



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:	Theory of Partial Differential Equation																
Module level, if applicable:	Doctoral Program																
Code, if applicable:	MMM 7304																
Semester(s) in which the module is taught:	1 st (first) year																
Person responsible for the module:	Chair of Applied Mathematics Research Group																
Lecturer(s):	Assigned Lecturer(s)																
Language:	Bahasa Indonesia																
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:	Students have learned integral, introduction to partial differential equations, metric space or normed space, and continuous linear mapping.																
Module objectives/intended learning outcomes:	<p>On successful completion of this course, students should be able to:</p> <p>CO 1. prove some properties in Sobolev space.</p> <p>CO 2. analyze some properties of coercive and closed operator in boundary value problems.</p> <p>CO 3. analyze the existence and uniqueness of solution of the first evolution problem, especially the Cauchy problem.</p> <p>CO 4. analyze the existence and uniqueness of solution of the second evolution problem and implicit evolution.</p>																
Content:	<ol style="list-style-type: none"> 1. Elements of Hilbert Space: Hilbert space, L_p, and Dual operators. 2. Distribution and Sobolev Space: Distributions, Sobolev Space, Trace, Imbedding Theorem, Density, and compactness. 3. Boundary Value problems: Operator, Abstract Boundary Value Problems, Coercivity, Regularity, closed operator, adjoint. 4. Evolution Equations: First Order (The Cauchy Problem, Generation of Semigroups, Accretive operators, generation of groups, analytic semigroups), Implicit, and second order. 																
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>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>		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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	The initial cut-off points for grades A, B, C, and D should not be less than 80%, 65%, 50%, and 40%, respectively.
Media employed:	Board, LCD Projector, Laptop/Computer
Reading List:	<ol style="list-style-type: none"> 1. Erich Zauderer, 1983, Partial Differential Equations of Applied Mathematics, John Wiley and Sons, New York. 2. R.E. Sholwater 1994, "Hilbert Space Methods for Partial Differential Equations", Electronic journal of Differential Equations Monograph 01, Austin, Texas. 3. Conway, J.B., 2007, "A Course in Functional Analysis", Springer Verlag, New York.

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.