

MODULE HANDBOOK

STATISTICAL DATA ANALYSIS



**STATISTICS UNDERGRADUATE PROGRAM
DEPARTMENT OF STATISTICS
FACULTY OF SCIENCE AND DATA ANALYTICS
INSTITUT TEKNOLOGI SEPULUH NOPEMBER
SURABAYA**

ENDORSEMENT PAGE



MODULE HANDBOOK STATISTICAL DATA ANALYSIS STATISTICS UNDERGRADUATE PROGRAM DEPARTMENT OF STATISTICS INSTITUT TEKNOLOGI SEPULUH NOPEMBER

Proses <i>Process</i>	Penanggung Jawab <i>Person in Charge</i>			Tanggal <i>Date</i>
	Nama <i>Name</i>	Jabatan <i>Position</i>	Tanda tangan <i>Signature</i>	
Perumus <i>Preparation</i>	Dr. Kartika Fithriasari, M.Si	Dosen Lecturer		
Pemeriksa dan Pengendalian <i>Review and Control</i>	Dr. Kartika Fithriasari, M.Si; Irhamah, M.Si., Ph.D.; Dr. Santi Wulan Purnami, S.Si., M.Si.	Tim kurikulum Curriculum team		
Persetujuan <i>Approval</i>	Prof. Nur Iriawan, M.Ikom, Phd.	Koordinator RMK Course Cluster Coordinator		
Penetapan <i>Determination</i>	Dr. Kartika Fithriasari, M.Si	Kepala Departemen Head of Department		

MODULE HANDBOOK

STATISTICAL DATA ANALYSIS

Module name	STATISTICAL DATA ANALYSIS	
Module level	Undergraduate	
Code	SS234523	
Course (if applicable)	STATISTICAL DATA ANALYSIS	
Semester	5	
Person responsible for the module	Dr. Kartika Fithriasari, M.Si	
Lecturer	Dr. Kartika Fithriasari, M.Si; Irhamah, M.Si., Ph.D.;Dr. Santi Wulan Purnami, S.Si., M.Si.	
Language	Bahasa Indonesia and English	
Relation to curriculum	Undergraduate degree program, mandatory, 5th semester.	
Type of teaching, contact hours	Lectures, <50 students	
Workload	1. Lectures [L] : 2 x 50 = 100 minutes perweek. 2. Practicum [P] : 2x45=90 minutes per week. 3. Exercises and Assignments [EA] : 2 x 60 = 120 minutes (2 hours) perweek. 4. Independent learning [IL]: 2 x 60 = 120 minutes (2 hours) per week	
Credit points	3 credit points (SKS) Equivalent to 4.8 ECTS	
Requirements according to the examination regulations	A student must have attended at least 80% of the lectures to sit in the exams.	
Mandatory prerequisites	-	
Learning outcomes and their corresponding PLOs	CLO.1 Able to study and utilize statistical methods in order to solve a case. CLO.2 Able to solve problems by implementing information and communication technology CLO.3 Able to apply statistical theory to descriptive, diagnostic and predictive analysis CLO.4 Able to use modern computing devices to solve statistical problems CLO.5 Able to apply and evaluate computational techniques to solve statistical problems CLO.6 Able to apply statistical methods correctly and evaluate them to analyze theoretical and real problems	PLO-1 PLO-2 PLO-3 PLO-4 PLO-5 PLO-6 PLO-7 PLO-8 PLO-9 PLO-10

	CLO.7 Able to apply Computing-based Business, Industrial, Financial Economic, Social Population, Environmental or Health Statistics methods to real problems	
Content	This course focuses on students' ability to be able to apply the statistical methods that have been studied so far in relation to solving real problems in the field properly and correctly. Apart from that, students are equipped with the ability to select the correct analysis method, the ability to process and analyze data and interpret the output obtained from data processing. Students are also required to be able to communicate the results of their analysis in the form of written reports and orally.	
Assessment and its weight		
Media employed	LCD, whiteboard, websites (myITS Classroom), zoom	
Reading list	<ol style="list-style-type: none"> 1. Data Analysis and Graphics Using R: An Example-Based Approach, John Maindonald, W. John Braun, · 2010 2. Data Analysis with R - Second Edition: A comprehensive guide to manipulating, analyzing, and visualizing data in R, Tony Fischetti, 2018 3. Data Analysis: A Gentle Introduction for Future Data Scientists, Graham Upton, Dan Brawn, · 2023 4. Behavioral Data Analysis with R and Python, Florent Buisson ,· 2021 	



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

**Kode
Dokumen**

**RENCANA PEMBELAJARAN SEMESTER
SEMESTER LEARNING PLAN**

MATA KULIAH (MK)/ <i>Course</i>	KODE/ <i>Code</i>	Rumpun MK/ <i>Course Group</i>	BOBOT (sks) / <i>Weight (Credit)</i>	SEMESTER/ <i>Semester</i>	Tgl Penyusunan/ <i>Drafting Date</i>
Analisis Data Statistik <i>Statistical Data Analysis</i>	SS234523	Lab Computational Statistics	3	V	
OTORISASI	Pengembang RPS/ <i>RPS Developer</i>	Koordinator RMK/ <i>Course Group Coordinator</i>	Ketua PRODI/ <i>Head of Department</i>		
	Dr. Kartika Fithriasari, M.Si	Prof. <i>Nur Iriawan</i> , M.Ikom, Ph.D	Dr. Kartika Fithriasari, M.Si		
Capaian Pembelajaran (CP)/ <i>Learning Achievement</i>	CPL-PRODI yang dibebankan pada MK <i>PLO</i>				
	CPL-2	Mampu mengkaji dan memanfaatkan ilmu pengetahuan dan teknologi dalam rangka mengaplikasikannya pada bidang Statistika, serta mampu mengambil keputusan secara tepat dari hasil kerja sendiri maupun kerja kelompok dalam bentuk laporan tugas akhir atau bentuk kegiatan pembelajaran lain yang luarannya setara dengan Tugas Akhir melalui pemikiran logis, kritis, sistematis dan inovatif. <i>Able to study and utilize science and technology in order to apply it to the field of Statistics, and able to make appropriate decisions from the results of one's own work or group work in the form of final assignment reports or other forms of learning activities whose output is equivalent to the Final Assignment through logical, critical thinking, systematic and innovative.</i>			
	CPL-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			

	<p>mengimplementasikan teknologi informasi dan komunikasi dan memperhatikan prinsip keberlanjutan serta memahami kewirausahaan berbasis teknologi</p> <p><i>Able to manage one's own learning, and develop oneself as a lifelong learner 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 principles of sustainability and understanding technology-based entrepreneurship</i></p>
CPL-5	<p>Mampu menerapkan teori statistika pada metode statistika</p> <p><i>Able to apply statistical theory to statistical methods</i></p>
CPL-7	<p>Mampu menggunakan perangkat komputasi modern untuk menyelesaikan permasalahan statistik</p> <p><i>Able to use modern computing devices to solve statistical problems</i></p>
CPL-8	<p>Mampu menggunakan teknik komputasi untuk menyelesaikan permasalahan statistik</p> <p><i>Able to use computational techniques to solve statistical problems</i></p>
CPL-9	<p>Mampu menerapkan metode statistika untuk menganalisis permasalahan teoritis dan riil</p> <p><i>Able to apply statistical methods to analyze theoretical and real problems</i></p>
CPL-10	<p>Mampu menerapkan metode statistika Bisnis, Industri, Ekonomi, Sosial, Lingkungan atau Kesehatan pada permasalahan riil</p> <p><i>Able to apply Business, Industrial, Economic, Social, Environmental or Health statistical methods to real problems</i></p>
<p>Capaian Pembelajaran Mata Kuliah (CPMK)</p>	
<p><i>CLO</i></p>	
<p>CPMK.1 Mampu mengkaji dan memanfaatkan metode statistika dalam rangka menyelesaikan suatu kasus.</p> <p>CPMK.2 Mampu menyelesaikan masalah dengan mengimplementasikan teknologi informasi dan komunikasi</p> <p>CPMK.3 Mampu menerapkan teori statistika pada analysis deskriptif, diagnostic dan prediktif</p> <p>CPMK.4 Mampu menggunakan perangkat komputasi modern untuk menyelesaikan permasalahan statistik</p> <p>CPMK.5 Mampu menerapkan dan mengevaluasi teknik komputasi untuk menyelesaikan permasalahan statistik</p> <p>CPMK.6 Mampu menerapkan metode statistika dengan tepat serta mengevaluasinya untuk menganalisis permasalahan teoritis dan riil</p> <p>CPMK.7 Mampu menerapkan metode Statistika Bisnis, Industri, Ekonomi Finansial, Sosial Kependudukan, Lingkungan atau Kesehatan yang berbasis Komputasi pada permasalahan riil</p> <p><i>CLO.1 Able to study and utilize statistical methods in order to solve a case.</i></p> <p><i>CLO.2 Able to solve problems by implementing information and communication technology</i></p> <p><i>CLO.3 Able to apply statistical theory to descriptive, diagnostic and predictive analysis</i></p> <p><i>CLO.4 Able to use modern computing devices to solve statistical problems</i></p> <p><i>CLO.5 Able to apply and evaluate computational techniques to solve statistical problems</i></p> <p><i>CLO.6 Able to apply statistical methods correctly and evaluate them to analyze theoretical and real problems</i></p>	

	CLO.7 Able to apply Computing-based Business, Industrial, Financial Economic, Social Population, Environmental or Health Statistics methods to real problems							
	Matrik CPL – CPMK							
		CPL-2	CPL-3	CPL-5	CPL-7	CPL-8	CPL-9	CPL-10
	CPMK-1	v						
	CPMK-2		v					
	CPMK-3			v				
	CPMK-4				v			
	CPMK-5					v		
	CPMK-6						v	
	CPMK-7							v
Deskripsi Singkat MK Course Description	<p>Mata kuliah ini menitik beratkan pada kemampuan mahasiswa untuk bisa mengaplikasikan metode-metode statistika yang sudah dipelajari sejauh ini terkait penyelesaian permasalahan riil di lapangan dengan baik dan benar. Selain itu, mahasiswa dibekali dengan kemampuan pemilihan metode analisa yang benar, kemampuan untuk mengolah dan menganalisa data serta interpretasi output yang didapatkan dari pengolahan data. Mahasiswa juga dituntut untuk dapat mengkomunikasikan hasil analisisnya dalam bentuk laporan tertulis dan secara lisan.</p> <p><i>This course focuses on students' ability to be able to apply the statistical methods that have been studied so far in relation to solving real problems in the field properly and correctly. Apart from that, students are equipped with the ability to select the correct analysis method, the ability to process and analyze data and interpret the output obtained from data processing. Students are also required to be able to communicate the results of their analysis in the form of written reports and orally.</i></p>							
Bahan Kajian: Materi Pembelajaran	<ol style="list-style-type: none"> 1. Konsep analisis data 2. Metode preprocessing data 3. Analisis deskriptif: pengukuran statistik dan visualisasi data 4. Analisis hubungan variable dan visualisasi data <i>multivariate</i> 5. Analisis trend dan pola anomaly 6. Pemodelan: <i>Supervised</i> dan <i>Unsupervised</i> <p>1. Data analysis concept</p>							

	<p>2. <i>Data preprocessing method</i> 3. <i>Descriptive analysis: statistical measurements and data visualization</i> 4. <i>Analysis of variable relationships and visualization of multivariate data</i> 5. <i>Analyze trends and anomaly patterns</i> 6. <i>Modeling: Supervised and Unsupervised</i></p>						
Pustaka/ <i>References</i>	Utama :						
	1. Data Analysis and Graphics Using R: An Example-Based Approach, John Maindonald, W. John Braun, · 2010 2. Data Analysis with R - Second Edition: A comprehensive guide to manipulating, analyzing, and visualizing data in R, Tony Fischetti, 2018						
	Pendukung :						
	1. Data Analysis: A Gentle Introduction for Future Data Scientists, Graham Upton, Dan Brawn, · 2023 2. Behavioral Data Analysis with R and Python, Florent Buisson , · 2021						
Dosen Pengampu/ <i>Lecturers</i>	Dr. Dra. Kartika Fithriasari, M.Si ; <i>Irhamah</i> , M.Si, Ph.D; <i>Santi Wulan Purnami</i> , M.Si, Ph.D						
Matakuliah syarat/ <i>Pre-requisite Course</i>	1. Pengantar Analisis Deret Waktu 2. Analisis Multivariat Terapan 3. Analisis Regresi 4. Analisis data Kategori 1. <i>Introduction to Time Series Analysis</i> 2. <i>Applied Multivariate Analysis</i> 3. <i>Regression Analysis</i> 4. <i>Category data analysis</i>						
Mg Ke- <i>Week</i>	Kemampuan akhir tiap tahapan belajar (Sub-CPMK) <i>Final capability for each learning step</i>	Penilaian <i>Evaluation</i>		Bantuk Pembelajaran, Metode Pembelajaran, Penugasan Mahasiswa, [Estimasi Waktu] Learning Format Learning Methods Assignment for Student [Estimated Time]		Materi Pembelajaran [Pustaka] <i>Learning Material</i> [References]	Bobot Penilaian (%) <i>Evaluation Weight (%)</i>
		Indikator <i>Indicator</i>	Kriteria & Bentuk <i>Criteria and Format</i>	Luring (<i>offline</i>)	Daring (<i>online</i>)		

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	Mampu menjelaskan konsep-konsep di dalam analisis data <i>Able to explain concepts in data analysis</i>	<ol style="list-style-type: none"> Mampu menjelaskan pengertian dan pentingnya analisis data Mampu menjelaskan macam-macam data dan tipenya <p><i>1. Able to explain the meaning and importance of data analysis</i></p> <p><i>2. Able to explain various types of data and their types</i></p>	Observasi Aktifitas di kelas <i>Observation of activities in class</i>			<ol style="list-style-type: none"> Konsep analisis data Pentingnya analisis data Macam-macam data dan tipenya <p><i>1. Data analysis concept</i></p> <p><i>2. The importance of data analysis</i></p> <p><i>3. Various types of data and their types</i></p>	5%/5%
2-3	Mampu melakukan pengecekan data dan preprocessing <i>Able to carry out data checking and preprocessing</i>	<ol style="list-style-type: none"> Mampu melakukan pengecekan <i>missing value</i> dan <i>multicollinierity</i> Mampu melakukan preprocessing data: imputasi data dan transformasi data <p><i>1. Able to check missing values and multicollinearity</i></p> <p><i>2. Able to carry out data preprocessing: data imputation and data transformation</i></p>	Observasi Aktifitas di kelas <i>Observation of activities in class</i>			<ol style="list-style-type: none"> Pengecekan <i>missing value</i> dan <i>multicollinierity</i> imputasi data transformasi data <p><i>1. Checking for missing values and multicollinearity</i></p> <p><i>2. data imputation</i></p> <p><i>3. data transformation</i></p>	10%/15%
4-5	Mampu menentukan metode analisis deskriptif yang sesuai serta mampu	<ol style="list-style-type: none"> Dapat menjelaskan konsep-konsep di-dalam statistika 	Observasi Aktifitas di kelas <i>Observation of activities in class</i>			<ol style="list-style-type: none"> Statistik deskriptif Visualisasi data 	15%/30%


	<p>menjelaskan apa yang terjadi pada suatu masalah berdasarkan hasil analisis deskriptif</p> <p><i>Able to determine the appropriate descriptive analysis method and able to explain what happens to a problem based on the results of descriptive analysis</i></p>	<p>deskriptif</p> <ol style="list-style-type: none"> 2. Dapat menerapkan statistic deskriptif yang sesuai 3. Dapat rekonfigurasi data menjadi bentuk/format yang mudah dibaca/dipahami 4. Dapat menginterpretasikan hasil analisis deskriptif <p><i>1. Can explain the concepts in descriptive statistics</i></p> <p><i>2. Can apply appropriate descriptive statistics</i></p> <p><i>3. Can reconfigure data into a form/format that is easy to read/understand</i></p> <p><i>4. Can interpret the results of descriptive analysis</i></p>				<p><i>1. Descriptive statistics</i></p> <p><i>2. Data visualization</i></p>	
6-7	<p>Mampu melakukan diagnostic analysis yaitu analisis mencari sebab dan akibat untuk menggambarkan mengapa sesuatu bisa terjadi.</p> <p><i>Able to carry out diagnostic analysis,</i></p>	<ol style="list-style-type: none"> 1. Mampu mengidentifikasi outlier 2. Mampu melakukan analisis untuk menemukan pola hubungan antar variabel 	<p>Observasi Aktifitas di kelas</p> <p><i>Observation of activities in class</i></p>			<ol style="list-style-type: none"> 1. Identifikasi outlier 2. Analisis hubungan antar variable. 3. Identifikasi pola anomaly dan trend 4. Visualisasi data multivariat <p><i>1. Identify outliers</i></p>	15%/45%

	<p><i>namely analysis looking for causes and effects to describe why something happened</i></p>	<p>3. Mampu melakukan analisis pola anomali (Isolate patterns) 4. Mampu melakukan analisis trend 5. Mampu melakukan trouble shoot issues dan menginterpretasikan hasil analisis diagnostik</p> <p><i>1. Able to identify outliers</i> <i>2. Able to carry out analysis to find patterns of relationships between variables</i> <i>3. Able to carry out anomalous pattern analysis (Isolate patterns)</i> <i>4. Able to carry out trend analysis</i> <i>5. Able to troubleshoot issues and interpret diagnostic analysis results</i></p>				<p><i>2. Analysis of the relationship between variables.</i> <i>3. Identify anomaly and trend patterns</i> <i>4. Multivariate data visualization</i></p>	
8	Evaluasi Tengah Semester / Ujian Tengah Semester						

9-10	Mampu melakukan predictive analysis pada model supervised <i>Able to carry out predictive analysis on supervised models</i>	<ol style="list-style-type: none"> 1. Mampu menjelaskan metode-metode pada pemodelan supervised 2. Mampu membedakan dan mampu memilih metode statistik yang sesuai dalam menyelesaikan suatu masalah pemodelan supervised <p><i>1. Able to explain methods in supervised modeling</i></p> <p><i>2. Able to differentiate and be able to choose appropriate statistical methods in solving a supervised modeling problem</i></p>	<ul style="list-style-type: none"> • Observasi Aktifitas di kelas • Kemampuan menyelesaikan syudi kasus • <i>Observation of activities in class</i> • <i>Ability to complete case studies</i> 			<ol style="list-style-type: none"> 1. Macam-macam kasus supervised 2. Macam-macam metode statistic dalam kasus supervised <p><i>1. Various supervised cases</i></p> <p><i>2. Various statistical methods in supervised cases</i></p>	20%/65%
11-12	Mampu melakukan predictive analysis pada model unsupervised <i>Able to perform predictive analysis on unsupervised models</i>	<ol style="list-style-type: none"> 1. Mampu menjelaskan metode-metode pada pemodelan unsupervised 2. Mampu membedakan dan mampu memilih metode statistik yang sesuai dalam menyelesaikan suatu masalah pemodelan unsupervised 	<ul style="list-style-type: none"> • Observasi Aktifitas di kelas • Kemampuan menyelesaikan syudi kasus • <i>Observation of activities in class</i> • <i>Ability to complete case studies</i> 			<ol style="list-style-type: none"> 1. Macam-macam kasus unsupervised 2. Macam-macam metode statistic dalam kasus unsupervised <p><i>1. Various unsupervised cases</i></p> <p><i>2. Various statistical methods in unsupervised</i></p>	20%/85%

		<p><i>1. Able to explain methods in unsupervised modeling</i></p> <p><i>2. Able to differentiate and be able to choose appropriate statistical methods in solving an unsupervised modeling problem</i></p>				<i>cases</i>	
13-14	Mampu melakukan evaluasi suatu model <i>Able to evaluate a model</i>	<p>1. Mampu melakukan evaluasi untuk kasus supervised</p> <p>2. Mampu melakukan evaluasi untuk kasus unsupervised</p> <p>3. Mampu menjelaskan perbedaan overfitting dan underfitting dan menerapkan pada kasus</p> <p><i>1. Able to carry out evaluations for supervised cases</i></p> <p><i>2. Able to carry out evaluations for unsupervised cases</i></p> <p><i>3. Be able to explain the difference between overfitting and</i></p>	<ul style="list-style-type: none"> • Observasi Aktifitas di kelas • Presentasi • <i>Observation of activities in class</i> • <i>Presentation</i> 			<p>1. Ukuran kebaikan pada metode supervised</p> <p>2. Ukuran kebaikan pada metode unsupervised</p> <p>3. Overfitting dan underfitting</p> <p><i>1. Measures of goodness in supervised methods</i></p> <p><i>2. Measures of goodness of unsupervised methods</i></p> <p><i>3. Overfitting and underfitting</i></p>	10%/95%

		<i>underfitting and apply it to cases</i>					
15	Mampu membuat suatu rekomendasi untuk menyelesaikan suatu masalah berdasarkan hasil analisis <i>Able to make recommendations to solve a problem based on the results of the analysis</i>	<ol style="list-style-type: none"> 1. Mampu menyajikan hasil analisis dalam bentuk laporan tulisan dan dapat mengkomunikasikan secara lisan 2. Dapat membuat suatu rekomendasi berdasarkan hasil analisis <ol style="list-style-type: none"> 1. <i>Able to present analysis results in the form of written reports and can communicate orally</i> 2. <i>Can make recommendations based on the results of the analysis</i> 	<ul style="list-style-type: none"> • Observasi Aktifitas di kelas • Presentasi • <i>Observation of activities in class</i> • <i>Presentation</i> 			<ol style="list-style-type: none"> 1. Membuat suatu laporan dari hasil analisis 2. Membuat kesimpulan dan rekomendasi berdasarkan hasil analisis <ol style="list-style-type: none"> 1. <i>Create a report from the analysis results</i> 2. <i>Make conclusions and recommendations based on the analysis results</i> 	5%/100%
16	Evaluasi Akhir Semester / Ujian Akhir Semester						

	RENCANA ASESMEN & EVALUASI <i>Assesment and Evaluation Plan</i> Program Studi Sarjana Statistika / <i>Statistics Undergraduate Program</i> ANALISIS DATA STATISTIKA / <i>Statistical Data Analysis</i>		RA&E
			SLK-1
Kode MK: SS234523 <i>Course Code:</i> SS234523	Bobot sks (T/P): 3 <i>CREDITS : 3</i>	Rumpun MK: Statistika Komputasi dan Sains Data <i>Course cluster:</i> Computational Statistics and Data Science	Smt: 5 <i>Semester 5</i>
OTORISASI <i>AUTHORIZATION</i>	Penyusun <i>Author</i>	Koordinator RMK <i>Coordinator of course cluster</i>	Kaprodi <i>Head of Department</i> Dr. Kartika F, M.Si.

Mg ke (1)	Sub CP-MK (2)		Bentuk Asesmen (Penilaian) / Evaluation Type (3)	Bobot / Scoring (%) (4)
	No	Kemampuan akhir / <i>Final Capability</i>		
1		Tuliskan kemampuan akhir Sub CP-MK <i>Write down the final capability of Sub CP-MK</i>	Tuliskan bentuk asesmen <i>Write down the form of assessment</i>	
2				
3				
Total Bobot Penilaian				100%