UNIVERSITAS GADJAH MADA
Faculty of Mathematics and Natural Sciences
Department of Mathematics
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Doctor in Mathematics

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MODULE HANDBOOK

Module Name	Topic on Mathematical Statistics B
Code, if applicable	**MMM 7425**
Subtitle, if applicable	
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, project.
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	3
Required and recommended prerequisites for joining the module	The student has a good command of the fundamentals of Mathematical Statistics.
Module objectives/intended learning outcomes	On successful completion of this course, students should be able to: CO1 Mastery of the developments in the theory and methods of Statistics. CO2 Mastery of the developments in stochastic modeling. CO3 Mastery of the developments in statistical and stochastic analysis.

<table>
<tr><td>Content</td><td>1. Probability theory, random walk, Brownian motion, Ito integral for simple and general integrands, Ito-Doebelin formula..
2. Direct Domain Estimation, Traditional Demographic Methods, Small Area Model-Based Direct Domain Estimation, EBLUP Methods, Empirical Bayes Methods, Hierarchical Bayes Methods.
3. The topics and syllabus details of this course will be determined in relation to the student's research topic.</td></tr>
<tr><td>Examination forms</td><td>oral presentation and essay.</td></tr>
<tr><td>Study and examination requirements</td><td>The final mark will be weighted as follows:
<table><tr><th>No</th><th>Assessment methods (components, activities)</th><th>Weight (percentage)</th></tr><tr><td>1</td><td>Final Examination (portfolio/essay/oral presentation)</td><td>35%</td></tr><tr><td>2</td><td>Mid-Term Examination (portfolio/essay/presentation)</td><td>35%</td></tr><tr><td>3</td><td>Class Activities: Presentation</td><td>30%</td></tr></table>
To pass the course, the minimum grade is B.</td></tr>
<tr><td>Media employed</td><td>online platforms, Learning management systems, LCD projectors, and whiteboards.</td></tr>
<tr><td>Reading list</td><td>1. Capinski, M. and Kopp, E. (1998). Measure, Integral and Probability. Springer-Verlag, New York.
2. Shreve, S. (2012). Stochastic calculus for finance I: the binomial asset pricing model. Springer.
3. Shreve, S. E. (2012). Stochastic calculus for finance II: Continuous-time models. Springer, New York.
4. Mukhopadhyay, P. , 1998, Small Area in Survey Sampling , New Delhi : Narosa Publishing House.
5. Pfefferman, D., 2002, Small Area Estimation – New Developments and Directions, Interntinal Statistical Review, 70: 125-143.
6. Pfefferman, D. , 2013, New Important Developments in Small Area Estimation, Statistical Science, 28(1): 40-68.
7. Rao, J. N. K. , 2003, Small Area Estimation. New Jersey: Wiley.
8. Rao, J. N. K., 2014, Inferential Issues in Model Based Small Area Estimation: Some New Developments, Statistical in Transition New Series and Survey Methodology. Joint SpecialIssues: Small Area Estimation, 16(4):491-510.
.</td></tr>
</table>

CO-PLO Mapping

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

Compilation Date : 2/1/2023

Modified Date : 1/2/2024

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MODULE HANDBOOK
Doctoral in Mathematics

Module name:	Topik dalam Statistika Matematika B *(Topics in Mathematical Statistics B)*
Code, if applicable:	MMM 7425
Subtitle, if applicable	Fuzzy Systems
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:	Doctoral Degree in Mathematics, 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.
Module objectives/intended learning outcomes:	After completing this course the students have ability to: CO 1. Gain expertise in fuzzy logic principles and methodologies, facilitating the analysis and modeling of uncertain data. CO 2. Develop skills to apply fuzzy systems effectively in various domains, fostering innovative solutions to complex problems. CO 3. Attain autonomy in designing and conducting research projects utilizing fuzzy systems, contributing to advancements in theory and application.
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. Jang, J. S. R., Sun, C. T., & Mizutani, E. (1997). Neuro-fuzzy and soft computing: A computational approach to learning and machine intelligence. Prentice Hall. 2. Kosko, B. (1994). Fuzzy thinking: The new science of fuzzy logic. Hyperion. 3. Klir, G. J., & Yuan, B. (1995). Fuzzy sets and fuzzy logic: Theory and applications. Prentice Hall PTR. 4. Bezdek, J. C. (2013). Pattern recognition with fuzzy objective function algorithms. Springer Science & Business Media.

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 : October 9, 2023

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MODULE HANDBOOK

Module Name	Topic in Mathematical Statistics B
Code, if applicable	**MMM 7425**
Subtitle, if applicable	Bayesian Inference
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, project.
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	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 Bayesian Inference CO 2 master the Fundamentals of Bayesian Data Analysis CO 3 perform Bayesian computations CO 4 develop Bayesian to Classical statistics

Content	Bayesian on Multiparameter model, asymptotics, and connections to non-Bayesian approach, Hierarchical model, Evaluating, comparing, and expanding model, Bayesian computation.
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	Gelman, A., Carlin J. B., Stern H. S., Rubin D. B., 2004. Bayesian Data Analysis, Chapman and Hall/CRC. .

CO-PLO Mapping

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

Compilation Date : 2/1/2023

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MODULE HANDBOOK
Doctoral in Mathematics

Module name:	Topik dalam Statistika Matematika B *(Topics in Mathematical Statistics B)*
Code, if applicable:	MMM 7425
Subtitle, if applicable	Multivariate Analysis
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:	Doctoral Degree in Mathematics, 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. Gain expertise in diverse multivariate techniques for comprehensive data exploration and interpretation CO 2. Develop skills to interpret complex multivariate analysis results accurately, facilitating informed decision-making in research and practice. CO 3. Attain autonomy in designing and conducting multivariate analysis research projects, contributing valuable insights to scholarly literature and real-world applications.
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. Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). Multivariate data analysis (8th ed.). Cengage Learning.

	2. Johnson, R. A., & Wichern, D. W. (2007). Applied multivariate statistical analysis (6th ed.). Pearson. 3. Tabachnick, B. G., & Fidell, L. S. (2019). Using multivariate statistics (7th ed.). Pearson. 4. Rencher, A. C., & Christensen, W. F. (2012). Methods of multivariate analysis (3rd ed.). John Wiley & Sons.

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

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MODULE HANDBOOK

Module Name	Topic on Mathematical Statistics B
Code, if applicable	**MMM 7425**
Subtitle, if applicable	Stochastic Calculus
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, project.
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	3
Required and recommended prerequisites for joining the module	-

<table>
<tr><td>Module objectives/intended learning outcomes</td><td>On successful completion of this course, students should be able to:

CO1 master State Prices, Random Walk, and Brownian Motion
CO2 master Interest rate-dependent asset
CO3 perform Stochastic Calculus and Connections with Partial Different Equation
CO 4 develop Exotic Option</td></tr>
<tr><td>Content</td><td>State Prices, Random Walk, Brownian Motion, Interest rate dependent asset, Stochastic Calculus and Connections with Partial Different Equation, Exotic Option</td></tr>
<tr><td>Examination forms</td><td>oral presentation and essay.</td></tr>
<tr><td>Study and examination requirements</td><td>The final mark will be weighted as follows:
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To pass the course, the minimum grade is B.</td></tr>
<tr><td>Media employed</td><td>online platforms, Learning management systems, LCD projectors, and whiteboards.</td></tr>
<tr><td>Reading list</td><td>1. Shreve, S. E., 2004, Stochastics Calculus for Finance I, Springer Verlag New York. LLC.
2. Shreve, S. E., 2004, Stochastics Calculus for Finance II, Springer Verlag New York. LLC.
3. Yuh-Dauh Lyuu, 2004. Financial Engineering and Computation. CambridgeUniversity Press, United Kingdom.
4. Higham, D. J., 2004, An Introduction to Financial Option Valuation, Cambridge University Press.</td></tr>
</table>

CO-PLO Mapping

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

Compilation Date : 2/1/2023

Modified Date : 1/2/2024