SEMESTER STUDY PLAN

TOPIC IN STATISTICS II

(ELECTIVE COURSES)

DEPARTMENT OF MATHEMATICS AND DATA SCIENCE

FACULTY OF MATHEMATICS AND NATURAL SCIENCES

UNIVERSITAS ANDALAS

2024

	SEMESTER STUDY PLAN **STUDY PROGRAM: MASTER OF MATHEMATICS** **FACULTY OF MATHEMATICS AND NATURAL SCIENCES** **UNIVERSITAS ANDALAS**

Course Name	Course Code	*I-Learn* URL	Credits	Semester	Compilation Date
Topic in Statistics	MAT81232	https://sci.ilearn.unand.ac.id	3	2	May 8th, 2024

Person in Charge	Study Plan Creator	Head of Research Group	Head of the study program
	Prof. Dr. Ferra Yanuar, M.Sc Dr. Dodi Devianto	Yudiantri Asdi, M.Sc	Prof. Dr. Ferra Yanuar, M.Sc

Intended Learning Outcomes (ILO) and Performance Indicators (PI)	ILO Study Program	
	ILO-2	Mastering mathematical concepts and applications (real analysis, advanced linear algebra, and statistics) in solving complex mathematical problems. PI-1. An ability to explain mathematical concepts (Real Analysis, Advanced Linear Algebra, and Statistics). PI-2. An ability to identify complex mathematical problems. PI-3. An ability to solve complex mathematical problems.
	ILO-3	Comprehensive mastery of one or several theories for development in the fields of analysis, algebra, applied mathematics, statistics and combinatorial mathematics. PI-1. An ability to identify theories used in related mathematical problems. PI-2. An ability to apply theories for advancement in related fields (advanced theory). PI-3. An ability to use advanced theory to solve related mathematical problems.
	ILO-4	Mastering scientific techniques and developing them in solving research problems through multidisciplinary or interdisciplinary approaches. PI-1. An ability to apply mathematical techniques in research problem-solving.

		PI-2. An ability to analyse research problems. PI-3. An ability to formulate theorems/models and prove their validity. PI-4. An ability to use various mathematical software to solve complex mathematical problems.
	ILO-5	An ability to work and conduct research in the field of mathematics and related fields of science by developing the latest issues independently or collaboratively and communicating them academically PI-1. Capable of formally and correctly proving mathematical statements. PI-2. An ability to employ relevant techniques for conducting research. PI-3. Capable of communicating research findings in an academic manner.
	Course Learning Outcome (CLO)	
	CLO 1	An ability to explain the concept of Bayesian analysis and use Bayesian inference on data distributions (discrete and continuous) (ILO-2: PI-1, PI-2, PI-3).
	CLO 2	An ability to use hybridization of the Bayesian method with several other statistical methods (ILO-3: PI-1, PI-2, PI-3).
	CLO 3	An ability to use SPSS, R, and WinBugs application software in the model estimation process (ILO-4: PI-1, PI-2, PI-3, PI-4).
	CLO 4	An ability to reason intuitively and analytically and are able to express the results of their reasoning in writing, systematically and rigorously both individually and in groups (ILO-5: PI-1, PI-2, PI-3)
Short Description	This Topics in Statistics course is flexible; the curriculum changes each semester according to current issues. The initial material is usually related to the implementation of Bayesian methods in the inference of discrete and continuous random variables. The following material combines Bayesian methods with various other statistical methods. The method will be carried out with the software packages SPSS, R, and WinBUGS. The fundamental ideas for utilizing	

	the application will be addressed at the meeting following the midterm exam. This lecture also includes a final project, which consists of analyzing publications about Bayesian hybrids with other methods and presenting them individually to students in order to better their understanding and provide them with basic research experience.
Study Materials	1. Bayesian inference on distributions of discrete and continuous random variables. 2. Hybrid of Bayesian methods with other statistical methods (flexible material). 3. Basic concepts for using R and/or WinBUgs applications in Bayesian analysis 4. Presentation (article dissection on the development of Bayesian methods).
References	**Main:** 1. Bain, L. J. and Engelhardt, M. 2000. *Introduction to Probability and Mathematical Statistics,* Second Edition. Duxbury Press, California. 2. Bolstad, W. M. and Curran, J. M. 2016. *Introduction to Bayesian Statistics* , third edition. John Wiley & Sons, New Jersey. 3. Ntzoufras, I. 2009. *Bayesian Modeling Using WinBUGS* . John Wiley & Sons, Inc: New Jersey
	Supporting: 4. Rinne, H. 2009. *The Weibull Distribution A Handbook*. CRC Press: London. 5. (Articles from reputable journals, selected topics)
Learning Media	**Software:** / **Hardware:**

	• LMS Unand (http://sci.ilearn.unand.ac.id/) • Zoom meetings • WhatsApp • Software (SPSS, R and WinBUGS)	Computer/Laptop and LCD Projector
Team Teaching	1. Prof. Dr. Ferra Yanuar, M.Sc 2. Dr. Dodi Devianto	
Assessment	Assignment, participation, midterm exam, final exam.	
Required Course	MAT81131 Probability Theory	
Academic Norms	(https://akademik.unand.ac.id/images/2022-03-30%20Peraturan%20Rektor%20Nomor%207%20Tahun%202022%20Penyelenggaraan%20Pendidikan-khusus%20Bab%20II.pdf)	

Weekly Study Plan

WEEK (1)	COURSE OUTCOME (2)	ASSESSMENT INDICATORS (3)	FORM OF ASSESSMENT (4)	LEARNING ACTIVITIES [Estimated Time]					LEARNING MATERIALS [Reference] (10)	ASSESSMENT LOAD (%) (11)
				Synchronous		Asynchronous		MEDIA (9)		
				Face to Face Offline (5)	Face to Face Online (6)	Independent (7)	Collaborative (8)			
1-2	CLO 1: An ability to explain the concept of Bayesian analysis and use Bayesian inference on data distributions (discrete and continuous) (ILO-2: PI-1, PI-2, PI-3).	Discipline in implementing the college contract Accuracy in understanding related material	Participation (5%) Midterm (10%)	Class: - introduction of semester learning plan - discussion about course material [2 x 3 x 50 minutes]		○ Students find out the references and study lecture materials: basic concepts in statistics and modeling in statistics. [2x3x120 minutes]		LMS (ilearn UNAND)	Material alternatives: Bayesian analysis of the Weibull distribution.	15%

3-7	CLO 2: An ability to use hybridization of the Bayesian method with several other statistical methods (ILO-3: PI-1, PI-2, PI-3).	Accurate understanding of related material Accuracy in answering assignment questions Neatness of task execution Originality of task results	Participation (5%) Midterm exam (10%) Assignment (20%)	Class: - explanation of concepts - discussion about course materials [5 x 3 x 50 minutes]		Students find out the references and study materials [5 x 3 x 60 minutes]	Students's discussion in groups [5x3x60]	LMS (ilearn UNAND)	Material alternatives: • Survival Analysis of Exponential Distribution of Right Censored Data Using Bayesian Methods. • Comparison of Classic *np* Control Maps and Bayes *np Control Maps.* Bayesian Binary Logistic Regression Classification Method and Naive Bayes Classifier	35%
MID-TERM EXAM										
8-10	CLO 3: An ability to use SPSS, R and WinBugs application software in the model estimation	• Accuracy in understanding related material • Accuracy in answering assignment questions	Final exam (10%) Assignment (10%)	Class: Use of R and/or WinBugs applications Discussion about		Students find out the references and study materials [3 x 3 x 60 minutes]	Students's discussion in groups [3x3x60] minutes	• LMS	R coding for the model estimation that has been studied WinBugs coding for the model	20%

	process (ILO-4: PI-1, PI-2, PI-3) .	• Neatness of assignment execution Originality of assignment results.		course materials [3 x 3 x 50 minutes]					estimation that has been studied.	
11-14	CLO 4: An ability to reason intuitively and analytically and are able to express the results of their reasoning in writing, systematically and rigorously (ILO-5: PI-1, PI-2, PI-3).	• Accuracy in understanding related material • Accuracy in answering assignment questions • Neatness of assignment execution Originality of assignment results	Final exam (10%) Participation (5%) Assignment (15%)	Exercise: discussion about course materials Group presentation [4 x 3 x 50] minutes		Students find out the references and study materials [4 x 3 x 60] minutes	Students's discussion in groups [4x3x60] minutes	● LMS	Bayesian hybrid method with other statistical methods. Bayesian hybrid implementation with case data (using Spss, R or WinBugs).	30%
FINAL EXAM										

Indicators, Criteria, and Proportions of Assessment

1. Assessment weight for each Assessment

NO	FORM OF ASSESSMENT	PROPORTION (%)
1	Assignment	50
2	Participation	10
3	Midterm exam	20
4	Final exam	20
TOTAL		**100**

2. Assessment proportion for each Course Learning Outcome (CLO):

- CLO-1: 15%
- CLO 2: 35%
- CLO 3: 20%
- CLO 4: 30%

Assessment Plan Table

No	CLO	Assessment				
		Mid-term Exam (%)	Final Exam (%)	Participation (%)	Assignments (%)	Weight (%)
1	An ability to explain the concept of Bayesian analysis and use Bayesian inference on data distributions (discrete and continuous) (ILO-2: PI-1, PI-2, PI-3).	10			5	15
2	An ability to use hybridization of the Bayesian method with several other statistical methods (ILO-3: PI-1, PI-2, PI-3).	10		5	20	35
3	An ability to use SPSS, R and WinBugs application software in the model estimation process (ILO-4: PI-1, PI-2, PI-3).		10		10	20
4	An ability to reason intuitively and analytically and are able to express the results of their reasoning in writing, systematically and rigorously both individually and in groups (ILO-5: PI -1, PI-2, PI-3).		10	5	15	30

Total	**20**	**20**	**10**	**50**	**100**

Matrix of 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						✓	✓	✓										
4									✓	✓	✓	✓						
5													✓	✓	✓			