Module Handbook

Module Name:	Mathematical Physics I
Module Level:	Bachelor
Abbreviation, if applicable:	FI 2101
Sub-heading, if applicable:	
Courses included in the module, if applicable:	
Semester/term:	3/ second year
Module coordinator(s):	
Lecturer(s):	
Language:	Bahasa Indonesia
Classification within the curriculum:	~~General Studies~~ / Major Subject / ~~Elective Studies~~
Teaching format / class hours per week during the semester:	4 hours lecture
Workload:	4 hours lectures, 8 hours individual study, 16 weeks per semester, and total 192 hours a semester
Credit Points:	4
Requirements:	Mathematics IA, Mathematics IIA, Elementary Physics IA, Elementary Physics IIA
Learning goals:	**Knowledge:** 1. Demonstrate knowledge of various mathematical tools, their significances in physics and their properties, including complex numbers, vector space, matrices, calculus of partial derivatives, multiple integrals, vector analysis, Fourier analysis, ordinary differential equations, and integral transforms. **Skill:** 1. Ability to apply the mathematical tools to solve basic and simple/straightforward problems 2. Ability to apply the mathematical tools to solve multiple concepts (but not overtly complex nor open) problems 3. Ability to identify and/or formulate the right mathematical models for the given physical problems in mechanics, electricity and magnetism, thermodynamics, quantum mechanics, relativity 4. Ability to apply the mathematical tools to solve various physical problems in mechanics, electricity and magnetism, thermodynamics, quantum mechanics, and relativity
Content:	Complex Numbers: Cartesian representation, polar representation, operations with complex numbers, de Moivre's theorem, complex numbers functions (logarithmic and rank, the root of unity), hyperbolic functions Systems of Linear Equations: representation of matrices and vectors, Gauss elimination, the system of homogeneous and nonhomogeneous equations, Vector Spaces: the definition of a vector space, linear combination, basis, independent vector, a row / column, a multiplication in the vector orthogonal / orthonormal, ortogonalisasi Gram-Schmidt Matrix: rank, special matrices, matrix operations, determinants, matrix inverse, Linear transformations: matrix representation, null space, a result, rank-nullity theorem, change of basis, similarity transformation, eigenvalues: vectors and eigenvalues, diagonalization of matrices, the principal angles, quadratic forms, eigenvalues application to the solution of differential equations coupled, 3-d vector: vector operations in 3 dimensions, line equations, the field equations in 3-d,

	Partial derivatives: properties of partial derivatives, chain rule, implicit derivatives, optimization, optimization with constraints (Lagrange multiplier), Leibniz theorem Multiple Integral: area, volume, orthogonal coordinate systems, Jacobians, vector analysis: operators grad, div, curl, terorema Green, the divergence theorem, Stokes theorem, vector analysis in curvilinear coordinate systems, Ordinary Differential Equations: first-order differential equations, Bernoulli equation, second order differential equations with constant coefficients, Laplace transform, Fourier series and Fourier transform: Fourier coefficients, the complex Fourier series, Fourier transform properties, functions odd / even, convolution / deconvolution, Dirac delta function, Parseval theorem, DFT, transformation Fourier in high dimensions.
Study/exam achievements:	Students are considered to be competent and pass if at least get 50% of maximum mark of the exams, homework, quizes
Forms of Media:	Slides and LCD projectors, blackboards
Literature:	1. Boas, M. L., Mathematical Methods in the Physical Sciences, 3rd ed., John Wiley, 2005. 2. Arfken, G. B. dan Weber, H.J., Mathematical Methods for Physicist, 5th ed., Academic Press, 1995.
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