SEMESTER STUDY PLAN
INTRODUCTION OF FUZZY MATHEMATICS
(ELECTIVE COURSE)

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

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

Course Name	Course Code	URL *I-Learn*	Credits	Semester	Compilation Date
Introduction of Fuzzy Mathematics	MAT62111	https://sci.ilearn.unand.ac.id	3	2	15 May 2024

Person In Charge	Study Plan Creator	Head of Research Group	Head of Study Program
	Prof. Dr. Admi Nazra	Nova Noliza Bakar, M.Si	Dr. Noverina Alfiany

	Intended Learning Outcomes	
Intended Learning Outcomes (ILO) and Performance Indicator (PI)	**ILO-3**	An ability to identify, explain and generalize simple mathematical problems PI-1: An ability to identify simple mathematical problems PI-2: An ability to explain simple mathematical problems PI-3: An ability to generalize simple mathematical problems
	ILO-4	An ability to use concept and fundamental technique of mathematics in solving simple mathematical problems PI-1: An ability to choose appropriate basic mathematical concepts and techniques in solving simple mathematical problems PI-2: An ability to illustrate simple mathematical problems based on appropriate basic mathematical concepts and techniques PI-3: An ability to solve simple mathematical problems using appropriate basic mathematical concepts and techniques

	ILO-5	An ability to formally and correctly proves a simple mathematical statements using facts and methods that have been studied. PI-1: An ability to identify formal structures and analogous forms in mathematics PI-2: An ability to use facts and apply methods to prove simple mathematical statements PI-3: An ability to present simple mathematical statement proof rigorously (sequentially and conscientious) PI-4: An ability to conclude or interpret result of the proving simple mathematical statement
	ILO-6	Have 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 PI-4: An ability to conclude and interpret data processing results for simple mathematical problems or other fields PI-5: An ability to design an algorithm to solve simple mathematical problems or other fields
	Course Learning Outcomes	
	1	Understand and master the basic concepts of fuzzy sets *and their applications (*ILO-3, ILO -4, ILO -6)
	2	Understand and master the basic concepts of *fuzzy soft sets* (ILO -3, ILO -4, ILO -6)
	3	Understand and master the basic concepts of *intuitionistic fuzzy soft sets* and hesitant fuzzy soft sets, and their application to decision making (ILO -3, ILO -4, ILO -6)
	4	Understand and master the basic concepts of N-Soft Sets, Fuzzy N-soft sets, Hesitant N-Soft Sets, as well as their application of decision making. (ILO -3, ILO -4, ILO -6)

Brief Description	In this course, material is given about *fuzzy logic*, soft sets, and *fuzzy sets* and their development, which are related to the decision-making process. Some types of fuzzy sets are *fuzzy soft sets*, *intuitionistic fuzzy soft sets*, hesitant fuzzy sets, N-Soft Sets, Fuzzy N-soft sets, Hesitant N-soft sets and its application in decision-making.
Course Materials	Fuzzy sets and their application in decision making Soft Set and its application in decision making Fuzzy soft sets and their application in decision making Intuitionistic fuzzy sets and their application in decision making The intuitionistic Soft Fuzzy Set and its application in decision making Fuzzy Soft Matrix and its application in decision making Soft Fuzzy Matrix intuitionistic and its application in decision making Generalization of intuitionistic Fuzzy Soft Matrix and its application in decision making Hesitant Fuzzy Set and its application in decision making Hesitant Fuzzy Soft Set and its application in decision making The set of soft fuzzy intuitionistic hesitant and their application in decision making. N-soft sets, N-Soft Sets, Fuzzy N-soft sets, Hesitant N-Soft Sets and Applications
References	**Main:** 1. Atanassov, K.T., *Intuitionistics Fuzzy Sets*, Springer-Verlag, 1999 2. Scientific Articles at International Journal a/l: Atanassov, K., (1986), Intuitionistic fuzzy sets, Fuzzy Sets and Systems, vol 20, 87-96.

<table>
<tr><td></td><td colspan="2">Babitha , K.V., and John, S.J., (2011), Generalized intuitionistic fuzzy soft sets and its applications, Gen.Math.Notes, 7(2), 1-14.

Babitha, K. V., John, and S. J., (2013), Hesitant fuzzy soft sets, Journal of New Results in Science, vol. 3, 98–107.

Borah , M.J., Neog, T.J., and Sut, D.K., (2012), Fuzzy soft matrix theory and its decision making, IJMER, 2(2), 121-127.

Cagman, N., and Enginoglu, S., (2012), Fuzzy soft matrix theory and its application in decision making, International Journal of Fuzzy Systems,vol.9, 109-119.

Deli, I., and Cagman, N., (2013), Intuitionistic fuzzy parameterized soft set theory and its decision making, 1301.0454v1 [math.LO].

Maji, P.K., Biswas, R., and Roy, A.R., (2001), Fuzzy Soft Sets, Journal of Fuzzy Mathematics, 9(3), 589–602.

Maji, P.K., Roy, A.R., and Biswan, R., (2002), An Application of Soft Sets in a decision making problems, Computer and Mathematics with Applications, 44(8-9), 1070-1083.

Molodtsov, D., (1999), Soft set theory–first result, Computers and Mathematics with Applications, vol 37,19-31.

Nazra, A., (2015), Ideal and its Fuzzification in implicative semigroups, International Journal of Pure and Applied Mathematics. 104(4).

Additional:
-</td></tr>
<tr><td>Learning Media</td><td>Software:
• LMS Unand (http://fmipa.ilearn.unand.ac.id/)
• Zoom meeting
• Whatsapp</td><td>Hardware:
• Computer/Laptop
• Smartphone</td></tr>
<tr><td>Team Teaching</td><td colspan="2">Prof. Dr. Admi Nazra</td></tr>
<tr><td>Assessment</td><td colspan="2">Homework, Quizzes, Mid-Term exam, Final exam</td></tr>
<tr><td>Required courses</td><td colspan="2">-</td></tr>
</table>

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 / Meet (1)	Course Outcomes (2)	Indicator (3)	Assessment (4)	Activities/Forms of Learning [Time estimated]				Media (9)	Subject, references (10)	Weight (11)
				Synchronous*		Asynchronous**				
				Face to face Offline (5)	Face to face Online (6)	Individual (7)	Collaboration (8)			
1	Know the course plan for the next semester. Understanding the motivation for the birth of the concept of fuzzy logic	Discipline in carrying out college contracts • Able to explain the motivation for the birth of the concept of fuzzy logic	Activeness in lectures	Lecture: Concept Explained Discussion and Q&A of Lecture Material [1 x 3 x 50 minutes]		Students look for references and study course materials [1 x 3 x 120 minutes]		• Zoom/ • LMS (ilearn UNAND) Chat	RPS presentation. Presentation of lecture contracts. The motivation for the birth of the concept of fuzzy logic	
2	Ability to write definitions of fuzzy sets as well as definitions of operations on	Accuracy in writing the definition of a fuzzy set • Accuracy in defining operations on	Liveliness and Self-task	Lecture: Concept Explained Discussion and Q&A of Lecture Material		Students look for references and study course materials [1 x 3 x 120 minutes]		• Zoom/ • LMS (ilearn UNAND) • Chat	Blurred relations, Operations on blurred, reflexive, symmetrical	

	fuzzy sets and examples.	fuzzy sets and examples.		[1 x 3 x 50 minutes]					and transitive relations.	
3	Ability to explain basic concepts about fuzzy logic, as well as examples. Explain the differences between Tsukamoto and Mandani methods in decision making.	Accuracy in explaining the basic concepts of fuzzy logic, • Accuracy in using the Tsukamoto and Mandani Methods in decision making.	Liveliness and routine tasks	Lecture: Concept Explained Discussion and Q&A of Lecture Material [1 x 3 x 50 minutes]		Students look for references and study course materials [1 x 3 x 120 minutes]		• Zoom/ • LMS (ilearn UNAND) • Chat	Fuzzy IF_THEN rules, Tsukamoto Method, and Mandani.	
4	Ability to write down blurred graph definitions and operations and give examples.	• Accuracy in writing the definition of blurred graphs and their operations	Liveliness and routine tasks	Lecture: Concept Explained Discussion and Q&A of Lecture Material [1 x 3 x 50 minutes]		Students look for references and study course materials [1 x 3 x 120 minutes]		• Zoom/ • LMS (ilearn UNAND) Chat	Definition of blurred graphs, operations on blurred graphs. Blurred graph application.	
5	Ability to write definitions of soft sets as well as examples	• Accuracy in writing the definition of soft sets and examples	Liveliness and routine tasks	Lecture: Concept Explained Discussion and Q&A of Lecture Material		Students look for references and study course materials [1 x 3 x 120 minutes]		• Zoom/ • LMS (ilearn UNAND) • Chat	Definition of soft sets, several related postulates.	

				[1 x 3 x 50 minutes]		•				
6	The ability to write down the definition of the Fuzzy Soft Set and prove some related properties.	Accuracy in writing the definition of the Fuzzy Soft Set and proving some related properties. •	Liveliness and routine tasks	Lecture: Concept Explained Discussion and Q&A of Lecture Material [1 x 3 x 50 minutes]		Students look for references and study course materials [1 x 3 x 120 minutes] -		• Zoom/ • LMS (ilearn UNAND) • Chat	Definition of Fuzzy Soft Set, some related postulates.	
7	Ability to write the definition of a hesitant fuzzy Soft Set, examples, operations and applications	• Accuracy in writing the definition of N-soft sets, examples, operations and understanding the difference with Soft sets.	Liveliness	Lecture: Concept Explained Discussion and Q&A of Lecture Material [1 x 3 x 50 minutes]		Students look for references and study course materials [1 x 3 x 120 minutes]		• Zoom/ • LMS (ilearn UNAND) • Chat	N-soft sets, their operation and relationship with soft sets	
8-9	**MID-TERM EXAM**									
10	Ability to write down definitions of Intuitionistic soft fuzzy sets and their operations. Able to use this concept for decision making.	• Accuracy in writing the definition of the Intuitionistic fuzzy soft set and its operations.	Liveliness and routine tasks	Lecture: Concept Explained Discussion and Q&A of Lecture Material [1 x 3 x 50 minutes]		Students look for references and study course materials [1 x 3 x 120 minutes]		• Zoom/ • LMS (ilearn UNAND) • Chat	Intuitive fuzzy soft set, Related traits/postulates, their application to decision making.	

11	Ability to use the concept of N-soft sets for decision making, and write algorithms.	• Accuracy in using the concept of N-soft sets for decision making	Liveliness	Lecture: Concept Explained Discussion and Q&A of Lecture Material [1 x 3 x 50 minutes]		Students look for references and study course materials [1 x 3 x 120 minutes] -		• Zoom/ • LMS (ilearn UNAND) • Chat	Decision-making algorithms with N-soft sets and examples.	
12	Ability to write definitions of Fuzzy N-soft sets, examples and their operation and application	Accuracy in writing the definition of hesitant fuzzy soft sets, examples and their operation.	Liveliness	Lecture: Concept Explained Discussion and Q&A of Lecture Material [1 x 3 x 50 minutes]		Students look for references and study course materials [1 x 3 x 120 minutes]		• Zoom/ • LMS (ilearn UNAND) • Chat	Hesitant Fuzzy Soft Sets, examples and their operation.	
13	Ability to write definitions of Hesitant N-soft sets, examples, operations	Accuracy in writing the definition of N-soft sets of Hesitants, examples, operations	Liveliness	Lecture: Concept Explained Discussion and Q&A of Lecture Material [1 x 3 x 50 minutes]		Students look for references and study course materials [1 x 3 x 120 minutes]		• Zoom/ • LMS (ilearn UNAND) • Chat	Hesitant N-soft sets, its operation	
14	Ability to use Hesitant N-soft sets concepts for decision	Accuracy in using the concept of Hesitant N-soft sets for decision making,	Liveliness	Lecture: Concept Explained Discussion and Q&A of		Students look for references and study course materials		• Zoom/ • LMS (ilearn UNAND)	Decision making algorithm with Hesitant N-soft	

	making, and write algorithms.			Lecture Material [1 x 3 x 50 minutes]		[1 x 3 x 120 minutes]		• Chat	sets and examples.	
15	Ability to write definitions of Hesitant Fuzzy N-soft sets, examples, operations	Accuracy in writing the definition of Fuzzy N-soft sets, examples, operations	Liveliness	Lecture: Concept Explained Discussion and Q&A of Lecture Material [1 x 3 x 50 minutes]		Students look for references and study course materials [1 x 3 x 120 minutes]		• Zoom/ • LMS (ilearn UNAND) • Chat	Fuzzy N-soft sets, its operation	
16	An ability to use Hesitant N-soft sets concepts, Fuzzy N-soft sets for decision making and write the algorithm.	Accuracy in using the concept of Fuzzy N-soft sets for decision making.	Liveliness	Lecture: Concept Explained Discussion and Q&A of Lecture Material [1 x 3 x 50 minutes]		Students look for references and study course materials [1 x 3 x 120 minutes]		• Zoom/ • LMS (ilearn UNAND) Chat	Decision-making algorithms with Fuzzy N-soft sets and examples.	
									Total Weight	100%
16	**FINAL EXAM**									

1 credit = 50 minutes face-to-face meeting, 60 minutes structured study, 60 minutes independent study
Each meeting duration is 3 credits = 3×50 minutes

Indicators, Criteria, and Assessment Weights

1. Assessment weight for each Assessment

NO	Assessment	Weight (%)
1	Mid-Term Exam	30
2	Quizzes	20
3	Homework	20
4	Final Exam	30
TOTAL		**100**

2. Assessment weight for Intended Learning Outcome
   - CLO-1: 25 %
   - CLO-2: 25 %

- CLO-3: 25 %
- CLO- 4: 25 %

Assessment Plan Table:

No.	CLO	Assessment				Weigth (%)
		Homework (%)	Quizess (%)	Mid-Term Exam (%)	Final Exam (%)	
1	Understand and master the basic concepts of fuzzy sets *and their applications (*ILO-3, ILO -4, ILO -6)	5	5	15		25
2	Understand and master the basic concepts of *fuzzy soft sets* (ILO -3, ILO -4, ILO -6)	5	5	15		25

3	Understand and master the basic concepts of *intuitionistic fuzzy soft sets* and hesitant fuzzy soft sets, and their application to decision making (ILO -3, ILO -4, ILO -6)	5	5		15	25
4	Understand and master the basic concepts of N-Soft Sets, Fuzzy N-soft sets, Hesitant N-Soft Sets, as well as their application of decision making. (ILO -3, ILO -4, ILO -6)	5	5		15	25
Total		**20**	**20**	**30**	**30**	**100**

Information:

TK: Group Task

Matrix of CLO and ILO

CLO	**ILO**

							3			**4**			**5**				**6**																			
							PI			**PI**			**PI**				**PI**																			
							1	2	3	1	2	3	1	2	3	4	1	2	3	4	5															
1							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓															
2							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓															
3							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓															
4							✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓															