



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

Module name:	Category Theory and Functors												
Module level, if applicable:	Doctoral Program												
Code, if applicable:	MMM 6203												
Semester(s) in which the module is taught:	Odd semester												
Person responsible for the module:	Chair of Algebra Research Group												
Lecturer(s):	Prof. Dr. Indah Emilia Wijayanti, M.Si.												
Language:	Bahasa Indonesia												
Relation to curriculum:	Doctoral Degree in Mathematics, Compulsory / Elective Course												
Credit points:	3 Semester Credit Unit												
Type of teaching, contact hours:	3x50 minutes lectures, 3x60 minutes structured activities.												
Workload:	<ul style="list-style-type: none"> • 3x50 minutes lectures, • 3x60 minutes structured activities, • 3x60 minutes individual study, • In 16 weeks per semester (including assignments and examinations) 												
Recommended prerequisites:	Module theory, Algebraic structure												
Module objectives/intended learning outcomes:	<p>On successful completion of this course, students should be able to:</p> <p>CO 1 : recognize the fundamental properties of categories and functors</p> <p>CO 2 : recognize the concept of dualization to objects and morphisms in categories</p> <p>CO 3 : recognize the concept of natural transformation</p> <p>CO 4 : recognize the concept of equivalence of categories</p>												
Content:	<ol style="list-style-type: none"> 1. Category and subcategory 2. Special objects and special morphisms 3. Product and coproduct in category 4. Kernel and cokernel in category 5. Pullback and pushout 6. Equilizer and coequilizer 7. Covariant and contravariant functors 8. Natural transformation 9. Equivalence of categories 												
Study and examination requirements and forms of examination:	<p>The final mark will be computed from a proportional weight of assignments, mid examination and final examination. 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>40%</td> </tr> <tr> <td>2</td> <td>Mid-Term Examination</td> <td>30%</td> </tr> <tr> <td>3</td> <td>Class Activities: Quiz, Homework, etc</td> <td>30%</td> </tr> </tbody> </table>	No	Assessment methods (components, activities)	Weight (percentage)	1	Final Examination	40%	2	Mid-Term Examination	30%	3	Class Activities: Quiz, Homework, etc	30%
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1	Final Examination	40%											
2	Mid-Term Examination	30%											
3	Class Activities: Quiz, Homework, etc	30%											
Media employed:	Boards, projectors.												
Reading List:	<ol style="list-style-type: none"> 1. Anderson, F.W., Fuller, K.R., 1992, Rings and Categories of Modules, Springer Verlag, New York. 												

	2. Awodey, S., 2006, Category Theory, Clarendon Press, Oxford. 3. Schubert, H., 1972, Categories, Springer Verlag, Berlin. 4. Wisbauer, R., 1991, Foundation of Module and Ring Theory, Gordon and Breach, Philadelphia.
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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		V	
CO 4		V	V		V	

Programme Learning Outcomes (PLO) Doctoral Programme in Mathematics

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