



INSTITUT TEKNOLOGI SEPULUH NOPEMBER
FAKULTAS SAINS DAN ANALITIKA DATA
PROGRAM STUDI MAGISTER STATISTIKA
DEPARTEMEN STATISTIKA

Kode Dokumen

REV-1

RENCANA PEMBELAJARAN SEMESTER

MATA KULIAH (MK)		KODE	Rumpun MK	BOBOT (sks)		SEMESTER	Tgl Penyusunan
Teknik Simulasi Lanjut		SS255212	Statistika Komputasi dan Sains Data	T=3	P=0	II	Agustus 2026
OTORISASI		Pengembang RPS		Koordinator RMK		Kepala PRODI	
		Prof. Drs. Nur Iriawan, M.IKom., Ph.D.		Prof. Drs. Nur Iriawan, M.Ikomp, Ph.D		Irhamah, S.Si, M.Si, Ph.D.	
Capaian Pembelajaran (CP) <i>Learning Outcome (LO)</i>	CPL-PRODI yang dibebankan pada MK						
	CPL-4 <i>PLO-4</i>	Mampu menganalisis dan mengintegrasikan Teori Statistika dalam merumuskan metode statistika yang inovatif untuk menyelesaikan permasalahan teoritis dan riil. <i>Able to analyze and integrate statistical theory to formulate innovative statistical methods for solving both theoretical and real-world problems.</i>					
	CPL-6 <i>PLO-6</i>	Mampu mengintegrasikan perangkat komputasi modern untuk mengembangkan solusi statistik yang efisien, dengan mengevaluasi keandalan dan ketepatan hasil komputasi. <i>Able to integrate modern computing tools to develop efficient statistical solutions, while assessing the reliability and accuracy of computational results.</i>					
	CPL-7 <i>PLO-7</i>	Mampu menganalisis dan mengevaluasi teknik komputasi statistik untuk memecahkan permasalahan statistika yang kompleks berbasis data <i>Able to analyze and evaluate statistical computing techniques to address complex, data-driven statistical problems</i>					
	CPL-8 <i>PLO-8</i>	Mampu menganalisis dan mengevaluasi metode statistika untuk merumuskan solusi pada permasalahan teoritis dan riil dengan pendekatan multidisipliner <i>Able to analyze and evaluate statistical methodologies to formulate solutions for theoretical and real-world problems using a multidisciplinary approach.</i>					
	Capaian Pembelajaran Mata Kuliah (CPMK)						
	CPMK-1	Mampu merumuskan dan mengonseptualisasikan penggunaan Teknik Simulasi dan prosedurnya secara mendalam pada berbagai bidang kompleks <i>Able to formulate and conceptualize the advanced application of Simulation Technique concepts and procedures across complex domains</i>					
	CPMK-2	Mampu menganalisis, memvalidasi, dan menginterpretasikan data menggunakan metode statistika tingkat lanjut serta kerangka Teknik Simulasi <i>Able to analyze, validate, and interpret data using advanced statistical methods and Simulation Technique frameworks</i>					
	CPMK-3	Mampu mendesain, memformulasi, dan menyelesaikan permasalahan statistika tingkat lanjut pada berbagai bidang terapan berbasis Teknik Simulasi					

Mg Ke-	Kemampuan akhir tiap tahapan belajar (Sub-CPMK)	Penilaian		Bantuk Pembelajaran, Metode Pembelajaran, Penugasan Mahasiswa, [Estimasi Waktu]		Materi Pembelajaran [Pustaka]	Bobot Penilaian (%)
		Indikator	Kriteria & Bentuk	Luring (offline)	Daring (online)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	<i>of probability and distribution by combining information from data that have vary patterns either stochastic or non stochastic</i>	<ul style="list-style-type: none"> - <i>Determination of normalized constant</i> - <i>unimodal and multimodal of pattern data plot</i> 		<i>200 Minutes</i>		<i>presentation</i>	
2 – 3	<p>Mampu menjelaskan cara kerja Random number generation</p> <p><i>Able to explain how random number generation works</i></p>	<ul style="list-style-type: none"> - pembangkitan data random (0,1) (RNG=Random number generator) - pengertian pembuatan random variate generator (RVG) - pembangkitan data random berdistribusi diskrit dan kontinu - <i>Generation of random data (0,1) (RNG=Random number generator)</i> - <i>Definition of executing Random variate generator (RVG)</i> <i>Random data generation that are discrete and continue distributed</i> 	<p>Tes Tugas (Observasi Aktivitas di kelas</p> <p><i>Assignments (Observation Activities in class</i></p>	<p>Ceramah Interaktif-Latihan Soal-Praktikum (CILSP) 300 Menit</p> <p><i>Interactive Lectures-Exercises-Practicum (ILEP) 300 Minutes</i></p>		<p>Random number generation</p> <p><i>Random number generation</i></p> <p>1.</p>	
4	<p>Mampu menjelaskan teknik Monte Carlo dan mengimplementasikan dalam kalkulus dan penghitungan probabilitas</p> <p><i>Able to explain</i></p>	<ul style="list-style-type: none"> - penghitungan nilai integral dengan monte carlo - penghitungan nilai probabilitas dengan monte carlo 	<p>Presentasi dan diskusi Tugas (Observasi Aktivitas di kelas</p> <p><i>Presentation</i></p>	<p>Ceramah Interaktif-Latihan Soal-Praktikum (CILSP) 200 Menit</p>		<p>Monte Carlo techniques</p> <p><i>Monte Carlo techniques</i></p>	

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		Indikator	Kriteria & Bentuk	Luring (offline)	Daring (online)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	<i>Monte Carlo techniques and implement in calculus and probability calculation</i>	<i>- Calculation of integral values using monte carlo Calculation of probability values using Monte Carlo</i>	<i>and discussion Assignments (Observation Activities in class</i>	<i>Interactive Lectures- Exercises- Practicum (ILEP) 200 Minutes</i>			
5	Mampu menjelaskan konsep simulasi melalui proses Bootstrapping and resampling methods <i>Able to explain the concept of simulation through the process of Bootstrapping and resampling methods</i>	perbanyakkan versus pembangkitan data dengan resampling untuk menghitung integral dan probabilitas <i>Propagation versus data generation by resampling to calculate integrals and probabilities</i>	Presentasi dan diskusi Tugas (Observasi Aktifitas di kelas <i>Presentation and discussion Assignments (Observation Activities in class</i>	200 menit <i>200 minutes</i>		Bootstrapping and resampling methods <i>Bootstrapping and resampling methods</i>	
6	Mampu menentukan validitas hasil simulasi dengan memilih Statistical tests and model validation yang tepat <i>Able to determine the validity of simulation results by choosing the right Statistical tests and validation models</i>	pengujian validitas RNG dan RVG <i>RNG and RVG validity testing</i>	Presentasi dan diskusi Tugas (Observasi Aktifitas di kelas <i>Presentation and discussion Assignments (Observation Activities in</i>	Ceramah Interaktif- Latihan Soal-Praktikum (CILSP) 100 Menit <i>Interactive Lectures- Exercises- Practicum (ILEP) 100 Minutes</i>		Statistical tests and model validation <i>Statistical tests and model validation</i>	

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		Indikator	Kriteria & Bentuk	Luring (offline)	Daring (online)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
			class				
7 – 8	<ul style="list-style-type: none"> - Mampu menjelaskan dan menentukan Teknik reduksi varians data simulasi yang tepat - ETS - <i>Able to explain and determine the appropriate reduction variance technique of simulation data ETS</i> 	Pengendalian besaran varian data yang disimulasikan <i>Controlling the variance of simulated data</i>	Tes Tugas (Observasi Aktifitas di kelas <i>Test Assignments (Observation Activities in class</i>	Ceramah Interaktif- Latihan Soal-Praktikum (CILSP) 100 Menit <i>Interactive Lectures- Exercises- Practicum (ILEP) 100 Minutes</i>		Teknik reduksi varians <i>Variance reduction technique</i>	
9-10	Mampu mejelaskan kemanfaatan interaksi RNG dalam simulasi sistem event diskrit <i>Able to explain the usefulness of RNG interactions in discrete event system simulations</i>	Pembuatan simulator sistem M/M/S <i>M/M/S system simulator execution</i>	Presentasi dan diskusi Tugas (Observasi Aktifitas di kelas <i>Presentation and discussion Assignments (Observation Activities in class</i>	Ceramah Interaktif- Latihan Soal-Praktikum (CILSP) 250 Menit <i>Interactive Lectures- Exercises- Practicum (ILEP) 250 Minutes</i>		Discrete event simulation <i>Discrete event simulation</i>	
11	Mampu menjelaskan konsep dan proses Simulasi	- Simulasi data mixture k komponen distribusi diskrit	Presentasi dan diskusi	Ceramah Interaktif- Latihan		Mixture models and clustering	

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		Indikator	Kriteria & Bentuk	Luring (offline)	Daring (online)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	stokastik yang berpola mixture dan ber-kelompok (cluster) <i>Able to explain the concept and stochastic simulation process that have mixture and pattern and group (cluster)</i>	<ul style="list-style-type: none"> - Simulasi data mixture k komponen distribusi kontinu - <i>Simulation of mixture k components discrete distribution data</i> <i>Simulation of mixture k continuous distribution component data</i> 	Tugas (Observasi Aktifitas di kelas <i>Presentation and discussion Assignments (Observation Activities in class)</i>	Soal-Praktikum (CILSP) 175 Menit <i>Interactive Lectures- Exercises- Practicum (ILEP) 175 Minutes</i>		<i>Mixture models and clustering</i>	
12	Mampu menjelaskan konsep dan proses Simulasi proses rantai Markov discrete-time <i>Able to explain the concept and simulation process of the discrete-time Markov chain process</i>	Simulasi pengisian matriks transisi markov ($k \times k$) <i>Simulation of filling the markov transition matrix ($k \times k$)</i>	Presentasi dan diskusi Tugas (Observasi Aktifitas di kelas <i>Presentation and discussion Assignments (Observation Activities in class)</i>	Ceramah Interaktif- Latihan Soal-Praktikum (CILSP) 150 Menit <i>Interactive Lectures- Exercises- Practicum (ILEP) 150 Minutes</i>		Discrete time Markov chains <i>Discrete time Markov chains</i>	
13-14	Mampu menjelaskan kesamaan dan perbedaan konsep dan proses antara metode Markov chain	<ul style="list-style-type: none"> - Pengertian EM - Pengertian penggantian proses EM dengan MCMC - <i>Definition of EM</i> 	Presentasi dan diskusi Tugas (Observasi	Ceramah Interaktif- Latihan Soal-Praktikum (CILSP)		Markov chain Monte Carlo methods dan Expectation	

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		Indikator	Kriteria & Bentuk	Luring (offline)	Daring (online)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	<p>Monte Carlo (MCMC) dengan metode Expectation maximization (EM)</p> <p><i>Able to explain the similarities and differences in concepts and processes between the Markov chain Monte Carlo (MCMC) method and the Expectation maximization (EM) method</i></p>	<p><i>- Definition of the replacement of EM processes with MCMC</i></p>	<p>Aktifitas di kelas</p> <p><i>Presentation and discussion Assignments (Observation Activities in class)</i></p>	<p>300 Menit</p> <p><i>Interactive Lectures- Exercises- Practicum (ILEP) 300 Minutes</i></p>		<p>maximization</p> <p><i>Markov chain Monte Carlo methods and Expectation maximization</i></p>	
15 – 16	<p>- Mampu menjelaskan konsep MCMC and simulated annealing</p> <p>- EAS</p> <p><i>- Able to explain the concept of MCMC and simulated annealing</i></p> <p><i>- EAS</i></p>	<p>Pengertian simulated annealing untuk proses MCMC</p> <p><i>Definition of Simulated annealing for the MCMC process</i></p>	<p>Presentasi dan diskusi Tugas (Observasi Aktifitas di kelas)</p> <p><i>Presentation and discussion Assignments (Observation Activities in class)</i></p>	<p>Ceramah Interaktif- Latihan Soal-Praktikum (CILSP) 125 Menit</p> <p><i>Interactive Lectures- Exercises- Practicum (ILEP) 125 Minutes</i></p>		<p>MCMC and simulated annealing</p> <p><i>MCMC and simulated annealing</i></p>	