



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

Kode Dokumen

RENCANA PEMBELAJARAN SEMESTER

MATA KULIAH (MK)		KODE	Rumpun MK	BOBOT (sks)		SEMESTER	Tgl Penyusunan
Teknik Simulasi Lanjut		SS235112	Statistika Komputasi dan Sains Data	T=3	P=0		Februari 2023
OTORISASI		Pengembang RPS		Koordinator RMK		Ketua PRODI	
				Prof. Drs. Nur Iriawan, M.Ikomp, Ph.D		Dr.rer.pol. Dedy Dwi Prastyo, S.Si, M.Si	
Capaian Pembelajaran (CP)	CPL-PRODI yang dibebankan pada MK						
Learning Outcome (LO)	CPL-1 PLO-1	Mampu menunjukkan sikap dan karakter yang mencerminkan: ketakwaan kepada Tuhan Yang Maha Esa, etika dan integritas, berbudi pekerti luhur, peka dan peduli terhadap masalah sosial dan lingkungan, menghargai perbedaan budaya dan kemajemukan, menjunjung tinggi penegakan hukum mendahulukan kepentingan bangsa dan masyarakat luas, melalui kreatifitas dan inovasi, ekselensi, kepemimpinan yang kuat, sinergi, dan potensi lain yang dimiliki untuk mencapai hasil yang maksimal. <i>Able to demonstrate attitudes and characters that reflect: being pious to God Almighty, having ethics and integrity, virtuous character, sensitive and concern with social and environmental issues, respecting cultural differences and pluralism, upholding law enforcement, prioritizing the interests of the nation and the wider community, through creativity and innovation, excellence, strong leadership, synergy, and other potentials to achieve maximum results.</i>					
	CPL-2 PLO-2	Mampu mengembangkan dan memecahkan permasalahan ilmu pengetahuan dan teknologi dalam bidang keilmuan nya melalui riset dengan pendekatan inter atau multidisiplin hingga menghasilkan karya inovatif dan teruji dalam bentuk tesis dan makalah yang telah diterima di jurnal ilmiah nasional terakreditasi atau diterima di seminar internasional bereputasi. <i>Able to develop and solve science and technology problems in their field through research with an inter or multidisciplinary approach to produce innovative and tested works in the form of theses and papers that have been accepted in accredited national journals or accepted at reputable international seminars.</i>					
	CPL-3 PLO-3	Mampu mengelola pembelajaran diri sendiri, dan mengembangkan diri sebagai pribadi pembelajar sepanjang hayat untuk bersaing di tingkat nasional, maupun internasional, dalam rangka berkontribusi nyata untuk menyelesaikan masalah dengan mengimplementasikan teknologi informasi dan komunikasi dan memperhatikan prinsip keberlanjutan. <i>Able to manage their own learning and develop themselves as personal lifelong learners to compete at national and international levels, in order to make a real contribution to solving problems by implementing information and communication technology and paying attention to the principle of sustainability.</i>					
	CPL-4 PLO-4	Mampu menerapkan Teori Statistika pada Metode Statistika. <i>Able to apply Statistical Theory to Statistical Methods</i>					
	CPL-5	Mampu merancang, melaksanakan, dan mengevaluasi pengumpulan data dengan metodologi yang tepat.					

	Pendukung :	
Dosen Pengampu	Prof. Drs. Nur Iriawan, M.lkomp, Ph.D	
Matakuliah syarat		

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)
1	Mampu menjelaskan konsep probabilitas dan distribusi dengan memadukan informasi dari data yang berbeda-beda polanya baik bersifat stokastik ataupun non stokastik <i>Able to explain the concept of probability and distribution by combining information from data that have vary patterns either stochastic or non stochastic</i>	- Pengertian konsep data driven - pdf dan cdf close form - penentuan normalized constant - unimodal dan multimodalitas - plot pola data - <i>Definition of the concept of data driven</i> - <i>Close form pdf and cdf</i> - <i>Determination of normalized constant</i> - <i>unimodal and multimodal of pattern data plot</i>	Observasi Aktifitas di kelas <i>Observation Activities in class</i>	Ceramah Interaktif- Latihan Soal-Praktikum (CILSP) 200 Menit <i>Interactive Lectures- Exercises- Practicum (ILEP) 200 Minutes</i>		Probability review, simulation concepts, data presentation <i>Probability review, simulation concepts, data presentation</i>	
2 – 3	Mampu menjelaskan cara kerja Random number generation <i>Able to explain how random number generation works</i>	- pembangkitan data random (0,1) (RNG=Random number generator) - pengertian pembuatan random variate generator (RVG) - pembangkitan data random berdistribusi diskrit dan kontinu	Tes Tugas (Observasi Aktifitas di kelas <i>Assignments (Observation Activities in class</i>	Ceramah Interaktif- Latihan Soal- Praktikum (CILSP) 300 Menit <i>Interactive Lectures- Exercises-</i>		Random number generation <i>Random number generation</i> 1.	

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>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>		<i>Practicum (ILEP)</i> <i>300 Minutes</i>			
4	Mampu menjelaskan teknik Monte Carlo dan mengimplementasikan dalam kalkulus dan penghitungan probabilitas <i>Able to explain Monte Carlo techniques and implement in calculus and probability calculation</i>	- penghitungan nilai integral dengan monte carlo - penghitungan nilai probabilitas dengan monte carlo - <i>Calculation of integral values using monte carlo</i> - <i>Calculation of probability values using Monte Carlo</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) 200 Menit <i>Interactive Lectures-Exercises-Practicum (ILEP)</i> <i>200 Minutes</i>		Monte Carlo techniques <i>Monte Carlo techniques</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</i>	perbanyak data versus pembangkitan data dengan resampling untuk menghitung integral dan probabilitas <i>Propagation versus data generation by resampling to</i>	Presentasi dan diskusi Tugas (Observasi Aktifitas di kelas <i>Presentation and discussion</i>	200 menit <i>200 minutes</i>		Bootstrapping and resampling methods <i>Bootstrapping and resampling methods</i>	

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>and resampling methods</i>	<i>calculate integrals and probabilities</i>	<i>Assignments (Observation Activities in class)</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 class)</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>	
7 – 8	- 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</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>		Tenik reduksi varians <i>Variance reduction technique</i>	

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		Indikator	Kriteria & Bentuk	Luring (offline)	Daring (online)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	<i>ETS</i>						
9-10	Mampu menjelaskan 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 Aktivitas 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 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>	- Simulasi data mixture k komponen distribusi diskrit - 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>	Presentasi dan diskusi Tugas (Observasi Aktivitas di kelas) <i>Presentation and discussion Assignments (Observation Activities in class)</i>	Ceramah Interaktif- Latihan Soal-Praktikum (CILSP) 175 Menit <i>Interactive Lectures- Exercises- Practicum (ILEP) 175 Minutes</i>		Mixture models and clustering <i>Mixture models and clustering</i>	
12	Mampu menjelaskan	Simulasi pengisian matriks transisi	Presentasi dan	Ceramah		Discrete time	

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		Indikator	Kriteria & Bentuk	Luring (offline)	Daring (online)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	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>	markov ($k \times k$) <i>Simulation of filling the markov transition matrix ($k \times k$)</i>	diskusi Tugas (Observasi Aktifitas di kelas <i>Presentation and discussion Assignments (Observation Activities in class</i>	Interaktif- Latihan Soal-Praktikum (CILSP) 150 Menit <i>Interactive Lectures- Exercises- Practicum (ILEP) 150 Minutes</i>		Markov chains <i>Discrete time Markov chains</i>	
13-14	Mampu menjelaskan kesamaan dan perbedaan konsep dan proses antara metode Markov chain Monte Carlo (MCMC) dengan metode Expectation maximization (EM) <i>Able to explain the similarities and differences in concepts and processes between the Markov chain Monte Carlo (MCMC) method and the Expectation</i>	- Pengertian EM - Pengertian penggantian proses EM dengan MCMC - <i>Definition of EM</i> - <i>Definition of the replacement of EM processes with MCMC</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) 300 Menit <i>Interactive Lectures- Exercises- Practicum (ILEP) 300 Minutes</i>		Markov chain Monte Carlo methods dan Expectation maximization <i>Markov chain Monte Carlo methods and Expectation maximization</i>	

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>maximization (EM) method</i>						
15 – 16	- Mampu menjelaskan konsep MCMC and simulated annealing - EAS - <i>Able to explain the concept of MCMC and simulated annealing</i> - <i>EAS</i>	Pengertian simulated annealing untuk proses MCMC <i>Definition of Simulated annealing for the MCMC process</i>	Presentasi dan diskusi Tugas (Observasi Aktivitas di kelas <i>Presentation and discussion Assignments (Observation Activities in class</i>	Ceramah Interaktif- Latihan Soal-Praktikum (CILSP) 125 Menit <i>Interactive Lectures- Exercises- Practicum (ILEP) 125 Minutes</i>		MCMC and simulated annealing <i>MCMC and simulated annealing</i>	