FI222 Mathematical Physics I

Module name:	Mathematical Physics I	
Module level, if applicable:	Undergraduate	
Code:	FI222	
Sub-heading, if applicable:	-	
Classes, if applicable:	-	
Semester:	2nd	
Module coordinator:	Andi Suhandi	
Lecturer(s):	Andi Suhandi and Mimin Iryanti	
Language:	Bahasa Indonesia	
Classification within the curriculum:	Compulsory course	
Type of Teaching	Contact hours per week during the semester	Class Size
1. Lecture (conceptual, contextual and problem-solving approaches through expository, discussions and exercises). 2. Structured activities (assignments based on conceptual, contextual and problem-solving approaches) 3. Self-study (reading literature)	3 hours 20 minutes	35
Workload:	The total workload is 181 hours 20 minutes (6.4 ECTS) per semester, consisting of 40 hours/2400 minutes lectures (1.41 ECTS), 56 hours/3360 minutes structured activities (1.98 ECTS) and 56 hours/3360 minutes self-study (1.98 ECTS) per week for 12 weeks, 29 hour 11 minutes for four exams (1.03 ECTS)	
Credit points:	6.4 ECTS	
Pre-requisites course(s):	FI120 Basic Mathematics	
Course Learning Outcomes (CLO):	After taking this course, the students have the ability to: CLO1: Explain the concept of matrix (notation, terminology), matrix algebra operations, types of matrices, the properties of determinants, co-factors, Cramer's rules, Singular Matrix, Inverse Matrix, Orthogonal Matrix, Adjoin Matrix, trace matrix. CLO2: Explain about finding singular matrices, inverse matrices, orthogonal matrices, adjoining matrices, trace matrices. CLO3: Explain the use of matrices in solving simultaneous linear equations, solving the problem of eigenvalues and matrix diagonalization	

	CLO4: Explain about partial and total differential (definitions and notations), the differential concepts in approximate calculations, the chain rules, implicit differentiation, and more extended chain rules. CLO5: Apply the concept of partial differentiation in the ordinary maximum and minimum value problem, and the maximum, minimum problem is constrained using Lagrange multipliers CLO6: Explain about finding the differentiation of an integral using Leibniz's rule, the double and triple integrals. CLO7: Apply the concept of double and triple integration in solving relevant math and physics problems. CLO8: Explain about variable changes in fold integrals using the Jacobian concept, the surface integrals. CLO9: Explain of ordinary differential equations, notation, and terminology, the formulating GDP from a physical phenomenon, to finding a first order PDB solution using various methods: variable separation method; exact. Bernoulli, Linear, Homogeneous, the second-order GDP solution that has a constant and homogeneous coefficient, to finding a second-order non-homogeneous GDP solution using the following methods: order reduction, indeterminate coefficients, parameter variations, CLO10: Apply the concept of GDP in solving relevant Physics problems. CLO11: Explain the calculus of variations for Stationary value problems (notation and terminology), the Fermat's principles in optical problems, the Euler equations in various types of variables, the Lagrange equations, and Hamiltonian principles, CLO12: Apply the Hamiltonian principle in Mechanics problems, CLO13: Explain the Van Baak variation principle CLO14: Ability to apply the principle of the Van Baak variation in solving direct current electric circuit problems. CLO15: Explain the power series (notation and terminology), the power series convergence test using various testing techniques, the function in power series (Taylor and McLaurin series) CLO16: Apply the concept of power series in solving relevant math and physics problems. CLO17: Explain the Fourier series for periodic functions, notation and terminology, the Dirichlet's condition, the odd, even, and not odd periodic functions. CLO18: Expalin about expressing a periodic function in Fourier sine series, Fourier cosine series, and Fourier Sine-Cosine series CLO19: Explain Parseval's theorem and Fourier's Spectrum, CLO20 Apply the concept of the Fourier series in relevant Physics problems.
Content:	Matrix, The partial and total differential, The Integral, the ordinary differential equations, the calculus of variations for Stationary value problems, the power series
Study/exam achievements:	(see table below)

No	CLO	Assessment Object	Assessment Techniques	Weight
1		Subject specific competences:		

		1 – 20	a. Individual assignments	Written	20%
			b. Exam:		
		1 – 3	- Exam 1	Written test	20%
		4 – 8	- Exam 2	Written test	20%
		9 – 14	- Exam 3	Written test	20%
		15 – 20	- Exam 4	Written test	20%
	Total				100%
	The final mark will be weight as follow:				
Forms of media:	Board, LCD Projector, Laptop/Computer, LMS				
Literature:	1. Boas, M. L. (2015). *Mathematical methods in the physical sciences*. Wiley. 2. Farlow, S. J., (2006), *An Introduction to Differential Equations and Their Applications*, Dover Publications. 3. Jain, M. C. (2018). *Vector spaces, matrices and tensors in physics*. Alpha Science International, Limited. 4. Blanchard, P., & Bruening, E. (2012). *Mathematical Methods in Physics*. Springer Science & Business Media. 5. Forinash, K. (2009). *Mathematical methods in physics - partial differential equations, fouriers*. A K Peters. 6. Neuenschwander, D. E. (2015). *Tensor calculus for physics: a concise guide*. Johns Hopkins University Press.				

PLO and CLO mapping

	PLO1	PLO 2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1	√											
CLO2	√											
CLO3	√											
CLO4	√											
CLO5	√											
CLO6	√											
CLO7	√											
CLO8	√											
CLO9	√											
CLO10	√											
CLO11	√											
CLO12	√											
CLO13	√											
CLO14	√											
CLO15	√											
CLO16	√											
CLO17	√											
CLO18	√											
CLO19	√											
CLO20	√											