UNIVERSITAS GADJAH MADA
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Doctor in Mathematics

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MODULE HANDBOOK

Module name:	*Topics in Financial Statistics and Actuarial Science B*
Code, if applicable:	MMM 7423
Subtitle, if applicable	
Semester(s) in which the module is taught:	1st or 2nd semester
Person responsible for the module:	Chair of Statistics Research Group
Language:	Bahasa Indonesia
Relation to curriculum:	Elective Course
Teaching methods	Lecture, classroom discussion, project-based learning.
Workload (incl. contact hours, self-study hours)	Total workload is 232 hours per semester, which consists of 50 minutes lectures per week, 120 minutes of structured activities per week, 120 minutes of individual study per week, in total is 16 weeks per semester, including mid exam and final exam.
Credit points in Credit Units	3
Required and recommended prerequisites for joining the module	The student has a strong grasp of the fundamentals of Financial and Actuarial Statistics
Module objectives/intended learning outcomes:	After completing this course the students have ability to: CO 1. Mastery of the advancements in financial and actuarial mathematics. CO 2. Mastery of the advancements in financial and actuarial statistics. CO 3. Mastery of the advancements in modeling in the field of Finance and Actuarial Science
Content:	1. Claim Processes and Basic Methods (CL, BF, Poisson model, Algorithm, CL), Claim with Chain Ladder Model, Claim with Bayesian Model, Claim with Distributional Model, Claim with GLM, Claim with Bootstrap Method, Multivariate Reserve Method, and Other Topics. 2. Asset pricing models, European and American options, Barrier options. 3. Introduction to modeling, random variables, distribution measures, parameters, and their role in tail distribution, construction of new distributions, discrete and continuous distributions, insurance benefit models: deductibles, coinsurances, policy limits, consequences of insurance models, aggregate loss models, process models in insurance, discrete loss probabilities and finite time, adjustment coefficient, Lundberg's inequalities, integro-differential equations, maximum aggregate loss, Brownian motion risk processes, Brownian motion and loss probabilities. 4. The course syllabus will be tailored to the specific research topics of the students.

Examination forms	Oral presentation, essay, paper
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 (portfolio/essay/oral presentation) — 35% 2 — Mid-Term Examination (portfolio/essay/presentation) — 35% 3 — Class Activities: Presentation — 30% To pass the course, the minimum grade is B.
Media employed:	Board, LCD Projector, Laptop/Computer
Reading List:	1. W thrich, M.V., Merz,M., Stochastic Claim Reserving Methods in Insurance (2008), John Wiley & Sons. 2. Higham, D. (2004). An introduction to financial option valuation: mathematics, stochastics and computation, volume 13. Cambridge University Press. 3. Shreve, S. (2012). Stochastic calculus for finance I: the binomial asset pricing model. Springer. 4. Shreve, S. E. (2004). Stochastic calculus for finance II: Continuous-time models. Springer, New York. 5. Klugman, S. A., Panjer, H. H., dan Willmot G. E. (2012), Loss Model: From Data to Decision 4 th edition, Wiley.

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	v

Last Modified Date : February 10, 2024

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MODULE HANDBOOK

Module name:	*Topics in Financial Statistics and Actuarial Science B*
Code, if applicable:	MMM 7423
Subtitle, if applicable	Risk Management
Semester(s) in which the module is taught:	1st or 2nd semester
Person responsible for the module:	Chair of Statistics Research Group
Language:	Bahasa Indonesia
Relation to curriculum:	Elective Course
Teaching methods	Lecture, classroom discussion, project-based learning.
Workload (incl. contact hours, self-study hours)	Total workload is 232 hours per semester, which consists of 50 minutes lectures per week, 120 minutes of structured activities per week, 120 minutes of individual study per week, in total is 16 weeks per semester, including mid exam and final exam.
Credit points in Credit Units	3
Required and recommended prerequisites for joining the module	Students have learned some basic courses in statistics and statistical mathematics course. Students also have some knowledge on statistical software, such as *R.*
Module objectives/intended learning outcomes:	After completing this course the students have ability to: CO 1. analyze the theoretical aspect of Risk Management, related to the doctoral research being studied CO 2. use software for doing Risk Management related to the doctoral research being studied CO 3. analyze some extended Risk Management models and methods related to the doctoral research being studied
Content:	It will be derived from the research topic of the students. It will be focused on the theory, models, and method of specific data analysis used in the student research.
Examination forms	Oral presentation, essay, paper
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 (portfolio/essay/oral presentation) — 35% 2 — Mid-Term Examination (portfolio/essay/presentation) — 35% 3 — Class Activities: Presentation — 30% To pass the course, the minimum grade is B.

Media employed:	Board, LCD Projector, Laptop/Computer
Reading List:	1. Christoffersen, 2003, Elements of Financial Risk Measurements, Academic Press 2. Dowd, K., 2005, An introduction to market risk measurement, 2nd eds., Wiley 3. Recent publications on Risk Management, related to the research

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	v

Last Modified Date : February 10, 2024

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MODULE HANDBOOK
Doctoral in Mathematics

Module name:	Topics in Financial Statistics and Actuarial Science B
Code, if applicable:	MMM 7423
Subtitle, if applicable	Portfolio Management
Semester(s) in which the module is taught:	3
Person responsible for the module:	Chief of the Statistics Laboratory
Language:	Indonesian
Relation to curriculum:	Elective courses
Teaching methods:	Lecture, project.
Workload (incl. contact hours, self-study hours)	The total workload is 232 hours per semester, which consists of 50 minutes of lectures per week, 120 minutes of structured activities per week, and 120 minutes of individual study per week, in total is 16 weeks per semester, including mid and final exams.
Credit points:	3
Required and recommended prerequisites for joining the module	To take this course students must already understand a level of mathematical statistics, optimization theory and numerical methods.
Module objectives/intended learning outcomes:	After completing this course students will be able to: CO1 Analyze methods in portfolio allocation CO2 Integrate investment theory and practice and analyze them. CO3 Developing open problem ideas for research in the field of portfolio optimization
Content:	● Introduction to investment. Investment principles. Asset management is risk-free. Asset investment is risky. Investment Models. ● Random variables and their characteristic properties in portfolio theory. ● Introduction to portfolio theory. Efficient Portfolio. ● Two-asset portfolio. ● Markowitz model portfolio, two fund theorem model. ● Lagrange function in portfolio optimization. ● Portfolio Mean Variance, Portfolio Mean Variance Skewness, Portfolio Mean Variance Skewness Kurtosis. ● CAPM model. ● Multiobjective portfolio model. ● Monte Carlo simulation for portfolio theory. ● Resampling method (REF) in portfolios. ● Robust Method in Portfolio. ● Data analysis using Eviews, R, Python software.
Study and examination requirements and forms of examination:	Grades are based on a combination of 2 exams (mid and final exams), 2 assignments and one project with the following assessment proportions: 60%: Combination of two exams 15%: Combination of two tasks 25%: Projects (including writing papers and presentations) To pass the course, the minimum grade is B

Media employed:	Slides and LCD projectors, White boards
Reading List:	• Ernest Brown Skinner, 2015. The Mathematical Theory of Investment, Sagwan Press. • Samuel A. Broverman, 2017, Mathematics of Investment & Credit, SR Books Inc. • Andrew T Adam, Investment Mathematics, John Wiley and Sons, 2003 • David G. Luenberger, Investment Science, Oxford University Press, 1998 • An Introduction to Financial Option Valuation, Mathematics, Stochastics and Computation, Second Edition, Cambridge University Press 2004.

CO and PLO mapping

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6
CO 1	v	v	v			
CO 2	v	v		v		
CO 3	v	v			v	v

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MODULE HANDBOOK
Doctoral in Mathematics

Module name:	Topics in Financial Statistics and Actuarial Science B
Code, if applicable:	MMM 7423
Subtitle, if applicable	Health Insurance
Semester(s) in which the module is taught:	1st or 2nd Semester
Person responsible for the module:	Chair of Lab. Statistics
Language:	Bahasa Indonesia
Relation to curriculum:	Elective course
Credit points:	3
Type of teaching, contact hours:	Lecture, project.
Workload (incl. contact hours, self-study hours)	*The total workload is 232 hours per semester, which consists of 50 minutes of lectures per week, 120 minutes of structured activities per week, and 120 minutes of individual study per week, in total is 16 weeks per semester, including mid and final exams.*
Credit points in Credit Units	*3*
Required and recommended prerequisites for joining the module	Before taking this course, the students must have a good understanding in Actuarial mathematics
Module objectives/intended learning outcomes:	On satisfying the requirements of this course, students will have the knowledge and skills to: CO-1: Able to analyze the types of health insurance products with their actuarial models CO-2: Able to evaluate and use the claim frequency model, claim severity and collective risk models in health insurance. CO-3: Able to analyze the use of mortality, morbidity and multi-status models in health insurance. CO-4: Able to analyze actuarial models that can be used in the collective risk insurance system and the national health insurance system CO-5: Develop a health insurance product with its actuarial model based on real and simulated data
Content:	Health Insurance Products; Model claim frequency and claim severity; Mortality, Morbidity, and Multi-status Models; Collective Risk Model; Actuarial models related to National Health Insurance
Study and examination requirements and forms of examination:	The final mark will be weighted as follows: Weight (percentage) 1. Formulation of the originality of the research problem 25% 2. Formulation of the theoretical framework 25% 3. Formulation of the conjecture and methodology 20% 4. Presentation 30% To pass the course, the minimum grade is B.
Media employed:	White/Black Board, LCD Projector, Laptop/Computer

Reading List:	The related references to the dissertation will be nominated as per the selected topic and content. General references: 1. Cichon, M, Newbrander, W, Yamabana, H., Weber, A., Normand, C., Dror, D. and Preker, A., 1999, *Modelling in Health Care Finance*, International Labour Organization, Geneva 2. Cunningham, R. J., Herzog, T. N and London, R. L. , 2006, *Models for Quantifying Risk*, 2nd ed., ACTEX Publications, Inc. 3. Pitacco, E., 2014, *Health Insurance. Basic Actuarial Models*, Springer.

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	v
CO 2	v	v	v		v	v
CO 3	v	v	v		v	v
CO 4	v	v	v		v	v
CO 5	v	v	v		v	v

Compilation Date : 9/4/2023

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MODULE HANDBOOK

Module Name	Topic on Finance and actuarial science B
Code, if applicable	**MMM 7423**
Subtitle, if applicable	Option Theory
Semester(s) in which the module is taught	1st or 2nd semester
Person responsible for the module	Chair of Statistics Laboratory
Language	Bahasa Indonesia
Relation to curriculum	Elective course
Teaching methods	Lecture, classroom discussion, flipped classroom.
Workload (incl. contact hours, self-study hours)	Total workload is 232 hours per semester, which consists of 50 minutes lectures per week, 120 minutes of structured activities per week, 120 minutes of individual study per week, in total is 16 weeks per semester, including mid exam and final exam.
Credit points in Credit Units	3
Required and recommended prerequisites for joining the module	-
Module objectives/intended learning outcomes	On successful completion of this course, students should be able to: CO 1 master the Fundamentals of the Financial Model CO 2 perform European and American options CO 3 perform the Valuation of European and American options CO 4 perform Finite difference methods for the Black–Scholes PDE.

Content	Stock price model, European and American options, Valuation of European and American options, Application of option pricing, Finite difference methods for the Black–Scholes PDE.
Examination forms	*oral presentation and essay.*
Study and examination requirements	The final mark will be weighted as follows: No — Assessment methods (components, activities) — Weight (percentage) 1 — Final Examination (portfolio/essay/oral presentation) — 35% 2 — Mid-Term Examination (portfolio/essay/presentation) — 35% 3 — Class Activities: Presentation — 30% To pass the course, the minimum grade is B.
Media employed	online platforms, Learning management systems, LCD projectors, and whiteboards.
Reading list	1. Kellison, S. G., 1991. The Theory of Interest, John Wiley & Sons. New York. 2. Shreve, S. E., 2004, *Stochastics Calculus for Finance I*, Springer Verlag New York. LLC. 3. Shreve, S. E., 2004, *Stochastics Calculus for Finance II*, Springer Verlag New York. LLC. 4. Yuh-Dauh Lyuu, 2004. Financial Engineering and Computation. CambridgeUniversity Press, United Kingdom. 5. Higham, D. J., 2004, An Introduction to Financial Option Valuation, Cambridge University Press.

CO-PLO Mapping

	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5	PLO 6
CO 1	v					
CO 2	v	v			v	v
CO 3	v		v			
CO 4	v		v		v	v

Compilation Date : 2/1/2023

Modified Date : 30/1/2024