UNIVERSITAS GADJAH MADA
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:	Stochastic Calculus
Module level, if applicable:	Doctoral
Code, if applicable:	MMM 7404
Semester(s) in which the module is taught:	1st (first) year
Person responsible for the module:	Chair of Statustucs Research Group
Lecturer(s):	Dr. Gunardi, 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:	3 hours lectures, 3 hours structured activities, 3 hours individual study, 16 weeks per semester (including mid-term and final examinations), 144 hours per semester.
Recommended prerequisites:	Students have learned Mathematical Statistics and Stochastic Processes
Module objectives/intended learning outcomes:	After completing this course the students have ability to use : CO 1. Ito integral for simple integrand. CO 2. Ito integral for general integrand. CO 3. Ito – Doublin formula. CO 4. Multivariable Stochastics Calculus.
Content:	1. Construction of the integral and properties of the integral 2. Ito – doublin formula for Brownian motion and Ito Processes 3. Multiple Brownian Motion 4. Ito – doublin formula for Multiple Processes
Study and examination requirements and forms of examination:	The final mark will be weighted as follows: No — Assessment methods (components, activities) — Weight (percentage) 1 — Formulation the originality of research problem — 25% 2 — Formulation the theoritical framework — 25% 3 — Formulation the conjecture and metodhology — 20% 4 — Presentation — 30% Final grade will be determined as follows: Grade Criteria A : $95 \leq$ final mark ≤ 100 A- : $90 \leq$ final mark < 95 A/B : $85 \leq$ final mark < 90 B+ : $78 \leq$ final mark < 85 B : $70 \leq$ final mark < 78 B- : $65 \leq$ final mark < 70

	B/C : $60 \leq$ final mark < 65 C+ : $54 \leq$ final mark < 60 C : $48 \leq$ final mark < 54 C- : $40 \leq$ final mark < 48 C/D : $35 \leq$ final mark < 40 D+ : $30 \leq$ final mark < 35 D : $25 \leq$ final mark < 30 E : final mark < 25
Media employed:	Board, LCD Projector, Laptop/Computer
Reading List:	1. McCauley, J.L., 2013, Stochastic Calculus and Differential Equation for Physic and Finance, Cambridge University Press, New York 2. Shreve, S.E., 2004, Stochastic Calculus for Finance II, Springer, 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		**v**	
CO 2	v	v	v		**v**	
CO 3	v	v	v		**v**	
CO 4	v	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.