



# UNIVERSITAS GADJAH MADA

Faculty of Mathematics and Natural Sciences

Mathematics Department

Sekip Utara Bulaksumur Yogyakarta 55281 Telp: +62 274 552243 Fax: +62 274 555131 Email: [math@ugm.ac.id](mailto:math@ugm.ac.id) Website: [matematika.fmipa.ugm.ac.id](http://matematika.fmipa.ugm.ac.id)

## Doctoral Program in Mathematics

Telp : +62 274 552243

Email : [maths3@ugm.ac.id](mailto:maths3@ugm.ac.id);

Website : <http://math.fmipa.ugm.ac.id/dpmath>

MODULE HANDBOOK

Doctoral in Mathematics

<b>Module name:</b>	Fuzzy Functional Analysis															
<b>Module level, if applicable:</b>	Doctoral Program															
<b>Code, if applicable:</b>	MMM 7102															
<b>Semester(s) in which the module is taught:</b>	1 <sup>st</sup> (first) or 2 <sup>nd</sup> (second)															
<b>Person responsible for the module:</b>	Chair of Analysis Research Group															
<b>Lecturer(s):</b>	Prof. Dr. Ch. Rini Indrati, M.Si.															
<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>	Students have learned Theory of Fuzzy and Normed Space or Metric Space. For students who work on Fuzzy Optimization have to take Optimization Theory. Students, who work on differential equation or integral equation, have to learn at least theory of the Riemann integral.															
<b>Module objectives/intended learning outcomes:</b>	After completing this course the students have ability to : CO 1. make generalization or abstraction, especially some properties of fuzzy numbers, some concepts and properties in normed space and metric space. CO 2. analyze some properties that may not hold in fuzzy system.															
<b>Content:</b>	It depends on the topic of the students' research. It contains Fuzzy number and its characteristics, inequality, Fuzzy Banach Space or fuzzy metric space, continuous $t$ -norms, sequence, open mapping theorem,															
<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>30%</td> </tr> <tr> <td>2</td> <td>Mid-Term Examination</td> <td>30%</td> </tr> <tr> <td>3</td> <td>Class Activities: Presentation and Quiz</td> <td>25%</td> </tr> <tr> <td>4.</td> <td>Homework</td> <td>15%</td> </tr> </tbody> </table> <p>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	Final Examination	30%	2	Mid-Term Examination	30%	3	Class Activities: Presentation and Quiz	25%	4.	Homework	15%
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1	Final Examination	30%														
2	Mid-Term Examination	30%														
3	Class Activities: Presentation and Quiz	25%														
4.	Homework	15%														
<b>Media employed:</b>	Board, LCD Projector, Laptop/Computer															
<b>Reading List:</b>	1. George Bachman and Lawrence Narici, 2012, "Functional Analysis", 2 <sup>nd</sup> edition, Dover Singapore															

	<ol style="list-style-type: none"> <li>2. Conway, J.B., 2007, "A Course in Functional Analysis", Springer Verlag, New York.</li> <li>3. Royden, H.L. and Fitzpatrick, P.M., 2010, "Real Analysis", Chino Mochino Press, 4<sup>th</sup> Edition.</li> <li>4. George, A. and Veeramani, P., 1977 On Some Result of Analysis for Fuzzy Metric Spaces, Fuzzy Sets and Systems, Elsevier, 90 (1997), 365 – 368.</li> <li>5. R. Saadati and S. M. Vaezpour, 2005, Some Results On Fuzzy Banach Spaces, J. Appl. Math. &amp; Computing Vol. 17(2005), No. 1 - 2, pp. 475 - 484.</li> </ol>
	1.

### 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			
CO 2		v	v	v	v	

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

<b>PLO-1</b>	:	<p><b>Attitude:</b></p> <p>Devote to God Almighty, uphold the humanity values, internalize academic values and ethics, responsible in working in the area of expertise independently.</p>
<b>PLO-2</b>	:	<p><b>Knowledge:</b></p> <p>Mastering philosophy of mathematics and one of the fields in mathematics (algebra, analysis, applied mathematics, statistics, computational mathematics, computational statistics).</p>
<b>PLO-3</b>	:	<p><b>Knowledge:</b></p> <p>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.</p>
<b>PLO-4</b>	:	<p><b>Skill:</b></p> <p>Creating new concepts and / or new methods (original) in the field of mathematics that are recognized nationally and internationally.</p>
<b>PLO-5</b>	:	<p><b>Skill:</b></p> <p>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.</p>
<b>PLO-6</b>	:	<p><b>Life Long Learning:</b></p> <p>Having lifelong learning skills and adaptive to the development of science and technology, especially in fields related to Mathematics and its applications.</p>