



# UNIVERSITAS GADJAH MADA

Faculty of Mathematics and Natural Sciences

Mathematics Department

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Doctor in Mathematics

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## MODULE HANDBOOK

Module name	Matrix Theory												
Module level, if applicable	Doctor												
Code, if applicable	MMM-7205												
Subtitle, if applicable													
Courses, if applicable	Matrix Theory												
Semester(s) in which the module is taught	2												
Person responsible for the module	Algebra Research Group												
Lecturer(s)	Dr. rer.nat. Ari Suparwanto, M.Si. Dr. Sutopo, M.Si.												
Language	Bahasa Indonesia												
Relation to curriculum	Doctor Degree, Elective Course												
Teaching methods	Lecture, discussion, presentations, homework etc.												
Workload	Total workload is 136 hours per semester, which consists of 150 minutes lectures per week for 14 weeks, 180 minutes structured activities per week, 180 minutes individual study per week, in total is 16 weeks per semester, including mid exam and final exam.												
Credit points	3 Credits												
Requirements according to the examination regulations	Students have an examination card where the course is stated on.												
Recommended prerequisites	Students should be proficient in linear algebra.												
Module objectives/intended learning outcomes	On successful completion of this course, students should be able to: CO 1 explain various advanced concepts and techniques in matrix theory CO 2 utilize matrices as a tool to solve problems mathematics; CO 3 Apply basic matrix techniques in various fields such as mathematics, statistics, physics, computer science, and engineering, etc.												
Content	a. Partitioned Matrices: Elementary Operations of Partitioned Matrices, The Determinant and Inverse of Partitioned Matrices, The Rank of Product and Sum, The Eigenvalues of $AB$ b. Matrix Functions c. Matrix Norms d. Matrix Decompositions: Schur Decomposition, Spectral Decomposition, Singular Value Decomposition, Polar Decomposition, Jordan Canonical Forms. e. Special Types of Matrices: Idempotent matrices, nilpotent matrices, involutory matrices, projection matrices, tridiagonal matrices, circulant matrices, Vandermonde matrices, Hadamard matrices, permutation matrices, doubly stochastic matrices, and nonnegative matrices.,												
Study and examination requirements and forms of examination	The final mark will be weighted as follows: <table border="1" style="display: inline-table; vertical-align: top;"> <thead> <tr> <th>No</th> <th>Assessment methods (components, activities)</th> <th>Weight (percentage)</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>Final Examination</td> <td>25-40%</td> </tr> <tr> <td>2.</td> <td>Mid-Term Examination</td> <td>25-40%</td> </tr> <tr> <td>3.</td> <td>Quiz/Presentation, Homework</td> <td>20-30%</td> </tr> </tbody> </table> To pass the course, the minimum grade is B	No	Assessment methods (components, activities)	Weight (percentage)	1.	Final Examination	25-40%	2.	Mid-Term Examination	25-40%	3.	Quiz/Presentation, Homework	20-30%
No	Assessment methods (components, activities)	Weight (percentage)											
1.	Final Examination	25-40%											
2.	Mid-Term Examination	25-40%											
3.	Quiz/Presentation, Homework	20-30%											
Media employed	White/Black Board, LCD Projector, Laptop/Computer, Zoom, E-Learning, Simaster												
Reading List	1. Nicholson, W.K., 2019, <i>Linear Algebra with Applications</i> , Base Textbook, Version 2019 – Revision A												

	2. Zhang, F, 2011, <i>Matrix Theory</i> , Second Edition, Springer, Linear Park, Davie, Florida, USA
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**PLO and CO Mapping**

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6	PLO 7	PLO 8	PLO 9
CO 1		v	v	v	v				
CO 2	v			v	v	v			
CO 3		v	v	v	v	v			

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