physical	
	thermodynamics	function into				Science. 3rd	
	into	power series.				edition. New	
	mathematical	3.3. Students are				York: John	
	models using	able to solve				Wiley & Sons.	
	infinite series	mechanics and					
	2.Students are	thermodynamics					
	able to	problems using series concept.					
	formulate simple physical	4.1. Students are					
	systems related	able to execute					
	to mechanics	partial differential					
	and	using chain					
	thermodynamics	rules.					
	into	5.2. Students are					
	mathematical	able to execute					
	models using	implicit					
	partial	differentiation,					
	differentiation	change variables					
	3.Students are	and limits					
	able to solve	6.3. Students are					
	problems of	able to look for					
	simple physical	minimum and					
	systems related	maximum value					
	to mechanics	of a function					
	and thermodynamics	7.4. Students are able to solve					
	into	mechanics and					
	mathematical	thermodynamics					
	models using	problems using					
	infinite series	partial differential					
	and	concepts					
	computational						
	tools						
	4.Students are						
	able to solve						
	problems of						
	simple physical						
	systems related						
	to mechanics						
	and						
	thermodynamics						
	into						
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	models using partial						
	differentiation						
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	computational						
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	<ol><li>Students are</li></ol>						
	able to analyze						
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	6.Students are						
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	problems of						
	simple physical						
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	to mechanics						
	and thermodynamics						
	thermodynamics into						
	mathematical						
	models using						
	partial						
	differentiation						
	and						
	computational						
	tools.						

9	1.Students are able to solve problems of simple physical systems related to mechanics and thermodynamics into mathematical models using ordinary differential equations and computational tools.  2.Students are able to analyze problems of simple physical systems related to mechanics and thermodynamics into mathematical models using ordinary differential equations and computational tools.	1.1. Students are able to solve second order differential equations. 2.2. Students are able to find solutions for second order differential equations in physics problems. 3.3. Students are able to apply ordinary differential equations to solve physics problems in accordance with the concepts of mechanics and thermodynamics.	Criteria: Students will get full marks if they meet the assessment indicators Form of Assessment: Practice / Performance	Lectures, discussions, assignments 4 x 50	Lectures, discussions, assignments 4 x 50	Material: Ch 8 Bibliography: Mary L. Boas. 2006. Mathematical Methods in the Physical Science. 3rd edition. New York: John Wiley & Sons.	5%
10	1.Students are able to solve problems of simple physical systems related to mechanics and thermodynamics into mathematical models using ordinary differential equations and computational tools.  2.Students are able to analyze problems of simple physical systems related to mechanics and thermodynamics into mathematical models using ordinary differential equations and computational tools.	1.1. Students are able to solve second order differential equations. 2.2. Students are able to find solutions for second order differential equations in physics problems. 3.3. Students are able to apply ordinary differential equations to solve physics problems in accordance with the concepts of mechanics and thermodynamics.	Criteria: Students will get full marks if they meet the assessment indicators Form of Assessment: Practice / Performance	Lectures, discussions, assignments 4 x 50	Lectures, discussions, assignments 4 x 50	Material: Ch 8 Bibliography: Mary L. Boas. 2006. Mathematical Methods in the Physical Science. 3rd edition. New York: John Wiley & Sons.	5%

11	Students are able to formulate simple physical systems related to mechanics and thermodynamics into mathematical models using vector analysis	1.1. Students are able to hold vector multiplication and vector differentiation, also formulate simple physical systems using vector multiplication and vector differentiation concepts.  2.2. Students are able to use vector operators in cartesian coordinates, gradient, divergence and curl in simple physical models.  3.3. Students are able to understand Green Theorem, divergence theorem and Stokes theorem.	Criteria: Students will get full marks if they meet the assessment indicators Form of Assessment: Participatory Activities	Lectures, discussions, assignments 4 x 50	Lectures, discussions, assignments 4 x 50	Material: Ch 6 Bibliography: Mary L. Boas. 2006. Mathematical Methods in the Physical Science. 3rd edition. New York: John Wiley & Sons.	5%
12	Students are able to formulate simple physical systems related to mechanics and thermodynamics into mathematical models using vector analysis	1.1. Students are able to hold vector multiplication and vector differentiation, also formulate simple physical systems using vector multiplication and vector differentiation concepts.  2.2. Students are able to use vector operators in cartesian coordinates, gradient, divergence and curl in simple physical models.  3.3. Students are able to understand Green Theorem, divergence theorem and Stokes theorem.	Criteria: Students will get full marks if they meet the assessment indicators Form of Assessment: Participatory Activities	Lectures, discussions, assignments 4 x 50	Lectures, discussions, assignments 4 x 50	Material: Ch 6 Bibliography: Mary L. Boas. 2006. Mathematical Methods in the Physical Science. 3rd edition. New York: John Wiley & Sons.	5%

13	Students are able to formulate simple physical systems related to mechanics and thermodynamics into mathematical models using vector analysis	1.1. Students are able to hold vector multiplication and vector differentiation, also formulate simple physical systems using vector multiplication and vector differentiation concepts.  2.2. Students are able to use vector operators in cartesian coordinates, gradient, divergence and curl in simple physical models.  3.3. Students are able to understand Green Theorem, divergence theorem and Stokes theorem.	Criteria: Students will get full marks if they meet the assessment indicators Form of Assessment: Participatory Activities	Lectures, discussions, assignments 4 x 50	Lectures, discussions, assignments 4 x 50	Material: Ch 6 Bibliography: Mary L. Boas. 2006. Mathematical Methods in the Physical Science. 3rd edition. New York: John Wiley & Sons.	5%
14	1. Students are able to solve problems of physical systems related to mechanics and thermodynamics into mathematical models using vector analysis and computational tools.  2. Students are able to analyze problems of simple physical systems related to mechanics and thermodynamics into mathematical models using vector analysis and computational tools.	1.1. Students are able to identify various coordinates. 2.2. Students are able to understand coordinate transformation. 3.3. Students are able to use the concept of coordinate transformation to find solutions for simple physical models.	Criteria: Students will get full marks if they meet the assessment indicators Form of Assessment : Participatory Activities	Lectures, discussions 4 x 50	Lectures, discussions 4 x 50	Material: Ch 6 Bibliography: Mary L. Boas. 2006. Mathematical Methods in the Physical Science. 3rd edition. New York: John Wiley & Sons.	0%

15	1.Students are able to solve problems of physical systems related to mechanics and thermodynamics into mathematical models using vector analysis and computational tools.	1.1. Students are able to identify various coordinates. 2.2. Students are able to understand coordinate transformation. 3.3. Students are able to use the concept of coordinate transformation to find solutions for simple physical	Criteria: Students will get full marks if they meet the assessment indicators Form of Assessment : Participatory Activities	Lectures, discussions 4 x 50	Lectures, discussions 4 x 50	Material: Ch 6 Bibliography: Mary L. Boas. 2006. Mathematical Methods in the Physical Science. 3rd edition. New York: John Wiley & Sons.	0%
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**Evaluation Percentage Recap: Case Study** 

No	Evaluation	Percentage
1.	Participatory Activities	20.5%
2.	Portfolio Assessment	2.5%
3.	Practice / Performance	27%
4.	Test	50%
		100%

## Notes

- Learning Outcomes of Study Program Graduates (PLO Study Program) are the abilities possessed by each Study
  Program graduate which are the internalization of attitudes, mastery of knowledge and skills according to the level of their study
  program obtained through the learning process.
- 2. The PLO imposed on courses are several learning outcomes of study program graduates (CPL-Study Program) which are used for the formation/development of a course consisting of aspects of attitude, general skills, special skills and knowledge.
- 3. **Program Objectives (PO)** are abilities that are specifically described from the PLO assigned to a course, and are specific to the study material or learning materials for that course.
- Subject Sub-PO (Sub-PO) is a capability that is specifically described from the PO that can be measured or observed and is
  the final ability that is planned at each learning stage, and is specific to the learning material of the course.
- Indicators for assessing ability in the process and student learning outcomes are specific and measurable statements that identify the ability or performance of student learning outcomes accompanied by evidence.
- 6. Assessment Criteria are benchmarks used as a measure or measure of learning achievement in assessments based on predetermined indicators. Assessment criteria are guidelines for assessors so that assessments are consistent and unbiased. Criteria can be quantitative or qualitative.
- 7. Forms of assessment: test and non-test.
- 8. **Forms of learning:** Lecture, Response, Tutorial, Seminar or equivalent, Practicum, Studio Practice, Workshop Practice, Field Practice, Research, Community Service and/or other equivalent forms of learning.
- 9. **Learning Methods:** Small Group Discussion, Role-Play & Simulation, Discovery Learning, Self-Directed Learning, Cooperative Learning, Collaborative Learning, Contextual Learning, Project Based Learning, and other equivalent methods.
- 10. Learning materials are details or descriptions of study materials which can be presented in the form of several main points and sub-topics.
- 11. The assessment weight is the percentage of assessment of each sub-PO achievement whose size is proportional to the level of difficulty of achieving that sub-PO, and the total is 100%.
- 12. TM=Face to face, PT=Structured assignments, BM=Independent study.