SEMESTER STUDY PLAN (SSP)
CATEGORICAL DATA ANALYSIS
ELECTIVE COURSE

DEPARTMENT OF MATHEMATICS DAN DATA SCIENCE

FACULTY OF MATHEMATICS AND NATURAL SCIENCES

ANDALAS UNIVERSITY

2023/2024

1. Semester Study Plan (SSP)

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

SEMESTER STUDY PLAN

Course Name	Course Code	URL iLearn	Credits	Semester	Compilation Date
CATEGORICAL DATA ANALYSIS	MAT62256	https://sci.ilearn.unand.ac.id	3	6	May 8th, 2024

Person in Charge	Study Plan Creator	Head of Research Group	Head of Study Program
	Mawanda Almuhayar, M.Sc Dr. Maiyastri	Yudiantri Asdi, M.Sc	Dr. Noverina Alfiany

Learning Outcomes	Intended Learning Outcomes (ILO)	
	ILO-4	An ability to use concepts and fundamental techniques of mathematics in solving simple mathematical problems.
	ILO-5	An ability to formally and correctly proves a simple mathematical statements using facts and methods that have been studied.
	ILO-6	Have data literacy and technology ability and can apply them in solving simple mathematical problems or other relevant fields.
	Course Learning Outcomes (CLO)	
	1	An ability to explain categorical data and probability distributions for categorical data in everyday life. (ILO-4)
	2	An ability to perform statistical inference for categorical data to draw conclusions based on sample data. (ILO-4, ILO-5)

	3	An ability to create 2-dimensional contingency tables, determine probability structures from 2-dimensional contingency tables, compare proportions, and calculate relative risks and odds ratios in 2-dimensional contingency tables based on events in everyday life. (ILO-4, ILO-5)
	4	An ability to use various methods to test independence on 2-dimensional contingency tables based on events in everyday life. (ILO-4, ILO-5)
	5	An ability to create binary logistic regression models and multiple binary logistic regressions as well as perform statistical inference, model examination, model selection, and model interpretation using data based on events in everyday life. (ILO-4, ILO-5, ILO-6)
	6	An ability to create multinomial and ordinal logistic regression models and perform statistical inference, model examination, and model interpretation using data based on events in everyday life. (ILO-4, ILO-5, ILO-6)
Course Brief Description	This course applies the *Case-Based* Method (CBM), which is a learning method that uses cases as a medium for learning development. Course participants explore, assess, synthesize, and interpret information based on cases to produce an analysis and develop a solution plan. In this course, students will learn about data analysis methods used to describe and analyze categorical data which include an introduction to categorical data, probability distribution for categorical data, statistical inference for categorical data, 2-dimensional contingency tables, independence tests on 2-dimensional contingency tables, binary logistic regression models, multinomial logistic regression models, and ordinal logistic regression models along with model specifications, statistical inference, model examination, and model interpretation for each of those models.	
Course Material	1. Introduction to Categorical Data Analysis: Categorical Data and Probability Distribution for Categorical Data. 2. Statistical Inference for Categorical Data: Parameter Estimation and Hypothesis Test.	

<table>
<tr><td></td><td colspan="2">3. 2-Dimensional Contingency Table: Probability Structure in 2-Dimensional Contingency Table, Proportion Comparison, Relative Risk, and Odds Ratio.
4. Independence Test on 2-Dimensional Contingency Table: Chi-Square Independence Test, Likelihood Ratio Independence Test, Fisher Exact Independence Test, and Ordinal Data Independence Test.
5. Binary Logistic Regression: Model Specifications, Statistical Inference, Model Variations Binary Logistic Regression, Model Examination, Model Selection, and Model Interpretation.
6. Multinomial Logistic Regression: Model Specification, Statistical Inference, Model Examination, and Model Interpretation.
7. Ordinal Logistic Regression: Model Specification, Statistical Inference, Model Examination, and Model Interpretation.</td></tr>
<tr><td rowspan="2">References</td><td colspan="2">Main:
1. A. Agresti, An Introduction to Categorical Data Analysis, 3rd ed. Hoboken, New Jersey: John Wiley & Sons, 2019.
2. D. W. Hosmer, S. Lemeshow, R. X. Sturdivant, Applied Logistic Regression, 3rd ed. Hoboken, New Jersey: John Wiley & Sons, 2013.</td></tr>
<tr><td colspan="2">Additional:
3. A. Agresti, Categorical Data Analysis, 3rd ed. Hoboken, New Jersey: John Wiley & Sons, 2012.
4. J. Nugraha, Pengantar Analisis Data Kategorik. Yogyakarta: Deepublish, 2014.</td></tr>
<tr><td>Learning Media</td><td>Software:</td><td>Hardware:</td></tr>
<tr><td></td><td>◆ LMS UNAND (https://sci.ilearn.unand.ac.id/)
◆ Zoom Meeting / Microsoft Teams</td><td>◆ Computer / Laptop
◆ Smartphone
◆ LCD Projector</td></tr>
</table>

	◆ WhatsApp ◆ Minitab ◆ SPSS ◆ R	
Team Teaching	◆ Dr. Maiyastri ◆ Mawanda Almuhayar, M.Sc.	
Required Courses	◆ MAT61151 Data Analysis ◆ MAT62252 Analisis Regresi	
Academic Norms	https://akademik.unand.ac.id/images/2022-03-30%20Peraturan%20Rektor%20Nomor%207%20Tahun%202022%20Penyelenggaraan%20Pendidikan-khusus%20Bab%20II.pdf	

1.1 Weekly Study Plan

Week / Meeting (1)	CLO (2)	Assessment Indicators (3)	Forms of Assessment (4)	Learning Activities [Time Estimation]					Learning Materials [Reference] (10)	Weights (11)
				Synchronous*		Asynchronous**		Media (9)		
				Face-to-Face Offline (5)	Face-to-Face Online (6)	Self-Paced (7)	Collaborative (8)			
W1 / M1	CLO 1 An ability to explain categorical data and probability distributions for categorical data in everyday life. (ILO-4)	◆ Discipline in carrying out course contract ◆ Liveliness and participation in discussions	◆ Liveliness and Participation	◆ Explanation of Lecture Material ◆ Discussion and Q&A of Lecture Material [1 x 3 x 50 minutes]		◆ Self-Paced Learning [1 x 3 x 120 minutes]		◆ Learning Slides / Videos ◆ LMS (iLearn UNAND) ◆ Minitab ◆ SPSS ◆ R	❖ Assessment Rules, SSP, Syllabi, Course Contract ❖ Course overview ❖ Introduction to Categorical Data Analysis: ◆ Categorical Data ◆ Probability Distribution for Categorical Data [1]	

W2 / M2	CLO 2 An ability to perform statistical inference for categorical data to draw conclusions based on sample data. (ILO-4, ILO-5)	◆ Liveliness and participation in discussions	◆ Liveliness and Participation	◆ Explanation of Lecture Material ◆ Discussion and Q&A of Lecture Material [1 x 3 x 50 minutes]				◆ Learning Slides / Videos ◆ LMS (iLearn UNAND) ◆ Minitab ◆ SPSS ◆ R	❖ Statistical Inference for Categorical Data ◆ Parameter Estimation ◆ Hypothesis Testing [1]	
W3 / M3	CLO 3 An ability to create 2-dimensional contingency tables, determine probability structures from 2-dimensional contingency tables, compare proportions, and calculate relative risks and odds ratios in 2-dimensional contingency tables based on events in everyday life. (ILO-4, ILO-5)	◆ Liveliness and participation in discussions	◆ Liveliness and Participation	◆ Explanation of Lecture Material ◆ Discussion and Q&A of Lecture Material [1 x 3 x 50 minutes]		◆ Self-Paced Learning [1 x 3 x 120 minutes]		◆ Learning Slides / Videos ◆ LMS (iLearn UNAND) ◆ Minitab ◆ SPSS ◆ R	❖ 2-Dimensional Contingency Table: ◆ Probability Structure in 2-Dimensional Contingency Table ◆ Proportion Comparison [1]	
W4 / M4	CLO 3 An ability to create 2-dimensional contingency	◆ Liveliness and participation in discussions	◆ Liveliness and Participation ◆ Assigment 1	◆ Explanation of Lecture Material		◆ Structured Assignment [1 x 3 x 120 minutes]		◆ Learning Slides / Videos	◆ Relative Risk ◆ Odds Ratio [1]	5%

	tables, determine probability structures from 2-dimensional contingency tables, compare proportions, and calculate relative risks and odds ratios in 2-dimensional contingency tables based on events in everyday life. (ILO-4, ILO-5)	◆ Accuracy in explaining related material		◆ Discussion and Q&A of Lecture Material [1 x 3 x 50 minutes]				◆ LMS (iLearn UNAND) ◆ Minitab ◆ SPSS ◆ R		
W5 / M5	CLO 4 An ability to use various methods to test independence on 2-dimensional contingency tables based on events in everyday life. (ILO-4, ILO-5)	◆ Liveliness and participation in discussions	◆ Liveliness and Participation	◆ Explanation of Lecture Material ◆ Discussion and Q&A of Lecture Material [1 x 3 x 50 minutes]		◆ Self-Paced Learning [1 x 3 x 120 minutes]		◆ Learning Slides / Videos ◆ LMS (iLearn UNAND) ◆ Minitab ◆ SPSS ◆ R	❖ Independence Test on 2-Dimensional Contingency Table: ◆ Chi-Square Independence Test ◆ Likelihood Ratio Independence Test [1]	
W6 / M6	CLO 4 An ability to use various methods to test independence on	◆ Liveliness and participation in discussions	◆ Liveliness and Participation ◆ Assignment 2	◆ Explanation of Lecture Material ◆ Discussion and Q&A of		◆ Structured Assignment [1 x 3 x 120 minutes]		◆ Learning Slides / Videos	◆ Fisher Exact Independence Test	10%

	2-dimensional contingency tables based on events in everyday life. (ILO-4, ILO-5)	◆ Accuracy in explaining related material		Lecture Material [1 x 3 x 50 minutes]				◆ LMS (iLearn UNAND) ◆ Minitab ◆ SPSS ◆ R	◆ Ordinal Data Independence Test [1]	
W7 / M7	CLO 3 An ability to create 2-dimensional contingency tables, determine probability structures from 2-dimensional contingency tables, compare proportions, and calculate relative risks and odds ratios in 2-dimensional contingency tables based on events in everyday life. (ILO-4, ILO-5) CLO 4 An ability to use various methods to test independence on 2-dimensional contingency tables based on	◆ Liveliness and participation in discussions	◆ Liveliness and Participation	◆ Explanation of Lecture Material ◆ Discussion and Q&A of Lecture Material [1 x 3 x 50 minutes]			◆ Collaborative Learning [1 x 3 x 120 minutes]	◆ Learning Slides / Videos ◆ LMS (iLearn UNAND) ◆ Minitab ◆ SPSS ◆ R	❖ Case Study of 2D Contingency Table ❖ Case Study of Independence Test on 2-Dimensional Contingency Table [1]	

	events in everyday life. (ILO-4, ILO-5)									
W8 – W9 / -	**Midterm Exam**									**25%**
W10 / M8	CLO 5 An ability to create binary logistic regression models and multiple binary logistic regressions as well as perform statistical inference, model examination, model selection, and model interpretation using data based on events in everyday life. (ILO-4, ILO-5, ILO-6)	◆ Liveliness and participation in discussions	◆ Liveliness and Participation	◆ Explanation of Lecture Material ◆ Discussion and Q&A of Lecture Material [1 x 3 x 50 minutes]				◆ Learning Slides / Videos ◆ LMS (iLearn UNAND) ◆ Minitab ◆ SPSS ◆ R	❖ Binary Logistic Regression: ◆ Simple Binary Logistic Regression model specification ◆ Multiple Binary Logistic Regression model specification [1], [2]	
W11 / M9	CLO 5 An ability to create binary logistic regression models and multiple binary logistic regressions as well as perform statistical	◆ Liveliness and participation in discussions	◆ Liveliness and Participation	◆ Explanation of Lecture Material ◆ Discussion and Q&A of Lecture Material [1 x 3 x 50 minutes]				◆ Learning Slides / Videos ◆ LMS (iLearn UNAND) ◆ Minitab ◆ SPSS ◆ R	◆ Statistical Inference of Binary Logistic Regression model [1], [2]	

	inference, model examination, model selection, and model interpretation using data based on events in everyday life. (ILO-4, ILO-5, ILO-6)									
W12 / M10	CLO 5 An ability to create binary logistic regression models and multiple binary logistic regressions as well as perform statistical inference, model examination, model selection, and model interpretation using data based on events in everyday life. (ILO-4, ILO-5, ILO-6)	◆ Liveliness and participation in discussions	◆ Liveliness and Participation	◆ Explanation of Lecture Material ◆ Discussion and Q&A of Lecture Material [1 x 3 x 50 minutes]		◆ Self-Paced Learning [1 x 3 x 120 minutes]		◆ Learning Slides / Videos ◆ LMS (iLearn UNAND) ◆ Minitab ◆ SPSS ◆ R	◆ Binary Logistic Regression with category predictor variables ◆ Binary Logistic Regression with mixed predictor variables [1], [2]	
W13 / M11	CLO 5 An ability to create binary logistic regression models and	◆ Liveliness and participation in discussions	◆ Liveliness and Participation ◆ Assignment 3	◆ Explanation of Lecture Material ◆ Discussion and Q&A of		◆ Structured Assignment [1 x 3 x 120 minutes]		◆ Learning Slides / Videos ◆ LMS (iLearn UNAND)	◆ Binary Logistic Regression model selection	5%

	multiple binary logistic regressions as well as perform statistical inference, model examination, model selection, and model interpretation using data based on events in everyday life. (ILO-4, ILO-5, ILO-6)	◆ Accuracy in explaining related material		Lecture Material [1 x 3 x 50 minutes]				◆ Minitab ◆ SPSS ◆ R	◆ Binary Logistic Regression model examination ◆ Binary Logistic Regression model interpretation [1], [2]	
W14 / M12	CLO 6 An ability to create multinomial and ordinal logistic regression models and perform statistical inference, model examination, and model interpretation using data based on events in everyday life. (ILO-4, ILO-5, ILO-6)	◆ Liveliness and participation in discussions	◆ Liveliness and Participation	◆ Explanation of Lecture Material ◆ Discussion and Q&A of Lecture Material [1 x 3 x 50 minutes]				◆ Learning Slides / Videos ◆ LMS (iLearn UNAND) ◆ Minitab ◆ SPSS ◆ R	❖ Multinomial Logistic Regression: ◆ Multinomial Logistic Regression model specification ◆ Statistical Inference of Multinomial Logistic Regression model ◆ Multinomial Logistic Regression model examination	

									◆ Multinomial Logistic Regression model interpretation [1], [2]	
W15 / M13	CLO 6 An ability to create multinomial and ordinal logistic regression models and perform statistical inference, model examination, and model interpretation using data based on events in everyday life. (ILO-4, ILO-5, ILO-6)	◆ Liveliness and participation in discussions	◆ Liveliness and Participation	◆ Explanation of Lecture Material ◆ Discussion and Q&A of Lecture Material [1 x 3 x 50 minutes]				◆ Learning Slides / Videos ◆ LMS (iLearn UNAND) ◆ Minitab ◆ SPSS ◆ R	❖ Ordinal Logistic Regression: ◆ Ordinal Logistic Regression model specification ◆ Statistical Inference of Ordinal Logistic Regression model ◆ Ordinal Logistic Regression model examination ◆ Interpretation of the Ordinal Logistic Regression model [1], [2]	

W16 / M14	CLO 5 An ability to create binary logistic regression models and multiple binary logistic regressions as well as perform statistical inference, model examination, model selection, and model interpretation using data based on events in everyday life. (ILO-4, ILO-5, ILO-6) CLO 6 An ability to create multinomial and ordinal logistic regression models and perform statistical inference, model examination, and model interpretation using data based on events in	◆ Liveliness and participation in discussions	◆ Liveliness and Participation	◆ Explanation of Lecture Material ◆ Discussion and Q&A of Lecture Material [1 x 3 x 50 minutes]			◆ Collaborative Learning [1 x 3 x 120 minutes]	◆ Learning Slides / Videos ◆ LMS (iLearn UNAND) ◆ Minitab ◆ SPSS ◆ R	❖ Case Study of Binary Logistic Regression ❖ Case Studies of Multinomial Logistic Regression and Ordinal Logistic Regression [1]	

	everyday life. (ILO-4, ILO-5, ILO-6)									
W17 – W18 / -	**Final Exam / Final Project**									**55%**

1.2 Indicators, Criteria, and Assessment Weights

a. Assessment Weights of Each Form of Assessment:
   1) Assignment : 20%
   2) Midterm Exam : 25%
   3) Final Exam / Final Project : 55%

b. Assessment Weight of Each Course Learning Outcomes (CLO):
   1) CLO 1 : 10%
   2) CLO 2 : 10%
   3) CLO 3 : 15%
   4) CLO 4 : 25%
   5) CLO 5 : 20%
   6) CLO 6 : 20%

Note:
The weight of the assessment, the form of assessment, and the learning outcomes must be in sync

2. Assessment Plan Table

Forms of Assessment	Assignment			Midterm Exam	Final Exam / Final Project	Total Weight
CLO	**1**	**2**	**3**			
CLO 1 An ability to explain categorical data and probability distributions for categorical data in everyday life. (ILO-4)				5%	5%	10%
CLO 2 An ability to perform statistical inference for categorical data to draw conclusions based on sample data. (ILO-4, ILO-5)				5%	5%	10%
CLO 3 An ability to create 2-dimensional contingency tables, determine probability structures from 2-dimensional contingency tables, compare proportions, and calculate relative risks and odds ratios in 2-dimensional contingency tables based on events in everyday life. (ILO-4, ILO-5)	5%			5%	5%	15%
CLO 4 An ability to use various methods to test independence on 2-dimensional contingency tables based on events in everyday life. (ILO-4, ILO-5)		10%		10%	5%	25%
CLO 5 An ability to create binary logistic regression models and multiple binary logistic regressions as well as perform statistical inference, model examination, model selection,			5%		15%	20%

and model interpretation using data based on events in everyday life. (ILO-4, ILO-5, ILO-6)						
CLO 6 An ability to create multinomial and ordinal logistic regression models and perform statistical inference, model examination, and model interpretation using data based on events in everyday life. (ILO-4, ILO-5, ILO-6)					20%	20%
Total Weight	5%	10%	5%	25%	55%	**100%**