SEMESTER STUDY PLAN

STATISTICS THEORY

(ELECTIVE COURSES)

DEPARTMENT OF MATHEMATICS AND DATA SCIENCE

FACULTY OF MATHEMATICS AND NATURAL SCIENCES

UNIVERSITAS ANDALAS

2024

1 Semester Study Plan

<table>
<tr><td>  </td><td colspan="6">SEMESTER STUDY PLAN
STUDY PROGRAM: MASTER OF MATHEMATICS
FACULTY OF MATHEMATICS AND NATURAL SCIENCES
UNIVERSITAS ANDALAS</td></tr>
<tr><td colspan="2">Course Name</td><td>Course Code</td><td colspan="2">URL I-Learn</td><td>Credits</td><td>Semester</td><td>COMPILATION DATE</td></tr>
<tr><td colspan="2">STATISTICS THEORY</td><td>MAT 82231</td><td colspan="2">https://sci.ilearn.unand.ac.id</td><td>3</td><td>2</td><td>May 1st, 2024</td></tr>
<tr><td colspan="2" rowspan="2">Person in Charge</td><td colspan="2">Study Plan Creator</td><td colspan="2">Head of Research Group</td><td colspan="2">Head of the study program</td></tr>
<tr><td colspan="2">Prof. Dr. Ferra Yanuar, M.Sc</td><td colspan="2">Yudiantri Asdi, M.Sc</td><td colspan="2">Prof. Dr. Ferra Yanuar, M.Sc</td></tr>
<tr><td rowspan="2">Intended Learning Outcomes (ILO) and Performance Indicators (PI)</td><td colspan="7">ILO-Study Program</td></tr>
<tr><td>ILO-2</td><td colspan="6">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.</td></tr>
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	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 analyze 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.
	Course Learning Outcome (CLO)	
	CLO 1	Students are able to explain basic concepts related to random variables and their distribution (ILO-2: PI-1, PI-2)
	CLO 2	Students are able to analyze the concept of transformation of one and two random variables (ILO-2: PI-3)
	CLO 3	Students are able to analyze the concept of order statistics (ILO-3: PI-1, PI-2)
	CLO 4	Students are able to analyze the concept of t and F distribution transformations (ILO-3: PI-3)

	CLO 5	Students are able to explain and analyze the concepts of convergence and distribution of opportunities (ILO-4: PI-1, PI-2)
	CLO 6	Students are able to use the concept of hypothesis testing (ILO-4: PI-3)
	CLO 7	Students are able to use the concepts and stages of interval estimation (ILO-4: PI-4)
	CLO 8	Students are able to reason intuitively and analytically and are able to express the results of their reasoning in writing, systematically and rigorously (ILO-3: PI-4)
Brief description	In this course material is provided on basic concepts related to random variables and their distribution, transformation of one random variable, transformation of two or more random variables, the concept of order statistics, the concept of transformation of the t and F distribution, the concept of convergence and probability distribution, the concept of hypothesis testing and interval estimation. To increase understanding and provide simple research experience to students, this lecture is also equipped with a final project, namely implementing selected statistical methods on simple data and then presenting them individually (selected topics only).	
Study Materials	1. Concepts of random variables and their distribution 2. Transformation of one random variable 3. Transformation of two or more random variables 4. Setting statistics 5. Transformation of the t and F distribution 6. Convergence and distribution of opportunities 7. Hypothesis testing 8. Interval estimation 9. Case Study	

<table>
<tr><td>References</td><td colspan="2">Main:
Roussas, G. 2003. Introduction to Probability and Statistical Inference. Academic Press.
Hoog RV , McKean JW, Craig AT. 2005. Introduction to Mathematical Statistics 6 th Edition. Pearson Prentice Hall.
Supporting:
Wackerly D, Mendenhall W, Scheaffer RL. 2007. Mathematical Statistics with Applications 7 th Edition, Duxbury Thomson Learning.</td></tr>
<tr><td rowspan="2">Learning Media</td><td>Software:</td><td>Hardware:</td></tr>
<tr><td>SPSS dan R</td><td>Komputer/Laptop dan LCD Projector</td></tr>
<tr><td>Team Teaching</td><td colspan="2">Prof. Dr. Ferra Yanuar, M.Sc</td></tr>
<tr><td>Assessment</td><td colspan="2">Assignment, participation, quiz, midterm exam, final exam.</td></tr>
<tr><td>Required courses</td><td colspan="2">MAT81131 Probability Theory</td></tr>
<tr><td>Academic Norms</td><td colspan="2">Follow the Academic Regulations of the Andalas University Undergraduate Program (https://akademik.unand.ac.id/images/2022-03-30%20Peraturan%20Rektor%20Nomor%207%20Tahun%202022%20Penyelenggaraan%20Pendidikan-khusus%20Bab%20II.pdf)</td></tr>
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2. Weekly Lecture Plan

WEEK (1)	COURSE OUTCOME (2)	INDICATORS (3)	ASSESSMENT (4)	LEARNING ACTIVITIES [Estimated Time] (5)					LEARNING MATERIALS [Reference] (10)	WEIGHT (%) (11)
				Synchronous		Asynchronous		MEDIA (9)		
				Face to Face Offline (5)	Face to Face Online (6)	Independent (7)	Collaborative (8)			
1	CLO 1: Students are able to explain basic concepts related to random variables and their distributions.	● Discipline in implementing the college contract ● Accuracy in understanding related material	Participation (2.5%) Midterm exam (10%)	Class: - introduction of semester learning plan - discussion about course material		Students find out the references and study lecture materials: the scope of statistics and the concept of random variables and		LMS (ilearn UNAND)	● Scope of statistics, ● The concept of random variables and their distribution	12.5%

				[1 x 3 x 50 minutes]		their distributions. [1 x 3 x 120 minutes]				
2-3	CLO 2: Students are able to analyze the transformation concept of one and two random variables.	• Accuracy in understanding related material • Accuracy in answering assignment questions • Neatness of assignment execution • Originality of assignment results	Midterm exam (10%) Quiz (10%)	Class: - explanation of concepts - discussion about course materials [2 x 3 x 50 minutes]		Students find out the references and study materials [2 x 3 x 60 minutes]	Students's discussion in groups [2x3x60] minutes	LMS (ilearn UNAND)	a. Transformation of one random variable b. Transformation of two random variables	20%
4	CLO 3: Students are able to analyze the concept of regulatory statistics.	• Accuracy in understanding related material • Accuracy in answering assignment questions	Midterm exam (10%) Participation (2.5%) Assignment (2.5%)	- Quiz, - discussion about course materials [1 x 3 x 50 minutes]		Students find out references and study material [1 x 3 x 60 minutes]	Students discuss in groups [1x3x60]		Setting statistics	15%

		• Neatness of assignment execution • Originality of assignment results								
5	CLO 4: Students are able to analyze the concept of t and F distribution transformations.	● Accurate understanding of related material ● Accuracy in answering assignment question ● Neatness in completing assignments ● Originality of assignment results	Assignment (5%)	- Discussion about course materials [1 x 3 x 50 minutes]		Students find out references and study material [1 x 3 x 60 minutes]	Students discuss in groups [1x3x60]		a. Transformation of t and F distributions. b. Questions and discussion	5%
6-7	CLO 5: Students are able to analyze the concepts of convergence and opportunity distribution.	• Accurate understanding of related material • Accuracy in answering assignment questions	Participation (2.5%)	Class: - Explanation the concepts, - discussion about course materials		Students find out references and study material	Students discuss in groups [2x3x60]	● LMS	a. Convergence and probability distribution. b. Questions and discussion	2.5%

		• Neatness in completing assignments • Originality of assignment results		[2 x 3 x 50 minutes]		[2 x 3 x 60 minutes]				
Midterm exam										
8-10	CLO 6: Students are able to use the concept of hypothesis testing and its application.	• Accuracy in understanding of related material • Accuracy in answering assignment questions • Neatness in completing assignments • Originality of assignment results	Final exam (10%) Participation (2.5%) Assignment (2.5%)	Class: - Explanation the concepts, - discussion about course materials [3 x 3 x 50 minutes]		Students find out references and study material [3x 3 x 60 minutes]	Students discuss in groups [3x3x60]	● LMS ● Zoom	a. Hypothesis test b. One-way hypothesis test. c. Two-way hypothesis testing d. Case study	15%
11-14	CLO 7: Students are able to use the concepts and stages	• Accuracy in understanding of related material • Accuracy in answering	Final exam (10%+10%) Quiz (5%+5%)	Class: - Explanation the concepts,		Students find out references and study material	Students discuss in groups	● LMS ● Zoom	a. Estimation method (Bayesian Method)	30%

	of interval estimation. CLO 8: Students are able to reason intuitively and analytically and are able to express the results of their reasoning in writing, systematically and rigorously.	assignment questions • Neatness in completing assignments • Originality of assignment results		- discussion about course materials [4 x 3 x 50 minutes]		[4x 3 x 60 minutes]	[4x3x60]		b. Point estimation c. Interval estimation. d. Case study	
Final exam										

II. Indicators, Criteria, and Proportions of Assessment

NO	FORM OF ASSESSMENT	PROPORTION (%)
1	Assignment	10%
2	Participation	10%
3	Quiz	20%
4	Midterm exam	30 %
4	Final exam	30%
TOTAL		**100**

Assessment proportion for each Course Learning Outcome (CLO):

- CLO-1: 15 %
- CLO 2: 12%
- CLO 3: 12 %
- CLO 4: 11 %
- CLO 5: 11 %
- CLO 6: 11 %
- CLO 7: 17 %
- CLO 8: 11%

III. Assessment Plan Table

Form of assessment Course Learning Outcomes (CLO)	Midterm exam	Final exam	Quiz	Participation	Assignments	Total of Proportion
1. Students are able to explain basic concepts related to random variables and their distribution (ILO-2: PI-1, PI-2)	10%			2.5%		12.5%
2. Students are able to analyze the concept of transformation of one and two random variables (ILO-2: PI-3)	10%		10%			20%
3. Students are able to analyze the concept of ordered statistics. (ILO-3: PI-1, PI-2)	10%			2.5%	2.5%	15%
4. Students are able to analyze the concept of t and F distribution transformations (ILO-3: PI-3)					5%	5%

5. Students are able to explain and analyze the concepts of convergence and distribution of probabilities (ILO-4: PI-1, PI-2)				2.5%		2.5%
6. Students are able to use the concept of hypothesis testing (ILO-4: PI-3)		10%		2.5%	2.5%	15%
7. Students are able to use the concepts and stages of interval estimation (ILO-4: PI-4)		10%	5%			15 %
8. Students are able to reason intuitively and analytically and are able to express the results of their reasoning in writing, systematically and rigorously (ILO-3: PI-4)		10%	5%			15%
Total of Proportion	30%	30%	20%	10%	10%	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													✓	✓	✓			