SEMESTER STUDY PLAN CAPITA SELECTA STATISTICS 1 (ELECTIVE COURSES) (Case-Based Method)



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



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

Course Name		Course Code	I-Learı	ı URL	Credits	Credits Semester Compilation Date					
Capita Selecta Statisti	ics I	MAT62234	https://sci.ilear	n.unand.ac.id	3	6	May 11st, 2024				
Demonstra Charren		Study Plan	n Creator	Head of Rea	search Group	Head of	the study program				
Person in Charge		Prof. Dr. Ferra Yanuar, M.Sc Yudiantri Asdi, M.Sc Dr. Noverina Alfiany					overina Alfiany				
Intended Learning	ILO Stu	idy Program									
Outcomes (ILO) and	ILO-2	Possesses prof	ound knowled	ge of the basic	concept mather	natics					
Performance Indicators		PI-1: An abilit	y to explain bas	ic mathematic	al concepts						
(PI)		PI-2: An ability to provide examples that are relevant to basic mathematical concepts									
		PI-3: An abilit	y to determine s	solutions to sir	nple problems ı	using basic mat	hematical concepts				
	ILO-3	An ability to i	An ability to identify, explain and generalize simple mathematical problems								
		PI-1: An ability to identify simple mathematical problems									
		PI-2: An abili	ty to explain sir	nple mathema	tical problems						
		PI-3: An abili	ty to generalize	simple mathe	matical problem	าร					
	ILO-4	An ability to use	e concept and fu	undamental teo	chnique of math	ematics in solv	ing simple				
		mathematical pr	oblems								
		PI-1: An ab	ility to choose a	ppropriate bas	sic mathematica	l concepts and	techniques in solving				
		simple math	nematical proble	ems							
		PI-2: An ab	ility to illustrate	e simple mathe	ematical probler	ns based on apj	propriate basic				
		mathematic	al concepts and	techniques							
		PI-3: An ab	ility to solve sin	nple mathema	tical problems u	ising appropria	te basic mathematical				
		concepts and techniques									
	ILO-5	An ability to formally and correctly proves a simple mathematical statements using facts and									
		methods that ha	ve been studiec	1.							
		PI-1: An a	ability to identif	y formal struc	tures and analo	gous forms in r	nathematics				

		PI-2: An ability to use facts and apply methods to prove simple mathematical statements
	ILO-6	HHave 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
	ILO-7	An ability to communicate effectively especially in the area of mathematics in with diverse communities
		PI-1: An ability to convey ideas or study results orally, especially in the field of mathematics PI-2: An ability to present ideas or study results in writing, especially in the field of mathematics
		PI-3: An ability to respond to feedback given
	Course	Learning Outcome (CLO)
	1	Mastering basic concepts in statistics and modeling in statistics (ILO-2, ILO-3 : PI-3, ILO-4:PI-1, ILO-
		5)
	2	Mastering the concept of Bayesian analysis as a statistical modeling method that is often used in solving problems related to statistical modeling (ILO-2, ILO -3; PI-3, ILO-4; PI-1, ILO-5)
	3	Mastering the concept of Bayesian inference on several distributions of discrete and continuous
		random variables (ILO -2, ILO -3 : PI-3, ILO -4 : PI-1, PI-2, ILO -5:PI-1)
	4	Mastering the hybridization of Bayesian methods with several other statistical methods (ILO -2, ILO
		-3 : PI-3, ILO -4 : PI-1, PI-2, ILO -5: PI-1)
	5	Able to construct simple algorithms for modeling with Bayesian methods (ILO -2, ILO -3 : PI-3, ILO
		-4 : PI-2, ILO -5:PI-1 , ILO -6:PI-1,PI-2, PI-3)
	6	Able to create and present scientific reports (ILO -2, ILO -3 : PI-3, ILO -4 : PI-1, PI-2, ILO -5:PI-1, ILO
		-7:P1-1 ,PI -2 ,PI-3)
Brief Description	This co	urse, which applies the CBM (<i>Case Based Method</i>) <i>learning method</i> , discusses material about basic
	concep	ts in Bayesian inference , Bayesian inference on several distributions of discrete and continuous
	randon	n variables. To improve understanding and provide simple research experience to students, this

	lecture is also equipped with th	e task of selecting empirical data to then implement the Bayesian method						
	by constructing the R algorithm	1.						
Study Materials	1. Parameter estimation a	and hypothesis testing.						
	2. Basic concepts in Baye	sian analysis						
	3. Bayesian inference for	poisson distributions						
	4. Bayesian inference for	exponential distributions.						
	5. Bayesian survival anal	ysis.						
	6. R programming and W	Vinbugs for Bayesian methods						
	7. Reviewing articles rela	elated to Bayesian methods.						
References	Main :							
	1. Putri, SA, Yanuar, F., & Devianto, D. (2019). Bayesian Inference for Poisson Distributions.							
	https://drive.google.com/file/d/1xA2kTjI1_t2_T1s0D1xCMDcCAcO1bgr9/view?usp=share_link							
	2. Rahmadiah, A., Yanuar, F., & Devianto, D. (2019). Bayesian Inference on Exponential Distributions.							
	UNAND Mathematics Journ	al , 7 , 93-100.						
	http://jmua.fmipa.unand.a	ac.id/index.php/jmua/article/view/399/385						
	3. Hasanah, U., Yanuar, F., &	Devianto, D. (2019). Estimating Parameters in the Gamma Distribution						
	Using the Bayes Method. L	INAND Mathematics Journal, 7, 81-86.						
	Additional:							
	1. Aini, Z., Yanuar, F., & Hg, J Using the Bayes Method 1.	IR (2019). Determining the Reliability of the Weibull Distributed System						
	2 Vanuar E Sanutri C $\&$	$D_{\rm exianto}$ D (2020) Bayesian inference for Pareto distribution with conjugate						
	2. Tanuar, P., Sapuri, C., & D	priors Journal of Mathematics, Statistics and Computing, 16, 382,300						
	priors and non-conjugate p	11015. journal of Waldematics, Statistics and Computing , 10 , 302-390.						
Learning Media	Software :	Hardware :						
	Zoom, Software related	Computer/Laptop and LCD Projector						
	projects such as							
	SPSS, R and WinBUGS							
Team Teaching	Prof. Dr. Ferra Yanuar							
	Dr. Dodi Devianto							
Assessment	Assignment, midterm exam, m	ini research, final exam						

RequiredCourse	Data analysis
	Mathematical Statistics I
	Mathematical Statistics II
Academic Norms	https://akademik.unand.ac.id/images/2022-03-
	30%20Peraturan%20Rektor%20Nomor%207%20Tahun%202022%20Penyelenggaraan%20Pendidikan-communication and the second statement of the second statement o
	khusus%20Bab%20II.pdf

1.1.Weekly Lecture Plan

WEEK/	COURSE OUTCOME (2)	Indicators (3)	Assessment (4)		LEAR [ES					
MEET (1)				Synchronous*		Asynchro	nous**		Subject,	Weight
(1)				Face to Face Offline (5)	Face to Face Online (6)	Independent (7)	Collaborati ve (8)	MEDIA (9)	references (10)	()
1-2	CLO-1: Mastering basic concepts in statistics and modeling in statistics (ILO -2, ILO -3 : PI- 3, ILO -4:PI-1, ILO -5)	 Ability know principal discussion, method learning, achievements learning, reference And evaluation Ability understand about the concept of random variables and related ones, as well as the concept of parameter 	Assignment (5%) Mini research progress report (5%)	 Studying : Introduction to Study plan discussion and question and answer course material [2 x 3 x 50 minutes] 		Students look for references related to random variables and related concepts, as well as parameter estimation methods [2 x 3 x 60 minutes]	Students discuss in teams regarding random variables and related concepts, as well as parameter estimation methods [2 x 3 x 60 minutes]	LMS (ilearn UNAND)	 Study plan Concept of random variable, probability density function. 	10%

		estimation								
3-4	CLO-2: Mastering the concept of Bayesian analysis as a statistical modeling method that is often used in solving problems related to statistical modeling (ILO -2, ILO -3: PI-3, ILO -4: PI-1, ILO -5)	• Accuracy in estimating parameters using the Bayesian method	Assignment (5%) Mini research progress report (2.5%)	 Studying : concept explanation discussion and question and answer course material [2 x 3 x 50 minutes] 		Students look for references [2 x 3 x 60 minutes]	Students discuss in teams regarding Bayesian inference on the distribution of discrete & continuous random variables $[2 \times 2 \times 60$ minutes]	LMS (ilearn UNAND)	 Maximum likelihood method Bayesian Methods 	7.5%
5-7	CLO-3: Mastering the concept of Bayesian inference on several distributions of discrete and continuous random variables (ILO -2, ILO -3 : PI- 3, ILO -4 : PI- 1, PI-2, ILO - 5:PI-1)	• Ability in performing Bayesian inference on discrete and continuous variables	Assignment (5%) Mini research progress report (2.5%)		 Studying concept explanati on discussio n and question and answer course material 	Students look for references [3 x 3 x 60 minutes]	Students discuss in teams regarding Bayesian inference on popular distributions (such as Poisson, exponential, Gamma, Weibull, etc.)	• ILearn (UNA ND) • Zoom	 Bayesian inference on the Poisson distribution Bayesian inference on Exponential distributions. 	7.5%

					[3 x 3 x 50 minutes]		[3 x 3 x 60 minutes]			
8 (Midterm)	CLO-1: Mastering basic concepts in statistics and modeling in statistics (ILO- 2, ILO -3 : PI-3, ILO-4:PI-1, ILO -5)	• Accuracy in carrying out statistical modeling	Midterm value (5%)	-	-	-	-	LMS (ilearn UNAND)	• Midterm Answers	5%
	CLO-2: Mastering the concept of Bayesian analysis as a statistical modeling method that is often used in solving problems related to statistical modeling (ILO -2, ILO -3: PI-3, ILO -4: PI-1, ILO -5)	• Accuracy in performing simple Bayesian analysis	Midterm scores (7.5%)	-	-	-	-	ILearn (UNAND)	• Midterm Answers	7.5%

	CLO-3: Mastering the concept of Bayesian inference on several distributions of discrete and continuous random variables (ILO -2, ILO -3 : PI- 3, ILO -4 : PI- 1, PI-2, ILO - 5:PI-1)	• Accuracy in performing Bayesian inference on one of the selected population distributions	Midterm value (7.5%)	-	-	-	-	ILearn (UNAND)	• Midterm Answers	7.5%
9-11	CLO-4: Mastering the hybridization of Bayesian methods with several other statistical methods (ILO - 2, ILO -3 : PI-3, ILO -4 : PI-1, PI- 2, ILO -5: PI-1)	• Ability to understand the concept of Bayesian methods in survival analysis	Mini research progress report (20%)	 Review and discussion of project design alternatives and evaluation results Discussion of the project data collection process [3 x 3 x 50 minutes] 		Student propose alternative project designs along with selected case data and project implementation schedule. [3 x 3 x 60 minutes]	Students discuss in teams regarding Bayesian inference in Survival analysis [3 x 3 x 60 minutes]	LMS (ilearn UNAND)	• Bayesian survival method	20%
12-14	CLO-5: Able to construct simple algorithms for modeling using Bayesian methods (ILO - 2, ILO -3 : PI-3,	• Ability construct a simple algorithm for modeling with Bayesian	Mini research progress report (20%)		Discussion of the best design alternatives between lecturers	Students carry out final design activities based on the results of team discussions	Students discuss in teams to determine the best design alternative	• ILearn (UNA ND) • Zoom	• Bayesian method algorithm with R.	20%

	ILO -4 : PI-2, ILO -5: PI-1)	methods		and students [3 x 3 x 50 minutes]	[3 x 3 x 60 minutes]	[3 x 3 x 60 minutes]			
15-16	CLO-6 : Able to create and present scientific reports (ILO -2, ILO 3 : PI-3, ILO -4 : PI-1, PI-2, ILO - 5:PI-1, ILO - 7:P1-2)	• Student accuracy in presenting the final mini research report and answering questions	Mini research final report presentation (15%)	Individual presentatio n [2 x 3 x 50 minutes]	Students revise the written mini research progress report [2 x 3 x 60 minutes]	Students discuss in teams to improve the mini research progress report based on input during presentations and discussions [2 x 3 x 60 minutes	• ILearn (UNA ND)	• Presentation materials Mini research final report	15%
16 (Final Exam)	CLO-6: Able to create and present mini research reports (ILO -2, ILO -3: PI-3, ILO -4: PI- 1, PI-2, ILO -5: PI-1, ILO -7: P1- 2)	• Student accuracy in writing Mini research final report	Mini research final report		Compilation	of final mini re	search report	-	<u> </u>

1.2.Indicators, Criteria and Assessment Weights

1. Assessment Weight :

•	Assignment	: 15%
•	Midterm exam	: 20%

- Mini Research Progress Report : 50%
- Final exam (Mini Research Final Report Presentation) : 15%
- 2. Assessment Weight for each Course Learning Outcome
 - CLO 1: 12.5%
 - CLO 2: 15%
 - CLO 3: 15%
 - CLO 4 : 20%
 - CLO 5 : 20%
 - CLO 6 : 17.5%

1.3.Plan Assessment

Assessment Plan Table:

Form of Assessment Course Learning Outcomes	Assign ment	Midterm Exam	Mini research progress report	Final Exam (Presentation of mini research final report)	Total Weight
 Mastering basic concepts in statistics and modeling in statistics 	5%	5%	2.5%		12.5 %

Form of Assessment Course Learning Outcomes	Assign ment	Midterm Exam	Mini research progress report	Final Exam (Presentation of mini research final report)	Total Weight
2. Mastering the concept of Bayesian analysis as a statistical modeling method that is often used in solving problems related to statistical modeling	5%	7.5%	2.5%		15%
3. Mastering the concept of Bayesian inference on several distributions of discrete and continuous random variables	5%	7.5%	2.5%		15%
4. Mastering the hybridization of Bayesian methods with several other statistical methods			20%		20%
5. Able to construct simple algorithms for modeling using Bayesian methods			20%		20%
6. Able to create and present research reports in the form of scientific articles			2.5%	15%	17.5%
Total Weight	15%	20%	50%	15%	100%

Matrix CLO and ILO

CLO		ILO																
	1		2			3			4				5			6		
	PI		PI			PI			PI				PI			PI		
	1	2	1	2	3	1	2	3	1	2	3	4	1	2	3	1	2	3
1			~	✓	✓			~	✓				✓	~	✓			
2			✓	✓	✓			~	✓				✓	~	✓			

3		~	✓	✓		\checkmark	√			✓	✓	✓			
4		~	~	~		\checkmark	\checkmark	✓		~	✓	~	~	~	✓
5		~	✓	✓		\checkmark	\checkmark	✓					✓	✓	✓
6		✓	✓	✓		\checkmark	\checkmark	\checkmark		>	>	✓	✓	>	√