UNIVERSITAS GADJAH MADA
Faculty of Mathematics and Natural Sciences
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Doctoral Program in Mathematics

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MODULE HANDBOOK
Doctoral in Mathematics

Module name:	**Teori Optimisasi (*Optimization Theory*)**
Module level, if applicable:	Doctoral Program
Code, if applicable:	MMM 5301
Semester(s) in which the module is taught:	-
Person responsible for the module:	Chair of Applied Mathematics Research Group
Lecturer(s):	Salmah
Language:	Bahasa Indonesia
Relation to curriculum:	Doctoral Degree in Mathematics, Compulsory / Elective Course
Credit points:	3 Semester Credit Unit
Type of teaching, contact hours:	3x50 minutes lectures, 3x60 minutes structured activities.
Workload:	• 3x50 minutes lectures, • 3x60 minutes structured activities, • 3x60 minutes individual study, • In 16 weeks per semester (including assignments and examinations)
Recommended prerequisites:	-
Module objectives/intended learning outcomes:	On successful completion of this course, students should be able to: CO 1: to recognize basic concept in non linear optimization problems such as convex set, convex function, quasiconvex function and theorems related to optimization problems with convex functions and quasiconvex function. CO2. to solve optimization problems analitically such as optimization problem without constraints, optimization problem with equation constraints, and optimization problems with inequality constraints. CO3. to solve optimization problem numerically. CO4. To relate between the theory and applications of optimization problem, and to interpret the solutions. CO5. To recognize about introduction to advance theories in optimization.
Content:	Nonlinear optimization especially convex optimization and numerical method to solve optimization problem Syllabi: Topics include Euclidean space, convex sets, convex functions, quadratic forms, real functions, gradient, directional derivative, local and global extrema, unconstrained extrema, constrained extrema with equation by Lagrange multiplier, constrained extrema with inequality by Kuhn-Tucker theory, numerical methods: direct search, gradient method, Newton-Raphson method, numerical method for n-dimensional problem, numerical method for constrained extrema problem, application of optimization theories to simple real problems, introduction to advance theories of optimization such as: convex functions with nonconvex domains, quasiconvex functions, optimization for nondifferentiable functions, multi objective optimization,

	numerical methods for global optimizations, application of optimization theories on linear quadratic optimal control problems.
Study and examination requirements and forms of examination:	The final mark will be weighted as follows: No Assessment methods (components, activities) Weight (percentage) 1 Final Examination 40% 2 Mid-Term Examination 30% 3 Class Activities: Quiz, Homework, etc 30% Final grade will be determined as follows: Grade Criteria The initial cut-off points for grades A, B, C, and D should not be less than 80%, 65%, 50%, and 40%, respectively.
Media employed:	Board, LCD Projector, Laptop/Computer
Reading List:	1. Boyd, S., Vandenberghe, L., 2004, *Convex Optimization,* Cambridge University Press. 2. Edwin K.P. Chong, dan Stanislaw H. Zak, 1996, *An Introduction to Optimization*, John Wiley & Sons. 3. Mokhtar S Bazaraa, Hanif D. Sherali, C.M.Shetty, 2006, *Nonlinear Programming. Theory andAlgorithms* 3rd Edition, John Wiley and Sons. 4. Mital, K.V., 1993, *Optimization Methods in Operations Research and Analysis*, Wiley Eastern Ltd.

Mapping of The COs and PLOs

	PLO – 1 S3 Mat	PLO – 2 S3 Mat	PLO – 3 S3 Mat	PLO – 4 S3 Mat	PLO – 5 S3 Mat	PLO –6 S3 Mat
CO 2	√	√				
CO 3	√	√				
CO 4	√	√				
CO 5	√	√			√	√
CO 6	√	√	√	√		√

Programme Learning Outcomes (PLO) Doctoral Programme in Mathematics

PLO-1	:	**Attitude:** Devote to God Almighty, uphold the humanity values, internalize academic values and ethics, responsible in working in the area of expertise independently.
PLO-2	:	**Knowledge:** Mastering philosophy of mathematics and one of the fields in mathematics (algebra, analysis, applied mathematics, statistics, computational mathematics, computational statistics).
PLO-3	:	**Knowledge:** Able to think logically, analytically, inductively, deductively, and structured; having the ability to manage, lead, and develop research programs independently, and able to communicate the thoughts as well as his work to the scientific community and the general public.
PLO-4	:	**Skill:** Creating new concepts and / or new methods (original) in the field of mathematics that are recognized nationally and internationally.
PLO-5	:	**Skill:**

		Able to apply mathematics according to their field of expertise to solve problems including those that require a multidisciplinary, cross-disciplinary, or trans-disciplinary approach.
PLO-6	:	***Life Long Learning:*** Having lifelong learning skills and adaptive to the development of science and technology, especially in fields related to Mathematics and its applications.