



# UNIVERSITAS GADJAH MADA

Faculty of Mathematics and Natural Sciences

Mathematics Department

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## Doctoral Program in Mathematics

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MODULE HANDBOOK

Doctoral in Mathematics

<b>Module name:</b>	Matrix Analysis
<b>Module level, if applicable:</b>	Doctoral Program
<b>Code, if applicable:</b>	MMM 7203
<b>Semester(s) in which the module is taught:</b>	First Year
<b>Person responsible for the module:</b>	Ari Suparwanto
<b>Lecturer(s):</b>	All eligible lecturers
<b>Language:</b>	Bahasa Indonesia
<b>Relation to curriculum:</b>	Doctor Degree in Mathematics, Elective Courses
<b>Credit points:</b>	3
<b>Type of teaching, contact hours:</b>	3x50 minutes lectures, 3x50 minutes structured activities.
<b>Workload:</b>	<ul style="list-style-type: none"><li>• 3x50 minutes lectures,</li><li>• 3x50 minutes structured activities,</li><li>• 3x50 minutes individual study,</li><li>• In 16 weeks per semester (including mid-term and final examinations).</li><li>• Total: 144x50 minutes per semester.</li></ul>
<b>Requirements according to the examination regulations:</b>	NONE
<b>Recommended prerequisites:</b>	Before taking this course, the students must have a good understanding the basic concept of matrix algebra and their properties such as <ul style="list-style-type: none"><li>• be familiar enough with matrix analysis and linear algebra that they can effectively use the tools and ideas of these fundamental subjects in a variety of applications,</li><li>• understand some special matrices and their properties.</li><li>• understand the importance of spectral decomposition, Schur decomposition, Jordan canonical form and singular value decomposition,</li><li>• understand the role of matrix functions in solving differential and algebraic equations,</li></ul>
<b>Module objectives/intended learning outcomes:</b>	On satisfying the requirements of this course, students will have the knowledge and skills to: CO-1: Demonstrate understanding of the ability to work within various analysis of matrices. CO-2: Demonstrate understanding of the importance of algebraic properties with regard to working within various systems of matrix operations. CO-3: Demonstrate ability to form and evaluate conjectures in area of advanced matrix analysis CO-4. Develop specific skills, competencies and thought processes sufficient to support further study or work in this or related fields.
<b>Content:</b>	<ul style="list-style-type: none"><li>• This course introduces students to key concepts and techniques in advanced matrix algebra.</li><li>• Topics will be taken from contemporary research areas in matrix theory</li><li>• This course consist of the core and advanced courses from matrix theory.</li><li>• It will be a bridge for the student to enter on new research area in matrix theory.</li></ul>

	<ul style="list-style-type: none"> <li>The course is offered to accommodate the development of new research topic in matrix theory and related topics.</li> <li>The topics and also the syllabus will be decided related to the research topics of the student.</li> </ul>															
<b>Study and examination requirements and forms of examination:</b>	<p>The final mark will be weighted as follows:</p> <table border="1"> <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>35%</td> </tr> <tr> <td>2</td> <td>Mid-Term Examination</td> <td>30%</td> </tr> <tr> <td>3</td> <td>Projects</td> <td>25%</td> </tr> <tr> <td>4</td> <td>Peer Assessment/Quiz</td> <td>10%</td> </tr> </tbody> </table> <p>Final grade will be determined as follows:</p> <p>Grade Criteria</p> <p>A : <math>95 \leq \text{final mark} \leq 100</math>  A- : <math>90 \leq \text{final mark} &lt; 95</math>  A/B : <math>85 \leq \text{final mark} &lt; 90</math>  B+ : <math>78 \leq \text{final mark} &lt; 85</math>  B : <math>70 \leq \text{final mark} &lt; 78</math>  B- : <math>65 \leq \text{final mark} &lt; 70</math>  B/C : <math>60 \leq \text{final mark} &lt; 65</math>  C+ : <math>54 \leq \text{final mark} &lt; 60</math>  C : <math>48 \leq \text{final mark} &lt; 54</math>  C- : <math>40 \leq \text{final mark} &lt; 48</math>  C/D : <math>35 \leq \text{final mark} &lt; 40</math>  D+ : <math>30 \leq \text{final mark} &lt; 35</math>  D : <math>25 \leq \text{final mark} &lt; 30</math>  E : final mark &lt; 25</p>	No	Assessment methods (components, activities)	Weight (percentage)	1	Final Examination	35%	2	Mid-Term Examination	30%	3	Projects	25%	4	Peer Assessment/Quiz	10%
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<b>Media employed:</b>	White/Black Board, LCD Projector, Laptop/Computer															
<b>Reading List:</b>	The reading list will be announced by the lecturer on the first meeting.															

### 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 1		v	v		v	
CO 2		v	v		v	
CO 3				v		v
CO 4	v			v	v	v

### Programme Learning Outcomes (PLO) Doctoral Programme in Mathematics

<b>PLO-1</b>	<b>:</b>	<b>Attitude:</b>  Devote to God Almighty, uphold the humanity values, internalize academic values and ethics, responsible in working in the area of expertise independently.
<b>PLO-2</b>	<b>:</b>	<b>Knowledge:</b>  Mastering philosophy of mathematics and one of the fields in mathematics (algebra, analysis, applied mathematics, statistics, computational mathematics, computational statistics).
<b>PLO-3</b>	<b>:</b>	<b>Knowledge:</b>  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.

<b>PLO-4</b>	:	<b>Skill:</b> Creating new concepts and / or new methods (original) in the field of mathematics that are recognized nationally and internationally.
<b>PLO-5</b>	:	<b>Skill:</b> 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.
<b>PLO-6</b>	:	<b><i>Life Long Learning:</i></b> Having lifelong learning skills and adaptive to the development of science and technology, especially in fields related to Mathematics and its applications.