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Faculty of Mathematics and Natural Sciences
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Doctoral Program in Mathematics

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MODULE HANDBOOK
Doctoral in Mathematics

Module name:	Theory of Measure and Integration
Module level, if applicable:	Doctoral Program
Code, if applicable:	MMM 7101
Semester(s) in which the module is taught:	1st (first) or 2nd (second)
Person responsible for the module:	Chair of Analysis Research Group
Lecturer(s):	Prof. Dr. Ch. Rini Indrati, M.Si.
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:	• 3x50 minutes lectures, • 3x60 minutes structured activities, • 3x60 minutes individual study, • In 16 weeks per semester (including assignments and examinations)
Recommended prerequisites:	Student has learned the Riemann integral and it will be better if the student has learned the Lebesgue measure.
Module objectives/intended learning outcomes:	After completing this course the students have ability to: CO 1. construct an outer measure and Carathéodory which is induced by a measure. CO 2. prove and develop some properties of measurable functions. CO. 3 prove and develop some properties of the integral of measurable functions.
Content:	• Measure space: algebra of sets and σ-algebra of sets, measurable set, measure, and measure space. • Outer measure μ*: dcefinition of an outer measure μ*, μ*-measurable sets, outer measure which is induced by a measure, Carathéodory measure which is induced by a measure. • Measurable functions: definition of measurable functions and its properties, simple functions. • Integral of non-negative measurable functions: integral of non-negative simple functions, Fatou's Lemma, dominated convergence theorem, Beppo-Levi Theorem. • Integral of measurable functions: definition of the integral of measurable function, dominated convergence theorem, and Vitali's convergence theorem.
Study and examination requirements and forms of examination:	The final mark will be weighted as follows: 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%

	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:	1. Halmos, P. R., 1970, *Measure Theory*, Springer-Verlag, New-York. 2. Royden, H.L. and Fitzpatrick, P.M., 2010, *Real Analysis*, Edisi ke-4, Pearson Education, Inc. 3. Wheeden, R.L. and Zygmund, A., 1977, Measure and Integral, Marcel Dekker Inc., 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

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.