



# 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>	Numerical Analysis ( <i>Analisis Numerik</i> )												
<b>Module level, if applicable:</b>	Doctoral Program												
<b>Code, if applicable:</b>	MMM 7306												
<b>Semester(s) in which the module is taught:</b>	I (first year)												
<b>Person responsible for the module:</b>	Chair of Applied Mathematics Research Group												
<b>Lecturer(s):</b>	All eligible lecturers												
<b>Language:</b>	Bahasa Indonesia												
<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>	Before taking this course, it is better that students have understood very well some concepts on Functional Analysis.												
<b>Module objectives/intended learning outcomes:</b>	After completing this course the students should be able to <ul style="list-style-type: none"><li>• CO 1. Work in numerical analysis from a theoretical perspective.</li><li>• CO 2. Overcome the preliminary problem and prepare a manuscript for publication</li></ul>												
<b>Content:</b>	Introduction. Approximation Theory: Interpolation Theory, Best Approximation, Uniform error bounds. Iterative Methods for non linear equations: The Banach fixed point theorem and its application to iterative methods, Newton's Method in Banach Space and its Application. Finite Difference Method: Finite difference approximation, Lax Equivalence theorem. Additional numerical methods which are necessary to overcome problems related to the topic dissertation. Project: Application to the problem, a manuscript for publication.												
<b>Study and examination requirements and forms of examination:</b>	The final mark will be weighted as follows: <table><thead><tr><th>No</th><th>Assessment methods (components, activities)</th><th>Weight (percentage)</th></tr></thead><tbody><tr><td>1</td><td>Manuscript for Publication</td><td>40%</td></tr><tr><td>2</td><td>Examination/Presentation</td><td>30%</td></tr><tr><td>3</td><td>Other Activities: Homeworks etc.</td><td>30%</td></tr></tbody></table> <p>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.</p>	No	Assessment methods (components, activities)	Weight (percentage)	1	Manuscript for Publication	40%	2	Examination/Presentation	30%	3	Other Activities: Homeworks etc.	30%
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1	Manuscript for Publication	40%											
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3	Other Activities: Homeworks etc.	30%											

<b>Media employed:</b>	Board, LCD Projector, Laptop/Computer
<b>Reading List:</b>	<ol style="list-style-type: none"> <li>1. Atkinson K., and Weimin H., 2001, <i>Theoretical Numerical Analysis, A Functional Analysis Framework</i>,   Springer-Verlag, New York.</li> <li>2. Other text books or articles on Numerical Analysis related to the topic of dissertation.</li> </ol>

### 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	

#### 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>:</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>:</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>:</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.