



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
Analisis Reliabilitas		SS255223	Analitika Data Bisnis Dan Industri	T=3	P=0	II	Agustus 2026
OTORISASI		Pengembang RPS		Koordinator RMK		Kepala PRODI	
		Dr. Muhammad Ahsan, S.Si.		Dr. Muhammad Ahsan, S.Si.		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-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>					
	CPL-9 <i>PLO-9</i>	Mampu menganalisis dan mengevaluasi metode statistika berbasis komputasi atau analitik yang inovatif untuk mengatasi permasalahan riil di bidang bisnis, industri, ekonomi, finansial, sosial dan pembangunan berkelanjutan, lingkungan, kesehatan, serta mengevaluasi dampaknya terhadap pengambilan keputusan <i>Able to analyze and evaluate innovative computation- or analytics-based statistical methods to address real-world problems in business, industry, economics and finance, social and sustainable development, environment, and health, and to assess their impact on decision-making.</i>					
	Capaian Pembelajaran Mata Kuliah (CPMK)						
	CPMK-1	Mampu memahami konsep dasar analisis reliabilitas <i>Able to understand the basic concepts of reliability analysis.</i>					
	CPMK-2	Mampu memahami distribusi probabilitas dalam analisis reliabilitas					

		<i>Able to understand probability distributions in reliability analysis.</i>
	CPMK-3	Mampu menerapkan konsep Bayesian untuk analisis reliabilitas <i>Able to apply Bayesian concepts for reliability analysis.</i>
	CPMK-4	Mampu menghitung reliabilitas system dengan komponen penyusun yang saling bebas <i>Able to calculate system reliability with independent components.</i>
	CPMK-5	Mampu menghitung reliabilitas system dengan komponen penyusun tidak saling bebas <i>Able to calculate the reliability of a system with dependent components.</i>
	CPMK-6	Mampu memahami Counting process <i>Able to understand the Counting process.</i>
	CPMK-7	Mampu menghitung reliabilitas untuk maintained system <i>Able to calculate the reliability for maintained systems.</i>
	CPMK-8	Mampu melakukan uji hidup dipercepat <i>Able to perform the accelerated life tests.</i>

		Matrik CPL – CPMK									
		CPMK	CPL-1	CPL-2	CPL-3	CPL-4	CPL-5	CPL-6	CPL-7	CPL-8	CPL-9
		CPMK-1								V	V
		CPMK-2								V	V
		CPMK-3						V			V
		CPMK-4						V			V
		CPMK-5						V			V
		CPMK-6						V			V

		CPMK-7						V			V
		CPMK-8						V			V
Deskripsi Singkat MK											
Bahan Kajian: Materi Pembelajaran	Teori Statistika, Bisnis dan Industri <i>Statistical Theory, Business and Industry</i>										
Pustaka	Utama :										
	1. Birolini, Alessandro, 2017, Reliability Engineering: Theory and Practice, 8th edition, Springer: Heidelberg 2. Rausand, Marvin and Hsyland, Arnljot, 2004, System Reliability Theory: Models, Statistical Methods, and Applications, 2nd edition, John Wiley & Sons, Inc., 3. Lawless, J.F., 1982, Statistical Models and Methods for Life Time Data, John Wiley & Sons: New York.										
	Pendukung :										
Dosen Pengampu	Dr. Muhammad Ahsan, S.Si.										
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	1. Memahami konsep dasar	1.1 Mampu memodelkan	Observasi Aktifitas di kelas	Ceramah interaktif Diskusi (CID)		Konsep-konsep Statistik dalam	5%/5%

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	dalam analisis reliabilitas <i>1. Understand the basic concepts in reliability analysis</i>	banyak kerusakan dalam bentuk distribusi binomial, hipergeometrik, dan proses Poisson 1.2 Memahami system seri, parallel, dan mampu menghitung reliabilitas system <i>1.1 Able to do modeling of multiple damages in the form of binomial distribution, hypergeometric, and Poisson process</i> <i>1.2 Understand</i>	(TOA)	<i>Discussion (CID)</i> 150 menit <i>150 minutes</i>		analisis reliabilitas: 1. Data reliabilitas 2. Distribusi binomial, hipergeometrik, dan proses Poisson 3. Reliabilitas system seri dan parallel <i>Statistical concepts in reliability analysis:</i> <i>1. Data reliability</i> <i>2. Binomial distribution, hypergeometric and Poisson process</i> <i>3. Reliability of series and parallel system</i>	5%/5%

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>series, parallel systems, and be able to calculate system reliability</i>					
2, 3	2. Memahami distribusi probabilitas dalam analisis reliabilitas	4.1 Mampu membuat fungsi reliabilitas, fungsi laju kerusakan dari berbagai distribusi 4.2 Mampu menaksirkan parameter-parameter beberapa distribusi yang sering digunakan dalam analisis reliabilitas	Tes & Observasi Aktifitas di kelas(TOA) <i>Test and</i>	CID, Latihan Soal (L) <i>CID, Exercise (L)</i>		Distribusi probabilitas dalam analisis reliabilitas: 1. Fungsi reliabilitas dan fungsi laju kerusakan 2. MTTF dan MTBF 3. Distribusi eksponensial 4. Distribusi Weibull dan Gumbel 5. Distribusi dan log normal 6. Distribusi Gamma 7. Extreme Value Distribution <i>Probability distribution in reliability analysis:</i> 1. Reliability function and damage rate function 2. MTTF and MTBF	10%/15%

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)
2, 3	2. Understand probability distribution in reliability analysis	2.1 Able to make reliability function, damage rate function from various distribution 2.2 Able to estimate the parameters of several distributions that are often used in reliability analysis	Observation in class (TOA)	300 menit 300 minutes		3. Exponential distribution 4. Weibull and Gumbel distribution 5. Normal distribution and log 6. Gamma Distribusi Distribution 7. Extreme Value Distribution 2.	10%/15%
4, 5	3. Memahami Distribusi campuran (mixture) dalam analisis reliabilitas	3.1 Mampu mengidentifikasi komponen mixture dalam distrbusi	Tes &Observasi Aktifitas di kelas(TOA)	CIDL, Latihan Soal (L)		1. Distribusi campuran dengan jumlah komponen	20%/35%

Mg Ke-	Kemampuan akhir tiap tahapan belajar (Sub-CPMK)	Penilaian		Bantuan Pembelajaran, Metode Pembelajaran, Penugasan Mahasiswa, [Estimasi Waktu]		Materi Pembelajaran [Pustaka]	Bobot Penilaian (%)
		Indikator	Kriteria & Bentuk	Luring (<i>offline</i>)	Daring (<i>online</i>)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
4, 5	3. Understanding Mixture distribution in reliability analysis	3.2 Mampu menaksir parameter distribusi campuran dengan algoritma E-M 3.1 Able to identify mixture components in distribution 3.2 Able to estimate mixed distribution parameters with E-M . algorithm	Test and Observation in class (TOA)	CIDL, Exercises (L) 450 menit 450 minutes		mixture diketahui 2. Distribusi campuran dengan jumlah komponen mixture tidak diketahui 3. Algoritma Ekspektasi-Maksimisasi (E-M) untuk penaksiran parameter 1. Distribution of a mixture with a known number of components of the mixture 2. Distribution of mixtures with an unknown number of components of the mixture 3. Expectation-Maximization (E-M) Algorithm for parameter estimation	20%/35%

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)
6, 7	4. Mampu menerapkan konsep Bayesian untuk distribusi campuran pada analisis reliabilitas	4.1 Dapat menjelaskan konsep dasar Bayesian 4.2 Dapat menerapkan konsep Bayesian untuk distribusi campuran pada analisis reliabilitas 4.3 Memahami algoritma MCMC	Tes & Observasi Aktifitas di kelas (TOA)	CIDL, Latihan Soal (L)		1. Konsep dasar Bayesian: prior dan posterior 2. Bayesian untuk distribusi mixture 3. Komputasi Markov Chain Monte Carlo (MCMC)	15%/50%
6,7	4. Able to apply Bayesian concept for mixed distribution in reliability analysis	4.1 Able explain basic Bayesian concepts 4.2 Able to apply Bayesian concepts for mixed distributions in	Test and Observation in class (TOA)	CIDL, Exercises (L) 300 menit 300 minutes		1. Basic Bayesian concepts: prior and posterior 2. Bayesian for mixture distribution 3. Markov Chain Monte Carlo Computing (MCMC)	15%/50%

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)
		reliability analysis 4.3 Understand MCMC algorithm					
8 8	ETS ETS						
9 9	5. Mampu menghitung reliabilitas system dengan komponen penyusun yang saling bebas 5. Able to calculate system reliability with independent constituent components	5.1 Dapat menghitung reliabilitas sistem yang komponennya non-repairable dan saling bebas 5.2 Dapat menghitung redundancy system 5.1 Able to calculate the reliability of a system whose components are non-repairable and independent 5.2 Able to calculate system redundancy	Tes & Observasi Aktifitas di kelas (TOA) Test and Observation in class (TOA)	CIDL, Latihan Soal (L) CIDL, Exercises (L) 150 menit 150 minutes		1. Sistem non-repairable 2. Redundancy 1. Non-repairable system 2. Redundancy	9 9
10 10	6. Mampu menghitung reliabilitas system dengan komponen	Dapat memodelkan beberapa kejadian failure yang tidak saling bebas	Tes & Observasi Aktifitas di kelas(TOA) Test and Observation in	CIDL, Latihan Soal (L) CIDL, Exercises (L)		Memodelkan Dependent failure Modeling Dependent failure	10%/70% 10%/70%

Mg Ke-	Kemampuan akhir tiap tahapan belajar (Sub-CPMK)	Penilaian		Bantuan 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)
	penyusun tidak saling bebas 6. Able to calculate system reliability with components that are not independent of each other	<i>Able to do modeling of several non-independent failure events</i>	<i>class (TOA)</i>	150 menit <i>150 minutes</i>			
11, 12 11, 12	7. Memahami Counting process 7. Understand the Counting process	7.1 Dapat memodelkan proses Poisson dengan intensitas yang homogen dan non-homogen 7.2 Dapat menghitung reliabilitas sistem yang bisa diperbaiki dan bisa diperbaiki tapi tidak sempurna	Tes & Observasi Aktivitas di kelas (TOA) <i>Test and Observation in class (TOA)</i>	CIDL, Latihan Soal (L) <i>CIDL, Exercises (L)</i> 300 menit		1. Homogeneous Poisson process 2. Renewal process 3. Non-homogeneous Poisson process 4. Imperfect repair process <i>1. Homogeneous Poisson process 2. Renewal process 3. Non-homogeneous Poisson process 4. Imperfect repair</i>	10%/80% <i>10%/80%</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>7.1 Able to do modeling of the Poisson process with homogeneous and non-homogeneous intensity</i> <i>7.2 Able to calculate system reliability that can be improved and can be improved but not perfect</i>		300 minutes		process	
13-14	8. Mampu menghitung reliabilitas untuk <i>maintained system</i>	8.1 Dapat menguji distribusi dari downtime 8.2 Dapat melakukan optimasi perawatan system	Tes & Observasi Aktifitas di kelas (TOA) <i>Test and Observation in class (TOA)</i>	CIDL, Latihan Soal (L) <i>CIDL, Exercises (L)</i> 300 menit		1. Distribusi dari downtime 2. Optimasi <i>maintenance</i> <i>1. Distribution of downtime</i> <i>2. Maintenance optimization</i>	10%/90% <i>10%/90%</i>
13-14	<i>8. Able to calculate reliability for maintained system</i>	<i>8.1 Able to test distribution of downtime</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)
		8.2 Able to perform system maintenance optimization		300 minutes			
15	9. Mampu melakukan uji hidup dipercepat (Accelerated Life Testing)	9.1 Dapat melakukan pemodelan untuk ALT dengan pendekatan parametrik 9.2 Dapat melakukan pemodelan untuk ALT dengan pendekatan non-parametrik	Tes & Observasi Aktifitas di kelas (TOA)	CIDL, Latihan Soal (L)		Melakukan Accelerated Life Testing (ALT) dengan pendekatan parametrik dan nonparametric	10%/100%
15	9. Able to perform accelerated life testing (Accelerated Life Testing)	9.1 Able to do modeling for ALT with parametric approach 9.2 Able to do modeling for ALT	Test and Observation in class (TOA)	CIDL, Exercises (L) 150 menit 150 minutes		Performing Accelerated Life Testing (ALT) with parametric and nonparametric approaches	10%/100%

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 (<i>offline</i>)	Daring (<i>online</i>)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		<i>with non-parametric approach</i>					
16 <i>16</i>	EAS <i>EAS</i>						