



# 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>	Operator Theory															
<b>Module level, if applicable:</b>	Doctoral Program															
<b>Code, if applicable:</b>	MMM6104															
<b>Semester(s) in which the module is taught:</b>	1/2															
<b>Person responsible for the module:</b>	Chair of Analysis Research Group															
<b>Lecturer(s):</b>	1. Prof. Dr. Supama, M.Si.															
<b>Language:</b>	Indonesian															
<b>Relation to curriculum:</b>	Doctoral Degree in Mathematics, Compulsory / Elective Course															
<b>Credit points:</b>	3 Semester Credit Unit															
<b>Type of teaching, contact hours:</b>	3x50 minutes lectures, 3x60 minutes structured activities.															
<b>Workload:</b>	<ul style="list-style-type: none"> <li>• 3x50 minutes lectures,</li> <li>• 3x60 minutes structured activities,</li> <li>• 3x60 minutes individual study,</li> <li>• In 16 weeks per semester (including assignments and examinations)</li> </ul>															
<b>Recommended prerequisites:</b>	Functional Analysis															
<b>Module objectives/intended learning outcomes:</b>	<p>On successful completion of this course, students should be able to:</p> <p>CO 1: analyze linear operators and their adjoint.</p> <p>CO 2: analyze closed linear operators.</p> <p>CO 3: analyze some special linear operators.</p> <p>CO 4: analyze some spectral theorem.</p>															
<b>Content:</b>	<p>Syllabi:</p> <p>Linear operators and their adjoint: bounded linear operators and functionals, isomorphism and completeness, adjoint, Theorem of Banach-Steinhaus, strong and weak convergence, projection.</p> <p>Closed Linear Operator: closed and closable operator, Closed Graph Theorem, symmetric and self adjoint operator, normal operator.</p> <p>Special classes of linear operators: finite rank and compact operator, Hilbert Schmidt and Carleman operators, matrix and integral operators, differential operators on the Lebesgue space.</p> <p>Spectral theory.</p>															
<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>Task 1</td> <td>25%</td> </tr> <tr> <td>2</td> <td>Task 2</td> <td>25%</td> </tr> <tr> <td>3</td> <td>Task 3</td> <td>25%</td> </tr> <tr> <td>4</td> <td>Task 4</td> <td>25%</td> </tr> </tbody> </table>	No	Assessment methods (components, activities)	Weight (percentage)	1	Task 1	25%	2	Task 2	25%	3	Task 3	25%	4	Task 4	25%
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1	Task 1	25%														
2	Task 2	25%														
3	Task 3	25%														
4	Task 4	25%														

	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.
<b>Media employed:</b>	Whiteboard
<b>Reading List:</b>	1. Joachim Weidmann, 1980, Linear Operators in Hilbert Spaces, Springer-Verlag. 2. .... 3. ....

**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	v	
CO 2		v	v	v	v	
CO 3		v	v	v	v	
CO 4		v	v	v	v	

Programme Learning Outcomes (PLO) Doctoral Programme in Mathematics

<b>PLO-1</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>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>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>Life Long Learning:</b> Having lifelong learning skills and adaptive to the development of science and technology, especially in fields related to Mathematics and its applications.