SEMESTER STUDY PLAN
COMPUTATIONAL STATISTICS
(ELECTIVE COURSE)

DEPARTMENT OF MATHEMATICS AND DATA SCIENCE
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
UNIVERSITAS ANDALAS
2024

SEMESTER STUDY PLAN (SSP)
BACHELOR PROGRAM OF MATHEMATICS
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
UNIVERSITAS ANDALAS

Course Name	Course Code	URL *I-Learn*	Credits	Semester	Compilation Date
Computational Statistics	MAT61251	https://sci.ilearn.unand.ac.id	3	2	13 May 2024

Person In Charge	Study Plan Creator	Head of Research Group	Head of Study Program
	Dr. Maiyastri Yudiantri Asdi, MSc	Yudiantri Asdi, MSc	Dr. Noverina Alfiany

	Intended Learning Outcomes	
Intended Learning Outcomes (ILO) and Performance Indicator (PI)	**ILO-6**	Have ability data literacy and technology and can apply them in solving simple mathematical problems or other relevant fields PI-1: An ability to identify the right data and technology to solve simple mathematical problems or other fields PI-2: An ability to use data and technology and apply them to solve simple mathematical statements or other areas PI-3: An ability to process data using available technology in simple mathematical problems or other fields PI-4: An ability to conclude and interpret data processing results for simple mathematical problems or other fields PI-5: An ability to design an algorithm to solve simple mathematical problems or other fields
	ILO-7	An ability to communicate effectively especially in the area of mathematics in with diverse communities PI-1: Able to convey ideas or study results orally, especially in the field of mathematics PI-2: Able to present ideas or study results in writing, especially in the field of mathematics PI-3: Able to respond to feedback given

	Course Learning Outcomes	
	1	Students are able to use Minitab software for data management, such as inputting data, editing, adding and combining data (ILO 6:PI)
	2	Students are able to use Minitab software for descriptive statistics such as presenting data in tabular or graphical form.(ILO 6, ILO 7)
	3	Students are able to use Minitab software for inferential statistics such as testing hypotheses about means (ILO 6)
	4	Students are able to use Minitab software to perform matrix operations such as addition, subtraction, multiplication and inverse (ILO 6)
	5	Students are able to use Minitab software to generate data from existing data and from certain distributions (ILO 6)
	6	Students are able to use Minitab software to calculate probability values and cumulative distribution function (ILO 6, ILO 7)
	7	Students are able to use Minitab software for inferential statistics such as linear regression (ILO6, ILO 7)
	8	Students are able to use R software for data management, such as inputting data, editing, adding and combining data (ILO 6)
	9	Students are able to use R software for descriptive statistics such as presenting data in tabular or graphical form. (ILO 6, ILO 7)
	10	Students are able to use R software for inferential statistics such as linear regression, hypothesis testing about mean values (ILO 6, ILO 7)
	11	Students are able to use R software to perform matrix operations such as addition, subtraction, multiplication and inverse. (ILO 6)
	12	Students are able to use R and Python softwares to visualize data(ILO 6)
	13	Students are able to use R and Python softwares to generate data from existing data and from certain distributions (ILO 6, ILO 7)
	14	Students are able to use R software to carry out simple statistical simulations (ILO 6, ILO 7)
Brief Description	In this course, material is provided on the use of Minitab, R and Python software for data management, data presentation, hypothesis testing, programming for statistical computing and simulation.	

<table>
<tr><td>Course Materials</td><td>Computational Statistics is an elective course in the field of statistical studies. This course is offered in semester VI. This course is related to elementary statistics, regression analysis, experimental design and computer programming. This course requires skills in creating algorithms and programming logic. Computational Statistics discusses implementing statistical methods using the statistical software Minitab, R and Python. Apart from that, this course also discusses programming related to statistical methods that require more flexible computing, such as simulation. Lectures are carried out face to face and through discussions</td></tr>
<tr><td>References</td><td>Main:
1. Venables, W. N. and Smith, D. M. 2007. An Introduction to R. The R Development Core Team.
2. Lesik, S. A. 2019. Applied Statistical Inference with Minitab. 2nd edition. Taylor and Francis Group, New York
3. Sheppard, K. 2019. Introduction to Python for Econometrics, Statistics and Data Analysis. University of Oxford.
Additional:
1. McDonald, J. H. 2004. Using R for Data Analysis and Graphics: Introduction, Code and Commentary. Centre for Bioinformation Science, Australian National University.
2. Mueller, J. P. 2014. Beginning Programming with Python for Dummies. John Wiley & Sons, Incorporated.</td></tr>
<tr><td>Learning Media</td><td><table><tr><th>Software:</th><th>Hardware:</th></tr><tr><td>● LMS Unand (http://fmipa.ilearn.unand.ac.id/)
● Zoom meeting
● Whatsapp</td><td>● Computer/Laptop
● Smartphone</td></tr></table></td></tr>
<tr><td>Team Teaching</td><td>1. Dr. Maiyastri
2. Yudiantri Asdi, M.Sc</td></tr>
<tr><td>Assessment</td><td>Homework, Quizzes, Mid-Term exam, Final exam</td></tr>
<tr><td>Required courses</td><td>-</td></tr>
<tr><td>Academic Norms</td><td>https://akademik.unand.ac.id/images/2022-03-30%20Peraturan%20Rektor%20Nomor%207%20Tahun%202022%20Penyelenggaraan%20Pendidikan-</td></tr>
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Weekly Study Plan

Week / Meet (1)	Course Outcomes (2)	Indicator (3)	Assessment (4)	Activities/Forms of Learning [Time estimated]					Subject, references (10)	Weight (11)
				Synchronous*		Asynchronous**		Media (9)		
				Face to face Offline (5)	Face to face Online (6)	Individual (7)	Collaboration (8)			
1/1	CLO-1 Students are able to use Minitab software for data management, such as inputting data, editing, adding and combining data (ILO 6)	• Discipline in implementing the college contract • Presence • Accuracy in explanation related material	Non Test Test Midterm	Teaching and discussion: - Explanation of Semester Learning Plan - explanation of learning material - explanation of the task - explanation of the assessment [*1 × 3 × 50* minutes]	Teaching and discussion: - Explanation of Semester Learning Plan - explanation of learning material - explanation of the task - explanation of the assessment [*1 × 3 × 50* minutes] (Specific conditions: The total	• Students read and study learning materials • Students do assignments [*1 × 3 × 120* minutes]		• PPT • I learn (LMS Unand) (Specific condition: Zoom meeting, WA group, learning video)	-Tuition Contract -SSP -Scope of statistics -Data Management for Input, Edit, and delete data as well as other data management	

					number of blended learning meetings is 40% of the total number of meetings)					
2/2	CLO 2 Students are able to use Minitab software for descriptive statistics such as presenting data in tabular or graphical form (ILO 6, ILO 7)	● Presence ● Accuracy in explanation related material	Non test : Activeness and Participation Practical Report Test Midterm	- explanation of learning material - explanation of the task - explanation of the assessment [1 x 2 x 50 minutes] -Minitab Practicum in the Laboratory [1 x 1 x 50 minutes]	- explanation of learning material - explanation of the task - explanation of the assessment [$1 \times 3 \times 50$ minutes] (Specific conditions: The total number of blended learning meetings is 40% of the total number of meetings)	● Students read and study learning materials ● Students do assignments [$1 \times 3 \times 120$ minutes]		● PPT ● I learn ●	Minitab for Descriptive Statistics ◆ Presentation of data in the form of tables of figures and numbers [2]	4%
3/3	CLO 3 Students are able to use	● Presence ● Accuracy in explanation	Non test : Activeness and	- explanation of learning material		● Students read and study learning		● PPT ● I learn	Use of Minitab for Inferential	4%

	Minitab software for inferential statistics such as testing hypotheses about mean (ILO 6, ILO 7)	related material	Participation Practical Report Test Midterm	- explanation of the task - explanation of the assessment [1 x 2 x 50 minute] -Minitab Practicum in the Laboratory [1 x 1 x 50 minute]		materials Students do assignments [*1 × 3 × 120* minutes]		● n)	Statistics: ◆ Hypothesis Testing Average and difference between two means ◆ Estimation the confidence interval of the mean	
4/4	CLO 4 Students are able to use Minitab software to perform matrix operations such as addition, subtraction, multiplicatio n and inverse (ILO 6)	● Presence ● Accuracy in explanation related material	Non test : Activeness and Participation Practical Report Test Midterm	- explanation of learning material - explanation of the task - explanation of the assessment [1 x 2 x 50 minutes] -Minitab Practicum in the Laboratory [1 x 1 x 50 minutes]				● PPT ● I learn	Use Minitab to perform matrix operations such as addition, subtraction, multiplication and inverse	4%
5/5	CLO 5 Students are able to use Minitab software to generate data	● Presence ● Accuracy in explanation related material	Non test : Activeness and Participation Practical Report	- explanation of learning material - explanation of the task - explanation of		●		●PPT ● I learn ●	- Random number generation - Review the probability distribution	4%

	from existing data and from certain distributions (ILO 6 , ILO 7)		Test Midterm	the assessment [1 x 2 x 50 minutes] -Minitab Practicum in the Laboratory [1 x 1 x 50 minutes]					[1]	
6/1	CLO 6 Students are able to use Minitab software to calculate probabilty values and cumulative probability (ILO 6)	● Activeness and participation in discussions ● Accuracy in explaining related material	Non test : Activeness and Participation Practical Report Test Midterm	- explanation of learning material - explanation of the task - explanation of the assessment [1 x 2 x 50 minutes] -Minitab Practicum in the Laboratory [1 x 1 x 50 minutes]		-		- PPT - Ilearn	- Probability distribution function - Cummulative distribution function [1]	4%
7/1	CLO 7 Students are able to use Minitab software for inferential statistics such as linear	● Activeness and participation in discussions ● Accuracy in explaining related	Non test : Activeness and Participation Practical Report Test	- explanation of learning material - explanation of the task - explanation of the assessment [1 x 2 x 50				● PPT ● Ilearn	Simple Linear Regression [1]	4%

	regression (ILO 6)	material	Midterm	minutes] -Minitab Practicum in the Laboratory [1 x 1 x 50 minutes]						
8	Midterm Exam									30
9/1	CLO 8 Students are able to use R software for data management , such as inputting data, editing, adding and combining data (ILO 6)	● Activeness and participation in discussions ● Accuracy in explaining related material	Non test : Activeness and Participation Practical Report Test Midterm	- explanation of learning material - explanation of the task - explanation of the assessment [1 x 2 x 50 minutes] -Minitab Practicum in the Laboratory [1 x 1 x 50 minutes]				● PPT ● ILearn	Introduction to R Software: ◆ R and Statistics ◆ Installation ◆ Data management [2]	4%
10/1	CLO 9 Students are able to use R software for descriptive statistics such as presenting data in	● Activeness and participation in discussions ● Accuracy in explaining related material	Non test : Activeness and Participation Practical Report Test Midterm	- explanation of learning material - explanation of the task - explanation of the assessment [1 x 2 x 50 minutes]		● Independent Learning [1 x 3 x 60 minutes]		● PPT ● ILearn	Descriptive statistics with R	4%

	tabular or graphical form (ILO 6, ILO 7)			-Minitab Practicum in the Laboratory [1 x 1 x 50 minutes]						
11/1	CLO 10 Students are able to use R software for inferential statistics such as linear regression, hypothesis testing about mean values (ILO 6, ILO 7)	● Activeness and participation in discussions ● Accuracy in explaining related material	Non test : Activeness and Participation Practical Report Test Midterm	- explanation of learning material - explanation of the task - explanation of the assessment [1 x 2 x 50 minutes] -Minitab Practicum in the Laboratory [1 x 1 x 50 minutes]		-		● PPT ILearn	− Simple linear regression − Test regarding the mean.	**4%**
12/1	CLO 11 Students are able to use R software to perform matrix operations such as addition, subtraction, multiplication and inverse	● Activeness and participation in discussions ● Accuracy in explaining related material	Non test : Activeness and Participation Practical Report Test Midterm	- explanation of learning material - explanation of the task - explanation of the assessment [1 x 2 x 50 minutes] -Minitab		-		●	Vector and matrix operations [2]	**4%**

	(ILO 6)			Practicum in the Laboratory [1 x 1 x 50 minutes]						
13/1	CLO 12 Students are able to use R software to visualize data (ILO 6 , ILO 7)	● Activeness and participation in discussions ● Accuracy in explaining related material	Non test : Activeness and Participation Practical Report Test Midterm	- explanation of learning material - explanation of the task - explanation of the assessment [1 x 2 x 50 minutes] -Minitab Practicum in the Laboratory [1 x 1 x 50 minutes]		●	Collaborative Learning [1 x 3 x 60 minutes]	● PPT ● ILearnt	● Plotting Package ggplot2 [1], [2	**4%**
14/1	CLO 13 Students are able to use R software to generate data from existing data and from certain distributions (ILO 6)	● Activeness and participation in discussions ● Accuracy in explaining related material	Non test : Activeness and Participation Practical Report Test Midterm	- explanation of learning material - explanation of the task - explanation of the assessment [1 x 2 x 50 minutes] -Minitab Practicum in the Laboratory [1 x 1 x 50				● PPT ● ILearn	Generation of data from certain distributions [1] [2]	**5,5%**

				minutes]						
15/1	CLO 14 Students are able to use R and Python software to carry out simple statistical simulations (ILO 6, IL0 7)	● Activeness and participation in discussions ● Accuracy in explaining related material	Non test : Activeness and Participation Practical Report Test Midterm	- explanation of learning material - explanation of the task - explanation of the assessment [1 x 2 x 50 minutes] -Minitab Practicum in the Laboratory [1 x 1 x 50 minutes]				● PPT ● ILearn	● Create a Function ● Simple statistical simulation	**4%**
16	**FINAL EXAM**									

1 credit = 50 minutes face-to-face meeting, 60 minutes structured study, 60 minutes independent study
Each meeting duration is 3 credits = 3×50 minutes

Indicators, Criteria, and Assessment Weights

1. Assessment weight for each Assessment

NO	Assessment	Weight (%)
1	Mid-Term Exam	30
2	Final Exam	30
3	Practicum	60

TOTAL	**100**

2. Assessment weight for Intended Learning Outcome

1. CLO 1 : 0%
2. CLO 2 : 9%
3. CLO 3 : 9%
4. CLO 4 : 9%
5. CLO 5 : 7%
6. CLO 6 : 7%
7. CLO 7 : 9%
8. CLO 8 : 2%
9. CLO 9 : 7%
10. CLO 10 : 9%
11. CLO 11 : 7%
12. CLO 12 : 7%
13. CLO 13 : 9%
14. CLO 14 : 9%

Assessment Plan Table:

	Practicum to-										Mid term examination	Final Examination	**Weight**
CLO	1	2	3	4	5	6	7	8	9	10			
CLO 1 Students are able to use Minitab software for data management, such as inputting data, editing, adding and combining data (ILO 6)													
CLO 2 Students are able to use Minitab software for descriptive statistics such as presenting data in tabular or graphical form.(ILO 6, ILO 7)	4%										5%		9%
CLO 3 Students are able to use Minitab software for inferential statistics such as testing hypotheses about means (ILO 6)		4%									5%		9%
CLO 4 Students are able to use Minitab software to perform matrix operations such as addition, subtraction, multiplication and inverse (ILO 6)			4%								5%		9%
CLO 5 Students are able to use Minitab software to generate data from existing data and from certain distributions (ILO 6)				2%							5%		7%
CLO 6 Students are able to use Minitab software to				2%							5%		7%

calculate probability values and cumulative distribution function (ILO 6, ILO 7)													
CLO 7 Students are able to use Minitab software for inferential statistics such as linear regression (ILO6, ILO 7)					4%						5%		9%
CLO 8 Students are able to use R software for data management, such as inputting data, editing, adding and combining data (ILO 6)						2%							2%
CLO 9 Students are able to use R software for descriptive statistics such as presenting data in tabular or graphical form. (ILO 6, ILO 7)						2%						5%	7%
CLO 10 Students are able to use R software for inferential statistics such as linear regression, hypothesis testing about mean values (ILO 6, ILO 7)							4%					5%	9%
CLO 11 Students are able to use R software to perform matrix operations such as addition, subtraction, multiplication and inverse. (ILO 6)								2%				5%	7%
CLO 12 Students are able to use R and Python softwares to visualize data(ILO 6)								2%				5%	7%
CLO 13									4%			5%	9%

Students are able to use R and Python softwares to generate data from existing data and from certain distributions (ILO 6, ILO 7)													
CLO 14 Students are able to use R software to carry out simple statistical simulations (ILO 6, ILO 7)										4%		5%	9%
Weight Total	4%	4%	4%	4%	4%	4%	4%	4%	4%	4%	30%	30%	100%

CLO	ILO																															
	1			2			3			4			5				6					7			8				9			
	PI			PI			PI			PI			PI				PI					PI			PI				PI			
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	4	1	2	3	4	5	1	2	3	1	2	3	4	1	2	3	4
1																	✔	✔	✔	✔												
2																	✔	✔	✔	✔			✔									
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5																	✔	✔	✔	✔			✔									
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