



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:	Topology
Module level, if applicable:	Doctoral Program
Code, if applicable:	MMM 5106
Semester(s) in which the module is taught:	1 st (first) or 2 nd (second)
Person responsible for the module:	Chair of Analysis Research Group
Lecturer(s):	All eligible lectures
Language:	Indonesian
Relation to curriculum:	Doctoral Degree in Mathematics, 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:	Before taking this course, students must have a good background of rigorous analysis and set theory.
Module objectives/intended learning outcomes:	After completing this course, the students should have: <ul style="list-style-type: none">• CO 1. Ability to understand and analyze some general topological structures and use them to solve problems in a broad variety of mathematical disciplines.• CO 2. Ability to understand and analyze the product topology and use them to solve problems in a broad variety of mathematical disciplines.• CO 3. Ability to understand and analyze the connectedness in topological spaces and used them in a broad variety of mathematical disciplines.• CO 4. Ability to understand and analyze the properties on separation axioms and use them to solve problems in mathematical analysis.• CO 5. Ability to understand and analyze on covering axioms and use them to solve problems in a broad variety of mathematical disciplines.
Content:	<ol style="list-style-type: none">1. General concepts in topological spaces : definition of topological spaces, neighborhood, basis and subbasis, closed sets, derived sets and closure, subspaces, continuous functions, and homeomorphism.2. Product topology, box topology, continuous functions on product topology.3. Connectedness, local connectedness, and path-connectedness.4. Separation axioms : Hausdorff spaces, regular spaces, normal spaces, and completely regular spaces.

	5. Covering of spaces : compactness, separability, second countable spaces, Lindelof spaces.												
Study and examination requirements and forms of examination:	<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>40%</td> </tr> <tr> <td>2</td> <td>Mid-term examination</td> <td>30%</td> </tr> <tr> <td>3</td> <td>Other activities : presentation, homework, 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 85%, 65%, 50%, and 40%, respectively.</p>	No	Assessment methods (components, activities)	Weight (percentage)	1	Final examination.	40%	2	Mid-term examination	30%	3	Other activities : presentation, homework, etc.	30%
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1	Final examination.	40%											
2	Mid-term examination	30%											
3	Other activities : presentation, homework, etc.	30%											
Media employed:	Board, LCD Projector, Laptop/ Computer.												
Reading List:	<ol style="list-style-type: none"> 1. J. Dugundji, Topology, Allyn and Bacon Inc. Boston, 1966. 2. R. Engelking, General Topology, Heldermann Verlag, Berlin, 1989. 3. J.L. Kelley, General Topology, Spinger-Verlag, New York, 1975. 4. J.R. Munkres, Topology, Prentice Hall Inc, New Jersey, 2000. 												

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	V
CO 3		V	V		V	V
CO 4		V	V	V		V
CO 5		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.
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