

SEMESTER LEARNING PLAN

**STOCHASTIC PROCESSES COURSES
(23H01130203)**



TEACHING TEAM

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STUDI PROGRAM OF MATHEMATICS - S1
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
HASANUDDIN UNIVERSITY
MAKASSAR
2025

**STUDY PROGRAM OF MATEMATIKA - S1
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
HASANUDDIN UNIVERSITY**

Vision

The scientific vision is to become a study program with an international reputation in the development of mathematics based on the Indonesian maritime continent by 2030

Vision Strategy

Mission

To fulfill the above vision, the Undergraduate Mathematics Study Program has four missions, namely:

- Organizing innovative and effective mathematics learning to improve the quality and creativity of students in order to compete nationally and internationally.
- Improving a research culture that produces internationally reputable publications.
- Playing an active role in community service activities and collaborating with other academic institutions, government, business, media and society.
- Carry out governance in the Mathematics Study Program that is effective, efficient and transparent based on IT and ISO 9001:2015 standards to achieve the tridharma goals.

Graduate Profiles

Gagal diterjemahkan

PLO charged to courses

CPL-8 (S1) - The students have integrity that highly values the supreme divinity, social responsibility, and professional ethics

CPL-9 (S2) - The students are able to adapt and develop self-abilities, both in mathematics and other relevant areas of science in their professional lives

CPL-4 (KU2) - The students are able to use their sufficiently mathematical critical thinking for abstraction and generalization of a mathematical problem

CPL-5 (KK1) - The students are able to construct mathematical modelling with relatively new ideas and present the results orally and in writing

CPL-7 (KK3) - The students are able to demonstrate mathematical skills which include interpretation, connecting problems, solving problems, and communicating individually or teamwork

Course Learning Outcomes (CLO)

CPMK-1: Be able to explain the terminology related to various types of stochastic processes and the characteristics that differentiate the types of stochastic processes from each other. (CPL8 dan CPL4)

CPMK-2: Able to apply the concept of probability distribution to determine the properties associated with a stochastic process. (CPL4, CPL5 dan CPL7)

CPMK-3: Able to model the dynamics of random events in various fields of science, as well as interpret the long-run behavior of random events using different types of stochastic processes. (CPL9, CPL5 dan CPL7)

Sub-CLO

Sub CPMK-1: Students are able to understand the meaning and concept of opportunity distribution and stochastic processes. (CPMK-1)

Sub CPMK-2: Students are able to determine the m-step transition probability and long-term probability of a

discrete time Markov chain. (CPMK-1)

Sub CPMK-3: Students are able to classify the equivalence classes of a Markov chain. (CPMK-2)

Sub CPMK-4: Students are able to apply the limit theorem to determine the long run behavior of a Markov Chain. (CPMK-2)

Sub CPMK-5: Students are able to model various cases of random data, using the Markov chain approach (CPMK-3)

Sub CPMK-6: Students are able to describe the properties and assumptions related to the Poisson process. (CPMK-1)

Sub CPMK-7: Students are able to relate the distribution of arrivals and the distribution of waiting times from a Poisson process. (CPMK-2)

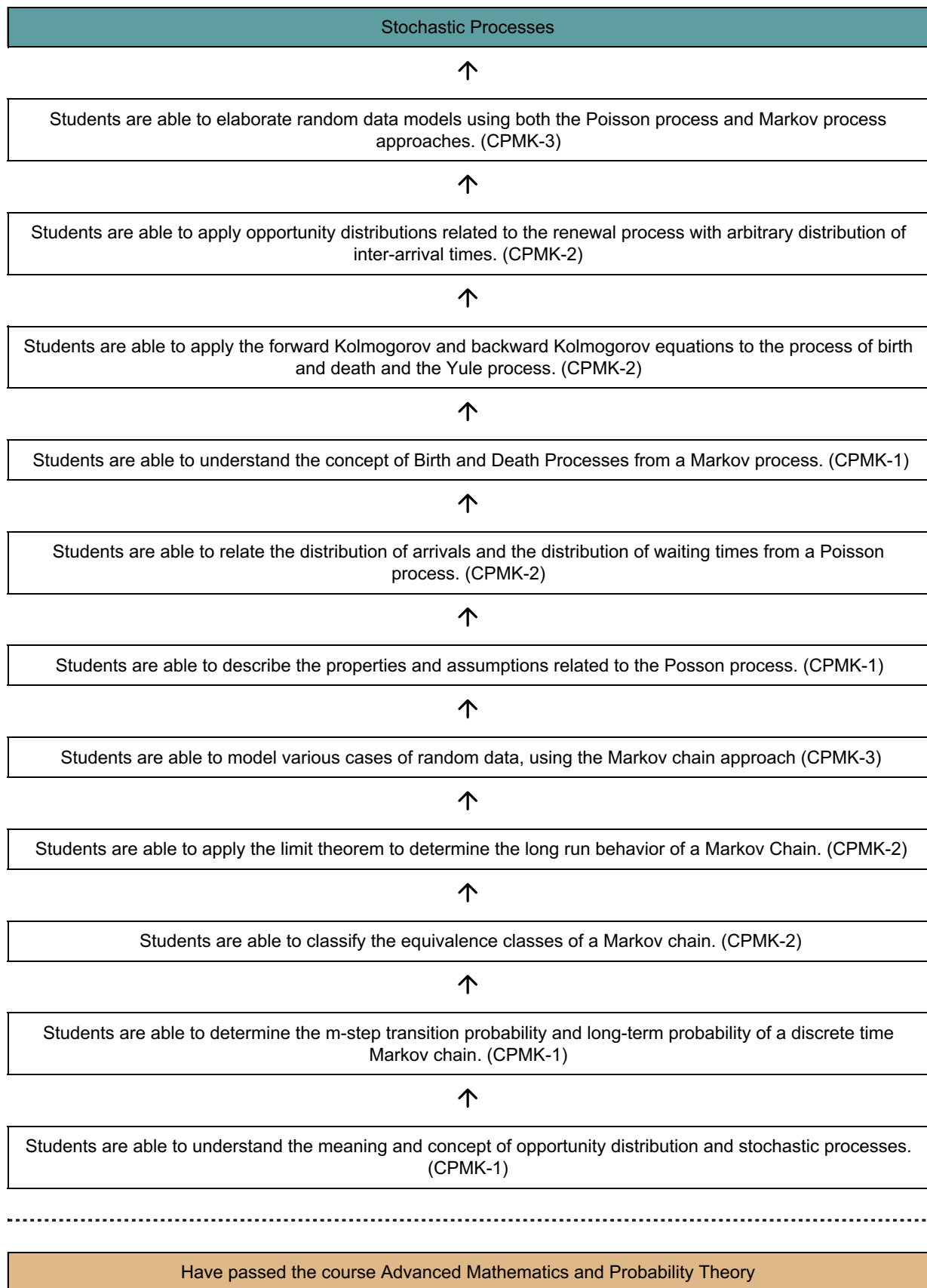
Sub CPMK-8: Students are able to understand the concept of Birth and Death Processes from a Markov process. (CPMK-1)

Sub CPMK-9: Students are able to apply the forward Kolmogorov and backward Kolmogorov equations to the process of birth and death and the Yule process. (CPMK-2)

Sub CPMK-10: Students are able to apply opportunity distributions related to the renewal process with arbitrary distribution of inter-arrival times. (CPMK-2)

Sub CPMK-11: Students are able to elaborate random data models using both the Poisson process and Markov process approaches. (CPMK-3)

Learning Analytics





HASANUDDIN UNIVERSITY

FAKULTY OF MATHEMATICS AND NATURAL SCIENCES

STUDY PROGRAM OF MATHEMATICS - S1

SEMESTER LEARNING PLAN

Course		Code	Course Group	Credits	SEMESTER	Compilation Date
Stochastic Processes		23H01130203	Statistics and Probability	3	5	10 Agustus 2024
AUTHORITY		SLP Developer Lecturer	Coordinator		Head of Study Program	
		Jusmawati Massalesse, S.Si.,M.Si., Dr. Firman, S.Si.,M.Si.	Jusmawati Massalesse, S.Si.,M.Si.		Dr. Firman, S.Si.,M.Si.	
Learning Outcomes	SLOs that are imposed on the course					
	SLO-8:	Mahasiswa memiliki integritas yang sangat menghargai keilahian tertinggi, tanggung jawab sosial, dan etika profesional				
	SLO-9:	Mahasiswa dapat beradaptasi dan mengembangkan kemampuan diri, baik dalam matematika dan bidang ilmu lain yang relevan dalam kehidupan profesional mereka, dengan budaya belajar sepanjang hayat				
	SLO-4:	Mahasiswa dapat menggunakan pemikiran kritis matematis mereka yang cukup untuk abstraksi dan generalisasi masalah matematika berdasarkan hasil analisis informasi dan data				
	SLO-5:	Mahasiswa dapat membangun pemodelan matematika dengan ideide yang relatif baru dan mempresentasikan hasil dengan jelas secara lisan dan tertulis				
	SLO-7:	Mahasiswa dapat menunjukkan keterampilan matematika termasuk menghubungkan masalah, menyelesaikan masalah, interpretasi, dan berkomunikasi secara individu atau dengan kerja tim				
	SLO ⇒ Course Learning Outcomes					
	After completing this course, it is expected:					
	SLO-4	CLO-1: Be able to explain the terminology related to various types of stochastic processes and the characteristics that differentiate the types of stochastic processes from each other.				
		CLO-2: Able to apply the concept of probability distribution to determine the properties associated with a stochastic process.				
	SLO-8	CLO-1: Be able to explain the terminology related to various types of stochastic processes and the characteristics that differentiate the types of stochastic processes from each other.				
	SLO-5	CLO-2: Able to apply the concept of probability distribution to determine the properties associated with a stochastic process.				
		CLO-3: Able to model the dynamics of random events in various fields of science, as well as interpret the long-run behavior of random events using different types of stochastic processes.				
		CLO-2: Able to apply the concept of probability distribution to determine the properties associated with a stochastic process.				

Course		SLO-7		CLO-3: Able to model the dynamics of random events in various fields of science, as well as interpret the long-run behavior of random events using different types of stochastic processes.							
		SLO-9		CLO-3: Able to model the dynamics of random events in various fields of science, as well as interpret the long-run behavior of random events using different types of stochastic processes.							
		CLO ⇒ Sub-CLO									
		CLO-1		Sub-CLO-1:Students are able to understand the meaning and concept of opportunity distribution and stochastic processes.							
				Sub-CLO-2:Students are able to determine the m-step transition probability and long-term probability of a discrete time Markov chain.							
				Sub-CLO-6:Students are able to describe the properties and assumptions related to the Posson process.							
				Sub-CLO-8:Students are able to understand the concept of Birth and Death Processes from a Markov process.							
		CLO-2		Sub-CLO-3:Students are able to classify the equivalence classes of a Markov chain.							
				Sub-CLO-4:Students are able to apply the limit theorem to determine the long run behavior of a Markov Chain.							
				Sub-CLO-7:Students are able to relate the distribution of arrivals and the distribution of waiting times from a Poisson process.							
				Sub-CLO-9:Students are able to apply the forward Kolmogorov and backward Kolmogorov equations to the process of birth and death and the Yule process.							
				Sub-CLO-10:Students are able to apply opportunity distributions related to the renewal process with arbitrary distribution of inter-arrival times.							
		CLO-3		Sub-CLO-5:Students are able to model various cases of random data, using the Markov chain approach							
				Sub-CLO-11:Students are able to elaborate random data models using both the Poisson process and Markov process approaches.							
		Correlation between SLOs/CLOs to Sub-CLOs									

SLOs that are charged on the Course	CPMK	SUB CPMK	Form of Assessment*						Weight	Value	Student Score
			Formative	Sumative							
				Independent Assignment	Quiz	Short Q&A	Case Studies	Written Exam			
SLO-4	CLO-1	SUB-CLO-2	Accuracy and completeness of answers, as well as timely submission of assignments	5	0	0	0	0	5		
SLO-7	CLO-2	SUB-CLO-3	Accuracy and completeness in classifying and providing examples, neatness of writing and timeliness of assignment submission	0	7	0	0	0	7		
SLO-7	CLO-2	SUB-CLO-4		0	0	3	0	20	23		
SLO-7	CLO-3	SUB-CLO-5		0	0	0	15	0	15		

SLOs that are charged on the Course	CPMK	SUB CPMK	Form of Assessment*					Weight	Value	Student Score	
			Formative	Sumative							
				Independent Assignment	Quiz	Short Q&A	Case Studies	Written Exam			
SLO-7	CLO-2	SUB-CLO-7		0	10	0	0	0	10		
SLO-7	CLO-2	SUB-CLO-9	Accuracy of prediction results	0	0	5	0	0	5		
SLO-7	CLO-3	SUB-CLO-11		0	0	0	35	0	35		
				5	17	8	50	20	100		
Course Description		<i>This course discusses Markov Chains, Poisson Processes, Markov Processes and Renewal Processes. Some important distributions that often appear in discussions are the Bernoulli, binomial, geometric, distribution, style="background-color: var(--bs-table-bg); font-size: var(--bs-body-font-size); font-weight: var(--bs-body-font-weight); text-align: var(--bs-body-text-align);">Poisson distribution, normal, uniform, exponential and other important distributions. The topic of Markov chains is focused on the description of n-step state transfer and long run behavior. The Poisson process discusses discrete random variables that fulfill memoryless properties with exponentially distributed times between events. Discussion on the topic of Markov processes includes understanding steady-state conditions, equilibrium conditions, and the application of the backward and forward Kolmogorof equations to the birth and death process. The last topic discusses the renewal process, which is a generalization of random variables with an arbitrary distribution of time between events.</i>									
Learning Materials/Subjects		1. Introduction to Stochastic Processes and relations with Random Variables and Probability (Introduction to Stochastic Processes and relations with Random Variables and Probability) 2. Probability and Joint Distribution in Stochastic Processes 3. Conditional probabilities and events (Conditional Distribution and Moments) 4. Markov Chain (Markov Chain) 5. Poisson Process (Poisson Processes) 6. Markov Processes 7. Pure Birth and Death Processes 8. Renewal Processes									
		Main References									

Reference	1. Karlin, S & H. M. Taylor, 1994. An Introduction to Stochastic Modelling, 3rd edition. Academic Press. New York 2. Allen, S. 2003. Introduction to Stochastic Process with Biology Application 3. Ross, Sheldon M. 2007. Introduction to Probability Models, 9th edition. Elsevier Inc. London						
	Additional References						
	lecture notes						
Teaching Team	Jusmawati Massalesse, S.Si.,M.Si., Dr. Firman, S.Si.,M.Si.						
Course requirement	Advanced Mathematics, Probability Theory						
Week	Sub CPMK (End-of-stage learning ability)	Penilaian (Assesment)		Learning Forms and Methods [time estimate]		Content	Weight of Assessment (%)
		Indicator	Techniques & Criteria	Offline	Online		
1	2	3	4	5	6	7	8
1	Students are able to understand the meaning and concept of opportunity distribution and stochastic processes. (CPMK-1)	Formative: None Sumative: None	Formative Criteria: None Sumative Criteria: Assessment Technique: Non Test	Studying: Other methods 1x3x50 minutes		College Contract Introduction to Stochastic Processes and their relationship to Random Variables and Probability 1. Definition of Stochastic Process 2. Properties of Random Variables 3. Expectations and Moments	0

2	Students are able to determine the m-step transition probability and long-term probability of a discrete time Markov chain. (CPMK-1)	Formative: 1. Students are able to explain the meaning of Markov Chains 2. Students are able to provide examples of the application of Markov Chains 2. Students are able calculating the n-step transition probability of a Markov chain. Sumative: None	Formative Criteria: Accuracy and completeness of answers, as well as timely submission of assignments dinilai dengan rubrik 01 Sumative Criteria: Independent Assignment (5) dinilai dengan rubrik 01 Assessment Technique: Non Test	Studying: Self-Directed Learning Students listen to the material and do independent assignments regarding the Markov Chain material [1x3x50]		Markov Chain 1. Properties of Markov 2. n-Step Transition 3. Some Cases of Markov Chains	5
3-4	Students are able to classify the equivalence classes of a Markov chain. (CPMK-2)	Formative: 1. Students are able to classify Markov Chain states correctly. 2. Students are able to identify recurrency and transient properties based on transition diagrams, -apple-system, BlinkMacSystemFont, "Segoe UI", Oxygen, Ubuntu, Cantarell, "Fira Sans", "Droid Sans", "Helvetica Neue", sans-serif; font-size: 12.75px;"> of a Markov Chain Sumative: None	Formative Criteria: Accuracy and completeness in classifying and providing examples, neatness of writing and timeliness of assignment submission Sumative Criteria: Quiz (7) dinilai dengan rubrik 01 Assessment Technique: Test	Studying: Self-Directed Learning, Case Study [1x3x50] Studying: Self-Directed Learning, Cooperative Learning, Collaborative Learning [2x3x50]		Markov Chain 1. Reducible and irreducible Markov chains 2. Recurrent and transient states	7

5	Students are able to apply the limit theorem to determine the long run behavior of a Markov Chain. (CPMK-2)	Formative: Students understand the concept of limit theorems and long run behavior of Markov Chains. Sumative: None	Formative Criteria: Sumative Criteria: Short Q&A (3) Assessment Technique: Non Test	Studying: Cooperative learning (Cooperative learning), Problem-based Learning (Problem-based Learning) [1x3x50]		Markov Chain 1. Markov Chain limit theorem 2. Long run behavior	3
6-7	Students are able to model various cases of random data, using the Markov chain approach (CPMK-3)	Formative: 1.Students are able to elaborate on the properties of Markov Chains in a comprehensive manner. 2. Students are able to work together in groups in carrying out assignments. 3. Students are able to demonstrate communication skills through presentations. Sumative:	Formative Criteria: Sumative Criteria: Case Studies (15) dinilai dengan rubrik 02 Assessment Technique: Test and Non-Test	Seminar: Case Study (Case Study) Case title: "Markov Chain Analysis in the Context of State Shifting". Students search for data which will be modeled and work together in groups to complete project. In the final stage, each group presents their respective models in class attended by all course participants. 2x3x50		Group presentation on the topic of Markov Chains and their properties using Markovian random data.	15

8	Students are able to apply the limit theorem to determine the long run behavior of a Markov Chain. (CPMK-2)	Formative: Sumative: 1. Students are able to classify the Markov chain properties of the given case. 2. Students are able to apply the Markov chain concept to predict n-step state shifts and long run behavior in the given case.	Formative Criteria: Sumative Criteria: Written Exam (20) dinilai dengan rubrik 01 Assessment Technique: Test	Other Forms: Discovery Learning 2x3x50		Doing Mid Test questions	20
9	Students are able to describe the properties and assumptions related to the Posson process. (CPMK-1)	Formative: Gagal diterjemahkan Sumative: None	Formative Criteria: Sumative Criteria: Assessment Technique: Gagal diterjemahkan	Studying: Cooperative learning (Cooperative learning) 1x3x50		Poisson Process 1. Calculation Process 2. Exponential distribution and Poisson distribution. 3. Poisson Process and Properties of Poisson Process	0
10	Students are able to relate the distribution of arrivals and the distribution of waiting times from a Poisson process. (CPMK-2)	Formative: Sumative: 1. Students are able to determine the probability of occurrence and the time between occurrences of a Poisson random variable. 2. Students are able to relate the distribution of the number of events and the time between events of a Poisson random variable.	Formative Criteria: Sumative Criteria: Quiz (10) dinilai dengan rubrik 01 Assessment Technique: Test	Studying: Cooperative learning (Cooperative learning) 1x3x50		Properties of the Poisson Process 1. Memoryless properties 2. Superposition Properties and Properties Decomposition 3. Compound Poisson Process	10

11	Students are able to understand the concept of Birth and Death Processes from a Markov process. (CPMK-1)	Formative: Gagal diterjemahkan Sumative: None	Formative Criteria: Sumative Criteria: Assessment Technique: Gagal diterjemahkan	Studying: Collaborative learning (Collaborative Learning) [1x3x50]		Markov Process 1. Continuous time Markov chain 2. Steady State Markov Process 3. Equilibrium Equations	0
12	Students are able to apply the forward Kolmogorov and backward Kolmogorov equations to the process of birth and death and the Yule process. (CPMK-2)	Formative: Students are able to apply the backward Kolmogorov and forward Kolmogorov equations to predict the probability of moving from one state to another state after t units of time. Sumative: Gagal diterjemahkan	Formative Criteria: Accuracy of prediction results dinilai dengan rubrik 01 Sumative Criteria: Short Q&A (5) dinilai dengan rubrik 04 Assessment Technique: Test and Non-Test	Studying: Collaborative learning (Collaborative Learning) [1x3x50]		1. Birth and death processes 2. Backward Kolmogorov Equation. 3. Kolmogorov's Forward Equation.	5
13	Students are able to apply opportunity distributions related to the renewal process with arbitrary distribution of inter-arrival times. (CPMK-2)	Formative: Gagal diterjemahkan Sumative: None	Formative Criteria: Sumative Criteria: Assessment Technique: Gagal diterjemahkan	Studying: Group discussion (Small Group Discussion), other methods [1x2x50]		Renewal Process 1. Understanding the renewal process 2. Distribution $N(t)$, $X(t)$ and $S(t)$ 4. Renewal Function	0

14-16	Students are able to elaborate random data models using both the Poisson process and Markov process approaches. (CPMK-3)	Formative: Sumative: 1. Student able to identify compatibility between random data with a Poisson process, Markov process or renewal process. 2. Student able to apply the concept of the Poisson process, or Markov process, or renewal process to estimate the probability of an event in the future. 3. Student able to work together in groups in completing the tasks they choose. 4. Student able to communicate the results of group work through presentations in class.	Formative Criteria: Sumative Criteria: Case Studies (35) dinilai dengan rubrik 02 Assessment Technique: Non Test	Seminar: Case Study (Case Study) Students choose cases related to the following topics: 1. Poisson Process Analysis in Event Context Random Event (Task A) 2. Analysis of Markov Processes in State Change Context (Task B) [3x3x50]	Group presentation on the topic Assignment A and Assignment B	35
						100

Matrix of SLO, CLO, and Assessment Method

SLO / CLO	CLO-1	CLO-2	CLO-3
CPL-4 (KU2)	Independent Assignment (Weight 5%)	Quiz (Weight 7%) Short Q&A (Weight 3%) Written Exam (Weight 20%) Quiz (Weight 10%) Short Q&A (Weight 5%)	
CPL-5 (KK1)		Quiz (Weight 7%) Short Q&A (Weight 3%) Written Exam (Weight 20%) Quiz (Weight 10%) Short Q&A (Weight 5%)	Case Studies (Weight 15%) Case Studies (Weight 35%)
CPL-7 (KK3)		Quiz (Weight 7%) Short Q&A (Weight 3%) Written Exam (Weight 20%) Quiz (Weight 10%) Short Q&A (Weight 5%)	Case Studies (Weight 15%) Case Studies (Weight 35%)
CPL-8 (S1)	Independent Assignment (Weight 5%)		
CPL-9 (S2)			Case Studies (Weight 15%) Case Studies (Weight 35%)

Evaluation Type and Assessment Weight

Type	Assessment Weight
Independent Assignment	5
Quiz	17
Short Q&A	8
Case Studies	50
Written Exam	20
Total	100

Assessment and Evaluation of Student Achievement of CLOs

SLOs that are charged on the Course	CLO	SUB CLO	Form of Assessment*						Weight	Value	Student Score
			Formative	Sumative							
				Independent Assignment	Quiz	Short Q&A	Case Studies	Written Exam			
SLO-4	CLO-1	SUB-CLO-2	Accuracy and completeness of answers, as well as timely submission of assignments	5	0	0	0	0	5		
SLO-7	CLO-2	SUB-CLO-3	Accuracy and completeness in classifying and providing examples, neatness of writing and timeliness of assignment submission	0	7	0	0	0	7		
SLO-7	CLO-2	SUB-CLO-4		0	0	3	0	20	23		
SLO-7	CLO-3	SUB-CLO-5		0	0	0	15	0	15		
SLO-7	CLO-2	SUB-CLO-7		0	10	0	0	0	10		
SLO-7	CLO-2	SUB-CLO-9	Accuracy of prediction results	0	0	5	0	0	5		
SLO-7	CLO-3	SUB-CLO-11		0	0	0	35	0	35		
				5	17	8	50	20	100		

Lampiran Rubrik 01 | ASSESMENT TERTULIS

Kriteria Penilaian	Bobot/Skor Penilaian				
	5	4	3	2	1/0
Konsep/ metode yang digunakan	Penjelasan konsep /metode (*) sangat lengkap dan akurat	Penjelasan konsep/metode (*) cukup jelas tetapi beberapa informasi tidak dituliskan secara lengkap.	Penjelasan konsep/metode (*) kurang jelas dan banyak informasi yang tidak dituliskan	Penjelasan yang dituliskan hampir tidak berkaitan dengan konsep/ metode (*)	Tidak memberikan konsep yang dibutuhkan
Sistematika penulisan/ pembuktian	Sistematika penulisan/ pembuktian sangat jelas dan terstruktur	Sistematika penulisan/ pembuktian cukup jelas namun ada langkah yang hilang	Sistematika penulisan/ pembuktian kurang jelas	Sistematika penulisan/ pembuktian tidak jelas	Jawaban tidak benar/ tidak ada
Interpretasi geometri/ kualitatif/ kuantitatif.	Interpretasi geometri/ kualitatif/ kuantitatif (*) tepat dan lengkap	Interpretasi geometri/ kualitatif/ kuantitatif (*) cukup lengkap/ tepat	Interpretasi geometri/ kualitatif/ kuantitatif (*) kurang lengkap/ tepat	Interpretasi geometri/ kualitatif/ kuantitatif (*) tidak lengkap/ tepat	Interpretasi geometri/ kualitatif/kuantitatif(*) tidak benar
Perhitungan/kesimpulan	Perhitungan/ kesimpulan sangat akurat/tepat dan disertai alasan yang mendasarinya	Perhitungan/ kesimpulan cukup akurat/tepat dan disertai alasan yang mendasarinya	Kesimpulan cukup tepat, namun tidak disertai alasan yang jelas	Perhitungan/ kesimpulan kurang akurat/tepat dan tidak disertai alasan yang mendasarinya	Perhitungan/kesimpulan salah

Lampiran Rubrik 02 | ASSESMENT PRESENTASI

Kriteria Penilaian	Bobot/Skor Penilaian				
	5	4	3	2	1
Penguasaan Materi	Mahasiswa sangat menguasai materi	Mahasiswa menguasai materi	Mahasiswa cukup menguasai materi	Mahasiswa kurang menguasai materi	Mahasiswa tidak menguasai materi
Sistematika Penyajian	Mahasiswa menyajikan materi presentasi dengan sangat sistematis	Mahasiswa menyajikan materi presentasi dengan sistematis	Mahasiswa menyajikan materi presentasi dengan cukup sistematis	Mahasiswa menyajikan materi presentasi dengan kurang sistematis	Mahasiswa menyajikan materi presentasi dengan tidak sistematis
Suara dan Ekspresi	Mahasiswa menjelaskan dengan suara yang sangat jelas, volume yang sangat sesuai, pengucapan istilah sangat tepat	Mahasiswa menjelaskan dengan suara yang jelas, volume yang sesuai, pengucapan istilah tepat	Mahasiswa menjelaskan dengan suara yang cukup jelas, volume yang cukup sesuai, pengucapan istilah cukup tepat	Mahasiswa menjelaskan dengan suara yang kurang jelas, volume yang kurang sesuai, pengucapan istilah kurang tepat	Mahasiswa menjelaskan dengan suara yang tidak jelas, volume yang tidak sesuai, pengucapan istilah tidak tepat
Kepercayaan Diri	Mahasiswa berbicara dengan sangat semangat, menularkan semangat dan antusiasme pada pendengar, eye contact ke semua peserta (audience)	Mahasiswa berbicara dengan semangat, menularkan semangat dan antusiasme pada pendengar, eye contact ke semua peserta (audience)	Mahasiswa berbicara dengan cukup semangat, cukup menularkan semangat dan antusiasme pada pendengar, eye contact ke semua peserta (audience)	Mahasiswa berbicara dengan kurang semangat, kurang menularkan semangat dan antusiasme pada pendengar, eye contact yang kurang ke semua peserta (audience)	Mahasiswa berbicara dengan tidak semangat, tidak dapat menularkan semangat dan antusiasme pada pendengar, tidak ada eye contact ke semua peserta (audience)
Kemampuan menjawab pertanyaan	Mahasiswa mampu menjawab semua pertanyaan dengan sangat tepat, sangat mendalam (lebih dari yang dibutuhkan), dan sangat tajam	Mahasiswa mampu menjawab semua pertanyaan dengan tepat, mendalam (lebih dari yang dibutuhkan), dan tajam	Mahasiswa mampu menjawab semua pertanyaan dengan cukup tepat, cukup mendalam, dan cukup tajam	Mahasiswa mampu menjawab semua pertanyaan dengan kurang tepat, kurang mendalam, dan kurang tajam	Mahasiswa mampu menjawab semua pertanyaan dengan tidak tepat, tidak mendalam, dan tidak tajam
Kepemimpinan (diskusi kelompok)	Mahasiswa sangat mampu menginisiasi, menggerakkan, mengarahkan, mengorganisir jalannya presentasi	Mahasiswa mampu menginisiasi, menggerakkan, mengarahkan, mengorganisir jalannya presentasi	Mahasiswa cukup mampu menginisiasi, menggerakkan, mengarahkan, mengorganisir jalannya presentasi	Mahasiswa kurang mampu menginisiasi, menggerakkan, mengarahkan, mengorganisir jalannya presentasi	Mahasiswa tidak mampu menginisiasi, menggerakkan, mengarahkan, mengorganisir jalannya presentasi

Lampiran Rubrik 04 | ASSESMENT DISKUSI

Kriteria Penilaian	Bobot/Skor Penilaian				
	5	4	3	2	1
Kelugasan argumen	Mahasiswa menyampaikan pendapat menggunakan bahasa yang sangat baik, sangat mudah dimengerti, intonasi suara yang sangat jelas	Mahasiswa menyampaikan pendapat menggunakan bahasa yang baik, mudah dimengerti, intonasi suara yang jelas	Mahasiswa menyampaikan pendapat menggunakan bahasa yang cukup baik, cukup mudah dimengerti, intonasi suara yang cukup jelas	Mahasiswa menyampaikan pendapat menggunakan bahasa yang kurang baik, kurang mudah dimengerti, intonasi suara yang kurang jelas	Mahasiswa menyampaikan pendapat menggunakan bahasa yang tidak baik, tidak mudah dimengerti, intonasi suara yang tidak jelas
Parsipitasi aktif	Mahasiswa sangat aktif menyampaikan pendapat/masukannya, sangat aktif memberi jawaban, dan sangat berinisiatif mencari solusi	Mahasiswa aktif menyampaikan pendapat/masukannya, aktif memberi jawaban, dan berinisiatif mencari solusi	Mahasiswa cukup aktif menyampaikan pendapat/masukannya, cukup aktif memberi jawaban, dan cukup berinisiatif mencari solusi	Mahasiswa kurang aktif menyampaikan pendapat/masukannya, kurang aktif memberi jawaban, dan kurang berinisiatif mencari solusi	Mahasiswa tidak aktif menyampaikan pendapat/masukannya, tidak aktif memberi jawaban, dan tidak berinisiatif mencari solusi
Etika dan sikap tata nilai	Mahasiswa sangat mengindahkan etika diskusi akademik secara umum	Mahasiswa mengindahkan etika diskusi akademik secara umum	Mahasiswa cukup mengindahkan etika diskusi akademik secara umum	Mahasiswa kurang mengindahkan etika diskusi akademik secara umum	Mahasiswa tidak mengindahkan etika diskusi akademik secara umum
Kepemimpinan (diskusi kelompok)	Mahasiswa sangat mampu menginisiasi, menggerakkan, mengarahkan, mengorganisir jalannya diskusi	Mahasiswa mampu menginisiasi, menggerakkan, mengarahkan, mengorganisir jalannya diskusi	Mahasiswa cukup mampu menginisiasi, menggerakkan, mengarahkan, mengorganisir jalannya diskusi	Mahasiswa kurang mampu menginisiasi, menggerakkan, mengarahkan, mengorganisir jalannya diskusi	Mahasiswa tidak mampu menginisiasi, menggerakkan, mengarahkan, mengorganisir jalannya diskusi