	Module Description/Course Syllabi
	Study Programme : Magister of Mathematics Faculty of Mathematics and Natural Sciences. Universitas Andalas

1. *Course number and name*

MAT82231 Statistics Theory

2. *Credits and contact hours/Number of ECTS credits allocated*

3 / 4,50 ECTS

3. *Instructors and course coordinator*

1. Prof. Dr. Ferra Yanuar, M.Sc

4. *Text book, title, outhor, and year*

a. Roussas, G. 2003. *Introduction to Probability and Statistical Inference*. Academic Press.

b. Hoog RV , McKean JW, Craig AT. 2005. *Introduction to Mathematical Statistics* 6 th *Edition*. Pearson Prentice Hall.

5. *Recommended reading and other learning resources/tools*

1. Wackerly D, Mendenhall W, Scheaffer RL. 2007. *Mathematical Statistics with Applications* 7 *th Edition*, Duxbury Thomson Learning.

6. *Specific course information*

A. *Brief description of the content of the course (catalog 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).

B. *Prerequisites or co-requisites*

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C. *Indicate whether a required or elective course in the program*

Required

D. *Level of course unit (according to EQF: first cycle Bachelor, second cycle Master)*

Second Cycle master

E. *Year of study when the course unit is delivered (if applicable)*

1st Year

F. Semester when the course unit is delivered	
Second Semester	

G. Mode of delivery (face-to-face, distance learning)	
Mixture (Face to face and Distance learning)	

7. *Intended Leening Outcomes*

ILO-2: Mastering mathematical concepts and applications (real analysis, advanced linear algebra, and statistics) in solving complex mathematical problems.
    PI-1: Able to explain mathematical concepts (Real Analysis, Advanced Linear Algebra, and Statistics).
    PI-2: Able to identify complex mathematical problems.
ILO-3: Able to master one or several mathematical problems in analysis, algebra, applied mathematics, statistics and combinatorics.
    PI-1: Able to identify theories used in related mathematical problems.
    PI-2: Able to apply theories for advancement in related fields (advanced theory).
    PI-3: Able 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: Able to apply mathematical techniques in research problem-solving.
     PI-2: Able to analyse research problems.
     PI-3: Able to formulate theorems/models and prove their validity.
     PI-4: Able to use various mathematical software to solve complex
     mathematical problems.

8. *Course Learning Outcomes* *ex. The student will be able to explain the significance of current research about a particular topic.*
1. Students are able to explain basic concepts related to random variables and their distribution. 2. Students are able to analyze the concept of transformation of one and two random variables. 3. Students are able to analyze the concept of regulatory statistics. 4. Students are able to analyze the concept of t and F distribution transformations. 5. Students are able to explain and analyze the concepts of convergence and distribution of opportunities. 6. Students are able to use the concept of hypothesis testing. 7. Students are able to use the concepts and stages of interval estimation. 8. Students are able to reason intuitively and analytically and are able to express the results of their reasoning in writing, systematically and rigorously.

9. *Brief list of topics to be covered*
1. Random variables and their distribution. 2. Transformation of one and two random variables.

3. Ordered statistics.

4. Transformation of t and F distribution.

5. Convergence and distribution of probability.

6. Hypothesis testing.

7. Interval estimation.

10. Learning and teaching methods
Presentation, Small Group Discussion, Directed Learning.

11. Language of instruction
Bahasa Indonesia

12. Assessment methods and criteria

Summative Assessment :
1. Activeness : 10%
2. Project : 10%
3. Quiz : 20 %
4. Mid Semester : 30%
5. Final Semester : 30%

Formative Assessment:
1. Thumb up and thumb down
2. Minutes paper

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

	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
STATISTICS THEORY	MAT 82231	http://sci.ilearn.unand.ac.id	3	2	May 1st, 2024

Person in Charge	Study Plan Creator	Head of Research Group	Head of the study program
	Prof. Dr. Ferra Yanuar, M.Sc	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. Able to explain mathematical concepts (Real Analysis, Advanced Linear Algebra, and Statistics). PI-2. Able to identify complex mathematical problems. PI-3. Able 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. Able to identify theories used in related mathematical problems. PI-2. Able to apply theories for advancement in related fields (advanced theory). PI-3. Able 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. Able to apply mathematical techniques in research problem-solving. PI-2. Able to analyse research problems. PI-3. Able to formulate theorems/models and prove their validity. PI-4. Able 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
References		**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.	
Learning Media	**Software:**	**Hardware:**
	SPSS dan R	Komputer/Laptop dan LCD Projector
Team Teaching	Prof. Dr. Ferra Yanuar, M.Sc	
Assessment	Assignment, participation, quiz, midterm exam, final exam.	
Required courses	MAT81131 Probability Theory	
Academic Norms	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)	

2.   Weekly Lecture Plan

WEEK (1)	COURSE OUTCOME (2)	INDICATORS (3)	ASSESSMENT (4)	LEARNING ACTIVITIES [Estimated Time] (5)					MEDIA (9)	LEARNING MATERIALS [Reference] (10)	WEIGHT (%) (11)
				Synchronous		Asynchronous					
				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 [1 x 3 x 50 minutes]		Students find out the references and study lecture materials: the scope of statistics and the concept of random variables and their distributions. [1 x 3 x 120 minutes]		LMS (ilearn UNAND)	● Scope of statistics, ● The concept of random variables and their distribution	12.5%
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	Midterm exam (10%) Quiz (10%)	Class: - explanation of concepts - discussion about course materials		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%

		• Neatness of assignment execution • Originality of assignment results		[2 x 3 x 50 minutes]						
4	CLO 3: Students are able to analyze the concept of regulatory statistics.	• Accuracy in understanding related material • Accuracy in answering assignment questions • Neatness of assignment execution • Originality of assignment results	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%
5	CLO 4: Students are able to analyze the concept of t and F	• Accurate understanding of related material	Assignment (5%)	- Discussion about course materials		Students find out references and study material	Students discuss in groups		a. Transformation of t and F distributions.	5%

	distribution transformations.	• Accuracy in answering assignment question • Neatness in completing assignments • Originality of assignment results		[1 x 3 x 50 minutes]		[1 x 3 x 60 minutes]	[1x3x60]		b. Questions and discussion	
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 • Neatness in completing assignments • Originality of assignment results	Participation (2.5%)	Class: - Explanation the concepts, - discussion about course materials [2 x 3 x 50 minutes]		Students find out references and study material [2 x 3 x 60 minutes]	Students discuss in groups [2x3x60]	• LMS	a. Convergence and probability distribution. b. Questions and discussion	2.5%

				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 of interval estimation. CLO 8: Students are able to reason intuitively and	• Accuracy in understanding of related material • Accuracy in answering assignment questions	Final exam (10%+10%) Quiz (5%+5%)	Class: - Explanation the concepts, - discussion about course materials [4 x 3 x 50 minutes]		Students find out references and study material [4x 3 x 60 minutes]	Students discuss in groups [4x3x60]	• LMS • Zoom	a. Estimation method (Bayesian Method) b. Point estimation	30%

analytically and are able to express the results of their reasoning in writing, systematically and rigorously.	• Neatness in completing assignments • Originality of assignment results								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%

	C1	C2	C3	C4	C5	Total
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 probabilitys (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%