SEMESTER STUDY PLAN INTRODUCTION TO GAME THEORY MATK62242 (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, PADANG, INDONESIA

Course Name		Course Code	URL I-Learn		Credit	Semester	Compilation Date			
INTRODUCTION TO GAME THEC	DRY	MAT62242	https://sci.ilear	n.unand.ac.id	3	6	April 17 th , 2024			
Den en la Channa		Study P	lan Creator	Head of Rese	earch Group	Head	of Study Program			
Person in Charge		Dr. Ahma	ad Iqbal Baqi	Dr. Ahmad	Iqbal Baqi	Dr. N	Joverina Alfiany			
Intended Learning Outcomes	Intended Learning Outcomes (ILO)									
(ILO) and Performance Indicator (PI)	ILO-1	Possesses a go PI-1: An abilit PI-2: An abilit PI-3: An abilit	Possesses a good ethics and integrity PI-1: An ability to explain academic ethics and integrity PI-2: An ability to act in accordance with academic ethics PI-3: An ability to act in accordance with academic integrity							
	1LO-2	Possesses profound knowledge of the basic concept mathematics PI-1: An ability to explain basic mathematical concepts PI-2: An ability to provide examples that are relevant to basic mathematical concepts PI-3: An ability to determine solutions to simple problems using basic mathematical concepts								
	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 solv 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
	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	An 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
ILO-7	An ability to communicate effectively especially in the area of mathematics in with diverse communities
	PI-1: An ability to convey ideas or study results orally, especially in the field of mathematics
	PI-2: An ability to present ideas or study results in writing, especially in the field of mathematics
	PI-3: An ability to respond to feedback given
ILO-8	An ability to work in team
	PI-1: An ability to actively participate in a team with full responsibility

	ILO-9	 PI-2: An ability to respond well to any feedback within the team PI-3: An ability to complete tasks according to the set schedule PI-4: An ability to adapt in a team An ability to apply knowledge of mathematics in career and involve in long life learning PI-1: An ability to carry out learning independently to deepen and expand the knowledge that has been obtained PI-2: An ability to carry out literature studies PI 3: An ability to propage and realize final project plane. 					
		PI-4: An ability to use mathematical concepts in identifying business opportunities					
	Course Lea	arning Outcomes (CLO)					
	1. CLO-1 An ability to design and interpret algorithms of Combinatorial Games (ILO-3:PI-3)						
	 CLO-2 An ability to determine the balance value of pure strategy and mixed strategy in the Zero Sum-Games (ILO-1;ILO-3:PI-3) 						
	3. CLO-3 An ability to determine the balance value of pure strategy and mixed strategy in the Gener Sum-Games (ILO-1;ILO-3:PI-3)						
	4. CLO-4	An ability to determine the solution of various Sequential Games (ILO-4:PI-1)					
	5. CLO-5	An ability to determine the solution of various Voting dan Cooperative Games (ILO-4:PI-1)					
	6. CLO-6	An ability to conclude and interpret Mind Games (ILO-4:P1-1)					
Brief Description	This course is a part of Operational Research in the field of Applied Mathematics. (Introduction to) Game Theory is another form of optimization. (Procedure/process) optimization whose (outcome) is not certain or not optimized. Because the realm of this theory is conflict, fighting, and strategic games being played; then the outcomes include those who win do not necessarily achieve maximum wins and those who lose do not suffer too many losses; The win-win solution is not to seek mutual victory, but rather to achieve stability or balance for each player.						
Course Materials	 Saddle Po Nash Equ Prisoner' Security Borda Co 	vint vilibrium s Dilemma Strategy unt					

	6. Shapley's Value 7. Solomon's Wisdom						
References	Main :						
	1. [1] Osborne, Martin J. 2000. An Introduction to Game Theory. Oxford: Oxford University Press Addition :						
	 [2] Tadelis, Steven. 2013. Game Theory: An Introduction. Princeton University Press [3] Barron, E. N. 2013. Game Theory: An Introduction, 2nd Edition. Oxford University Press 						
Learning Media	Software :	Hardware :					
	 LMS Unand (<u>http://fmipa.ilearn.unand.ac.id/</u>) Zoom meeting Whatsapp 	Computer/LaptopSmartphone					
Team Teaching	Dr. Ahmad Iqbal Baqi						
Required Course	 Elementary Linear Algebra Introduction to Probability Theory 						
Assessment	Homework, Quizzes, Mid-Term Exam, Fir	al Exam					
Academics Norms	https://akademik.unand.ac.id/images/20 30%20Peraturan%20Rektor%20Nomor%20 khusus%20Bab%20II.pdf	<u>22-03-</u> 7%20Tahun%202022%20Penyelenggaraan%20Pendidikan-					

Weekly Study Plan

Maala		Indicator (3)		Activities / Forms of Learning [Time estimated]						
vveek	Course		Assess ment (4)	Synchro	Synchronous*		ronous**		Subject,	Weight
Meet (1)	(2)			Face to face Offline (5)	Face to face Online (6)	Individual (7)	Collaboratio n (8)	MEDIA (9)	References (10)	(11)
1	CLO-1 An ability to design and interpret algorithms of Combinatorial Games (ILO-3:PI-3)	 Accuracy in understanding of related material Accuracy in answering assignment questions Neatness of task execution Originality of task results 	Mid-term Exam (10%) Homework (5%)	 Lecture: Introduction to SSP discussion and ask the questions of course material [1 x 3 x 50'] 		Students read and learn related materials [1 x 3 x 120']		LMS (ilearn UNAND)	 Tuition Contract SSP and Lecture Synopsis Combinatorial Games: (1) Sudoku Game (2) Tic tac-toe Game [1] 	15
2	CLO-2 An ability to determine the balance value of pure strategy and mixed strategy in the Zero Sum-Games (ILO-1;ILO- 3:PI-3)	 Accuracy in understanding of related material Accuracy in answering assignment questions Neatness of task execution Originality of task results 	Mid-term Exam (10%)	Lecture: • concept explanation • discussion and ask the questions of course material [1 x 3 x 50']		Students read and learn related materials [1 x 3 x 120']		LMS (ilearn UNAND)	 Zero Sum-Games Pure Strategy: (i) Dominant Strategy, and (ii) Maximum-minimax Strategy Mixed Strategy, Method: (1) Analytic, (2) Algebra, and (3) Matrix Algebra [1] [2] 	10

3	CLO-3 An ability to determine the balance value of pure strategy and mixed strategy in the Zero Sum-Games (ILO-1;ILO- 3:PI-3)	 Accuracy in understanding of related material Accuracy in answering assignment questions Neatness of task execution Originality of task results 	Homework (5%)	Lecture: • concept explanation • discussion and ask the questions of course material [1 x 3 x 50']	Students read and learn related materials [1 x 3 x 120']	Students discuss in groups [1 x 3 x 60']	LMS (ilearn UNAND)	 Continued: Zero Sum-Games (4) Coalition, (5) Linear Programming, (6) Duality, and (7) Graph [1] [2] 	5
4	CLO-3 An ability to determine the balance value of pure strategy and mixed strategy in the Zero Sum-Games (ILO-1;ILO- 3:PI-3)	 Accuracy in understanding of related material Accuracy in answering assignment questions Neatness of task execution Originality of task results 	Mid-term Exam (4%)	Lecture: • discussion and ask the questions of course material [1 x 3 x 50']	Students read and learn related materials [1 x 3 x 120']		LMS (ilearn UNAND)	 Nash Equilibrium Prisoner's Dilemma (PD) PD Case I and PD Case II Nash Equilibrium (NE) [1] [3] 	4
5	CLO-3 An ability to determine the balance value of pure strategy and mixed strategy in the Zero Sum-Games (ILO-1;ILO- 3:PI-3)	 Accuracy in understanding of related material Accuracy in answering assignment questions Neatness of task execution Originality of task results 	Quiz (4%)	Lecture: • discussion and ask the questions of course material [1 x 3 x 50']	Students read and learn related materials [1 x 3 x 120']		LMS (ilearn UNAND)	 General Sum-Games Models (Pure Strategy) (1) Prisoner's Dilemma, (2) Battle of the Sexes, (3) Chicken Game, (4) Hawk-Dove Game, (5) Stag Hunt Game, (6) Burning Money [1] [2] [3] 	4

6	CLO-3 Ability to determine the balance value of pure strategy and mixed strategy in the Zero Sum-Games (ILO-1;ILO- 3:PI-3)	 Accuracy in understanding of related material Accuracy in answering assignment questions Neatness of task execution Originality of task results 	Mid-term Exam (4%)	Lecture: • discussion and ask the questions of course material [1 x 3 x 50']	Students read and learn related materials [1 x 3 x 60']	Students discuss in groups [1 x 3 x 60']	LMS (ilearn UNAND)	Continued: General Sum-Games Models (Pure Strategy) (7) Cuban Missile Crisis, (8) Competition Game (9) Worker and Inspector, (10) Hero, (11) Pursuit of the Israelities, (12) Matching the Pennies, and (13) Rock- Paper-Scissor Game [1] [2] [3]	4
7	CLO-3 An ability to determine the balance value of pure strategy and mixed strategy in the Zero Sum Games (ILO-1;ILO-3:PI- 3)	 Accuracy in understanding of related material Accuracy in answering assignment questions Neatness of task execution Originality of task results 	Quiz (4%)	 Lecture: discussion and ask the questions of course material [1 x 3 x 50'] 	Students read and learn related materials [1 x 3 x 120']		LMS (ilearn UNAND)	 General Sum-Games Mixed Strategy: (i) Analytic Method, and (ii) Swastika Method [1] [3] 	4
8	Mid-term Exam								
9	CLO-3 An ability to determine the balance value of pure strategy and mixed strategy in the Zero Sum-Games (ILO-1;ILO 3:PI-3)	 Accuracy in understanding of related material Accuracy in answering assignment questions Neatness of task execution Originality of task results 	Homework (4%)	 Lecture: penjelasan konsep discussion and ask the questions of course material [1 x 3 x 50'] 	Students read and learn related materials [1 x 3 x 120']		LMS (ilearn UNAND)	• Correlated Equilibria - Probability Distribution in the cell of payoff matrix - Correlated Equilibria in the case of Battle of the Sexes [1] [2]	4
10	CLO-4 An ability to determine the solution of various Sequential Games (ILO- 4:PI-1)	 Accuracy in understanding of related material Accuracy in answering 	Final Exam (10%)	Lecture: • concept explanation	Students read and learn related materials	Students discuss in groups [1 x 3 x 60′]	LMS (ilearn UNAND)	 Sequential Games - Cases: (1) Senate Race; (2) Finite Game, dan (3) Centipede Games, (4) 	10

		assignment questions • Neatness of task execution • Originality of task results		 discussion and ask the questions of course material [1 x 3 x 50'] 	[1 x 3 x 60']			Ultimate Game (and second offer), [1] [2] [3]	
11	CLO-4 An ability to determine the solution of various Sequential Games (ILO- 4:PI-1)	 Accuracy in understanding of related material Accuracy in answering assignment questions Neatness of task execution Originality of task results 	Homework (5%)	 Lecture: discussion and ask the questions of course material [1 x 3 x 50'] 	Students read and learn related materials [1 x 3 x 120']		LMS (ilearn UNAND)	 Continued: Sequential Games (5) Security Game, (6) Sequential Games Applied and Prisoner's Dilemma in a Price War Auctions : English and Ducth Auctions Winner's Curses 	5
12	CLO-5 An ability to determine the solution of various Voting dan Cooperative Games (ILO-4:PI-1)	 Accuracy in understanding of related material Accuracy in answering assignment questions Neatness of task execution Originality of task results 	Final Exam (5%) Homework (5%)	 Lecture: concept explanation discussion and ask the questions of course material [1 x 3 x 50'] 	Students read and learn related materials [1 x 3 x 120']		LMS (ilearn UNAND)	 Voting : Voting Theories Approval Voting Borda Count [1] [2] [3] 	10
13	CLO-5 An ability to determine the solution of various Voting dan Cooperative Games (ILO-4:PI-1)	 Accuracy in understanding of related material Accuracy in answering assignment questions Neatness of task execution Originality of task results 	Final Exam (5%) Homework (5%)	 Lecture: discussion and ask the questions of course material [1 x 3 x 50'] 	Students read and learn related materials [1 x 3 x 60']	Students discuss in groups [1 x 3 x 60']	LMS (ilearn UNAND)	• Cooperative Games: Social Choice Theory Shapley's Value [1]	10

14	CLO-6 An ability to conclude and interpret Mind Games (ILO-4:P1-1).	 Accuracy in understanding of related material Accuracy in answering assignment questions Neatness of task execution Originality of task results 	Final Exam (10%)	 Lecture: concept explanation discussion and ask the questions of course material [1 x 3 x 50'] 		Students read and learn related materials [1 x 3 x 120']	LMS (ilearn UNAND)	 Game Theory Problems in the Hebrew Bible: (1) The Imposting Contrains and (dis)obedience of Adam and Eva, (2) The Belief Between God and Man [1] 	10
15	CLO-6 An ability to conclude and interpret Mind Games (ILO-4:P1-1).	 Accuracy in understanding of related material Accuracy in answering assignment questions Neatness of task execution Originality of task results 	Quiz (5%)	Lecture • discussion and ask the questions of course material [1 x 3 x 50']		Students read and learn related materials [1 x 3 x 120']	LMS (ilearn UNAND)	 Continued: Game Theory Problems in the Hebrew Bible: (3) Abraham's Sacrifice to God, (4) The Wisdom of King Solomon 	5
16		•			Fina	ıl Exam			
								Total	100

1. Indicators, Criteria, and Assessment Weights

No.	Assessment	Weight (%)
1	Mid-term Exam	30 %
2	Final Exam	30 %
3	Homework	20 %

4	Quizzes	20 %
	Total	100%

2. Assessment weight for each assessment

- CLO-1 : 15%
- CLO-2 : 15%
- CLO-3 : 20 %
- CLO-4 : 15 %
- CLO-5 : 20%
- CLO-6 : 15%

3. Assessment Plan Table:

Assessment	Mid-Term Exam	Final Exam	Home work	Quizze s	Weigh t (%)
 An ability to design and interpret algorithms of Combinatorial Games (ILO-3:PI-3) 	10%		5%		15%
 An ability to determine the balance value of pure strategy and mixed strategy in the Zero Sum-Games (ILO-1;ILO-3:PI- 3) 	10%		5%		15%
3. An ability to determine the balance value of pure strategy and mixed strategy in the General Sum-Games (ILO-1;ILO- 3:PI-3)	10%			10%	20%
4. An ability to determine the solution of various Sequential Games (ILO-4:PI-1)		10%	5%		15%
5. An ability to determine the solution of various Voting dan Cooperative Games (ILO-4:PI-1)		10%		10%	20%
6. An ability to conclude and interpret Mind Games (ILO-4:P1- 1)		10%	5%		15%
Total	30%	30%	20%	20%	100%