SEMESTER STUDY PLAN COMPLEX FUNCTION 1 (COMPULSORY COURSE) (Case-Based Method)



## 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 Norme Code UDL Learn Credite Constant Commitation I								
Course Nam		Course Code		I-Learn	Credits	Semester	Compilation Date	
Complex Functi	on 1			arn.unand.ac.id			15 May 2024	
		J	Study Plan Creator Head of Research Group Head of S					
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Person In Cha	rge		Efendi, M.Si Dr. Haripamyu Dr. N					
		Dr. Haripa		Divitai	ipainya		o verma rimany	
		Dr. Shelvi E	kariani					
Intended Learning	Intende	d Learning Outcomes						
Outcomes (ILO) and	ILO-2	Possesses profound k	nowledge of	the basic conce	pt mathematics			
Performance Indicator		PI-1: An ability to exp	0		L			
(PI)						thematical con	conte	
		<b>5 1</b>	-	ples 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						
		PI-1: An ability to identify simple mathematical problems						
		PI-2: An ability to explain simple mathematical problems						
	ILO-4	An ability to use con				atics in solvin	g simple	
		mathematical proble	-		- <b>1</b>		8	
		-		م سم عدام مسم عدا مما		alamian a in a		
		PI-1: Able to choose	the right basi	c mathematical	concepts and te	chilques in so	olving simple math	
		problems;						
		PI-2: Able to illustrate simple mathematical problems based on appropriate basic mathematical						
	concepts and techniques;							
		PI-3: Able to solve sin	3: Able to solve simple mathematical problems using appropriate basic mathematical concepts and					
		techniques.						

	Course Le	arning Outcomes
	1	Students are able to define complex numbers
	2	Students can identify, explain and generalize problems that require the concept of complex numbers
	3	Students can understand the concepts of limits and continuity
	4	Students can understand the concepts of analytic function.
	5	Students can apply the concepts of limits and continuity as well as analytical functions correctly
	6	Students can explain concepts related to complex numbers orally and in writing
Brief	In gen	eral, the course studies complex numbers, roots of complex numbers, limits and continuity, the
Description	Cauch	y-Riemann equation, analytical functions, original exponential and logarithmic functions, inverse
	trigon	ometric functions and hyperbolic inverses, each of which is applied. The output of this course is that
	studer	its are able to operate complex numbers, find the roots of complex numbers and solve equations on
	origina	al exponential and logarithmic functions, trigonometric inverse and hyperbolic inverse functions
	involv	ing complex numbers.
Course Materials	1. Con	nplex numbers
	2. Roo	t of complex number
		it and continuity
		chy- Riemann equation
		lytic function
	-	onential function
		aral logarithmic inverse of trigonometric function and inverse of hyperbolic function with their
<b>D</b> (		lications.
References	Main	
		rchill, R, 1899, Complex Variable and Applications, McGraw-Hill.
	2. Saff,	E.B.,2003. Fundamentals of Complex Analysis with Applications to Engineering and Science. Printice Hall.
	propor	
	-	gel,R, <i>Peubah Kompleks,</i> (terjemahan Koko Martono, Gelora Aksara Pratama)
	2. Johr	-MHowie-Complex-Analysis-Springer-Undergraduate-Mathematics-Series-Springer-2007
	Softwa	re: Hardware:

Learning Media	LMS Unand	computer/Laptop
	(http://fmipa.ilearn.unand.ac.id/)	Smartphone
	• Whatsapp	
Team Teaching	Zulakmal, M.Si	
	Efendi, M.Si	
	Dr. Haripamyu	
	Dr. Shelvi Ekariani	
Assessment	1. Tasks : 10%	
	2. Quiz : 20 %	
	3. Mid Semester : 35%	
	4. Final Semester : 35%	
	Formative Assessment:	
	1. Thumb up and thumb down	
	2. Minutes paper	
Required courses	1. MAT61121 Calculus 1; 2. MAT62121 Ca	lculus 2
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)	Course Outcomes (2) Indicator (3) Assessment (4) Activities/Forms of Learnin (Time estimated) Synchronous* Asynchro		]	Subject, references	Weight (11)		
(1)				Face to face Offline (5)	Individual (7)	Collaboration (8)	(10)	(11)
1		Accuracy in defining complex numbers Accuracy in identifying decision making problems that require complex number concepts Accuracy in applying the concept of complex numbers	* Mid Semester (5%)	<ul> <li>Studying; Introduction to RPS.</li> <li>Explanation of tasks and group division task.</li> <li>The lecturer provides several case examples related to the lecture material on complex numbers.</li> <li>The lecturer asks questions that make students think about how to solve the given case.</li> <li>Student groups are asked to look for their own cases that are related to complex numbers and solve them this problem in the group each.</li> <li>Discussion and Questions</li> <li>Answer lecture material</li> <li>and tasks [1 x 2 x 50 minutes]</li> </ul>	Students look for references and study about lecture material • [1 x 2 x 60 minutes]	Students discuss in groups about lecture material and task to be carried out. * [1 x 2 x 60 minutes]	Complex Numbers and their applications.	6%

Week/ Meet (1)	Course Outcomes (2)	Indicator (3)	Assessment (4)		Forms of Learn Time estimated Asynch Individual		Subject, references (10)	Weight (11)
2	Students are able to analyze the results of calculations in group assignments related to cases of complex numbers. (ILO-4; PI-1) Students are able to interpret the data taken and the results of the process of each step in solving problems decision making with complex numbers. (ILO-3; PI-1) Students are able to communicate orally and in writing about material related to complex numbers. (ILO-4; PI-1,2,3)	Accuracy in analyzing calculation results in group assignments related to cases of complex numbers. Accuracy in interpreting the data taken and the process results of each step in solving decision- making problems with complex numbers Accuracy in communicating verbally and in writing about related material complex numbers	Group Report Mid Semester (5%)	Offline (5) •Group presentatio ns •Discussion and Q&A on lecture material and group assignment s • [1 x 2 x 50 minutes]	(7) Students look for references and learn about lecture material • [1 x 2 x 60 minutes]	(8) Students discuss in groups about lecture material and task to be carried out. * [1 x 2 x 60 minutes]	Complex Numbers and their applications.	7%

Week/ Meet (1)	Course Outcomes (2)	Indicator (3)	Assessment (4)	Activities/Forms of Learning [Time estimated] Synchronous* Asynchronous** Face to face Individual Collaboration			Subject, references (10)	Weight (11)
				Face to face Offline (5)	(7)	(8)		
3	Students are able to define the roots of complex numbers. (ILO-2; PI-1) Students are able to identify decision- making problems that require the concept of roots of complex numbers. (ILO-3; PI-1, PI-2) Students are capable apply the concept of roots of complex numbers appropriately. (ILO- 3; PI-1; CP-4,PI-2)	Accuracy in defining roots of complex numbers. Accuracy in identifying decision making problems that require the concept of complex number roots. Accuracy in applying the roots of complex numbers.	Mid Semester (5%)	<ul> <li>Studying;</li> <li>The lecturer provides several case examples related to the lecture material on roots of complex numbers.</li> <li>The lecturer asks questions that make students think about how to solve the given case.</li> <li>Groups of students are asked to find their own cases that are related to the roots of complex numbers and solve them this problem in the group each.</li> <li>Discussion and questions</li> <li>Answer lecture material and tasks [1 x 2 x 50 minutes]</li> </ul>	Students look for references and study about lecture material • [1 x 2 x 60 minutes]	Students discuss in groups about lecture material and task to be carried out. * [1 x 2 x 60 minutes]	Number roots complex and its application	6%

Week/ Meet (1)	Course Outcomes (2)	Indicator (3)	Assessment (4)		5	l] ronous**	Subject, references (10)	Weight (11)
				Face to face Offline (5)	Individual (7)	Collaboration (8)		
4	Students are able to analyze the results of calculations in group assignments related to cases of roots of complex numbers. (ILO-4; PI-1) Students are able to interpret the data taken and the results of the process of each step in solving problems decision making with roots of complex numbers. (ILO-3;PI-1) Students are able to communicate orally and in writing about material related to the roots of complex numbers. (ILO-4; PI- 1,2,3)	Accuracy in analyzing calculation results in group assignments related to cases of roots of complex numbers. Accuracy in interpreting the data taken and the process results of each step in solving decision- making problems with complex number roots. Accuracy in communicatin g verbally and in writing about material related to roots of complex numbers.	Group Report Mid Semester (10%)	Group presentations Discussion and Q&A on lecture material and group assignments [1 x 2 x 50 minutes]	Students look for references and study about lecture material • [1 x 2 x 60 minutes]	Students discuss in groups about lecture material and task to be carried out. * [1 x 2 x 60 minutes]	Roots of complex numbers and their applicati ons	7%

Week/ Meet (1)	Course Outcomes (2)	Indicator (3)	Assessment (4)	Forms of Learn Fime estimated Asynch Individual		Subject, references (10)	Weight (11)
5	Students are able to define limits and continuity. (ILO-2; PI-1) Students are able to identify decision- making problems that require the concepts of limits and continuity. (ILO-3; PI-1, PI-2) Students are able to apply the concepts of limits and continuity appropriately. (ILO-4; PI-1; ILO- 4,PI-2)	Accuracy in defining limits and continuity. Accuracy in identifying decision making problems that require the concept of limits and continuity. Accuracy in applying the concept of limits and continuity.	* Mid Semester (5%)	(7) Students look for references and learn about lecture material • [1 x 2 x 60 minutes]	(8) Students discuss in groups about lecture material and task to be carried out. * [1 x 2 x 60 minutes]	Limits and continuit y and their applicati ons	5%

Week / Meet (1)	Course Outcomes (2)	Indicator (3)	Assessment (4)	Synchronou s*	5	ronous**	Subject, references (10)	Weight (11)
				Face to face Offline (5)	Individual (7)	Collaboration (8)		
6	Students are able to analyze the results of calculations in group assignments related to cases of limits and continuity. (ILO-4; PI- 1) Students are able to interpret the data taken and the results of the process of each step in solving problems decision making with limits and continuity. (ILO-3;PI-1) Students are able to communicate orally and in writing about material related to limits and continuity. (ILO-4; PI-1,2,3)	Accuracy in analyzing calculation results in group assignments related to cases of limits and continuity. Accuracy in interpreting the data taken and the process results of each step in solving decision- making problems with limits and continuity. Accuracy in communicatin g verbally and in writing about material related to limits and continuity.	Group Report <ul> <li>Mid</li> <li>Semester (10%)</li> </ul>	Group presentations Discussion and Q&A on lecture material and group assignments [1 x 2 x 50 minutes]	Students look for	Students discuss in groups about lecture material and tasks to be carried out. * [1 x 2 x 60 minutes]	Limits and continuity and their applications.	6%

Week/ Meet (1)	Course Outcomes (2)	Indicator (3)	Assessment (4)	Synchronous *	3	1] ronous**	Subject, references (10)	Weight (11)
				Face to face Offline (5)	Individual (7)	Collaboration (8)		
7	Students are able to define the Cauchy- Riemann equation. (ILO-2; PI-1) Students are able to identify decision- making problems that require the concept of the Cauchy-Riemann equation. (ILO-3; PI- 1, PI-2) Students are able to apply the concept of the Cauchy- Riemann equation correctly. (ILO-4; PI- 1; ILO-4,PI-2)	Accuracy in defining the Cauchy- Riemann equation. Accuracy in identifying decision making problems that require the concept of the Cauchy-Riemann equation. Accuracy in applying the concept of the Cauchy- Riemann equation.	* Mid Semester (5%)	material	material [1 x 2 x 60 minutes]	Students discuss in groups about lecture material and task to be carried out. * [1 x 2 x 60 minutes]	The Cauchy- Riemann equation and its applications	7%

	[1 x 2 x 50 minu	utes]		

Week/ Meet	eet ()				/Forms of Lear Time estimate	- Subject,	Moister (11)	
(1)	Course Outcomes (2)	Indicator (3)	Assessment (4)	S*	Asynch	ronous**	references (10)	Weight (11)
				Face to face Offline (5)	Individual (7)	Collaboration (8)		
8	Students are able to analyze the results of calculations in group assignments related to cases of the Cauchy- Riemann equation. (ILO-4; PI-1) Students are able to interpret the data taken and the results of the process of each step in solving problems decision making with the Cauchy-Riemann equation. (ILO-4; PI-1) Students are able to communicate orally and in writing about material related to the Cauchy- Riemann equation. (ILO-4; PI-1,2,3)	Accuracy in analyzing calculation results in group assignments related to the case of the Cauchy- Riemann equation. Accuracy in interpreting the data taken and the process results of each step in solving decision- making problems using the Cauchy- Riemann equation Accuracy in communicatin g verbally and in writing about material related to the Cauchy-	Group Report • Final Semester (10%)	•Group presentations • Discussion and question and answer lecture material and group assignments [1 x 2 x 50 minutes]	Students look for references and learn about lecture material [1 x 2 x 60 minutes]	Students discuss in groups about lecture material and task to be carried out. * [1 x 2 x 60 minutes]	The Cauchy- Riemann equation and its applications.	7%

	Riemann equation			

Week/ Meet (1)	Course Outcomes (2)	Indicator (3)	Assessment (4)	Activities/I [T	Subject,			
(1)				Synchronous*	Async	hronous**		Weight (11)
				Face to face	Individual	Collaboration	(10)	
				Offline (5)	(7)	(8)		

	Students are able to define analytical functions. (ILO-2; PI-1) Students are able to identify decision- making problems that require the concept of analytical functions. (ILO-3; PI-1, PI-2) Students are able to apply the concept of analytical functions correctly. (ILO-3; PI-1; ILO-4; PI-2)	Accuracy in defining analytical functions. Accuracy in identifying decision making problems that require the concept of analytical functions. Accuracy in applying the concept of analytical functions.	* Final Semester (5%)	<ul> <li>Studying; The lecturer gave several case examples related to the analytical function lecture material.</li> <li>The lecturer asks questions that make students think about how to solve the given case.</li> <li>Student groups are asked to look for their own cases that are related to the analytical function and solve these problems in their respective groups.</li> <li>Discussion and questions and answers about lecture materials and assignments.</li> </ul>		Students discuss in groups about lecture material and tasks to be carried out. * [1 x 2 x 60 minutes]	Its analytica l and applied functions	5%
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(1)Course Outcomes (2)Indicator (3)Assessment (4)Synchronous*Asynchronous**Face to faceIndividual Collaboration(11)	Week/ Meet (1)	Course Outcomes (2)	Indicator (3)	Assessment (A)	Activities/Fo [Tir	Subject,	Weight		
	(1)	Course Outcomes (2)	indicator (5)	Assessment (4)	Synchronous*	Async	hronous**	references (10)	
					Face to face	Individua	Collaboration	· · ·	× /

10	Students are able to analyze the results of calculations in group assignments related to cases of analytical functions. (ILO-2; PI-1) Students are able to interpret the data taken and the results of the process of each step in solving decision-making problems with analytical functions. (ILO-3;PI-1) Students are able to communicate orally and in writing about material related to analytical functions. (ILO-4; PI-1,2,3)	related to cases using analytical functions.	Group Report • Final Semester (10%)		Student s look for referenc es and learn about lecture material [1 x 2 x 60 minutes]	Students discuss in groups about lecture material and tasks to be carried out. * [1 x 2 x 60 minutes]	Its analytical and applied functions.	7%
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Week / Meet (1) Course Outcomes (2)		Indicator (3)	Assessment	Activities/	Subject,	Weight			
	Indicator (3)	(4)	Synchronous*	Asynch	ronous**	references (10)	(11)		
			~ /	Face to face	Individual	Collaboration	( )	× /	
				Offline (5)	(7)	(8)			

11	Students are able to define real		* Final Semester (5%)	- Studying; The lecturer gave	Students look for	Students discuss in	Original and	6%
	exponential and	and logarithmic	(0,0)	several case examples	references	groups	applied	
	logarithmic	functions.		related to lecture	and learn	about	exponenti	
	functions. (ILO-2;			material on the topic	about	lecture	al and	
	PI-1)	Accuracy in		of exponential	lecture	material	logarithm	
	,	identifying decision		functions and original	material.	and	ic	
	Students are able to	making problems			[1 x 2 x 60	tasks to be	functions.	
	identify decision-	that require the		- The lecturer asks	minutes]	carried out.		
	making problems	concept of original		questions that make		* [1 x 2 x 60		
	that require the	exponential and		students think about		minutes]		
	concept of genuine	logarithmic		how to solve the				
	exponential and	functions.		given case.				
	logarithmic			0				
	functions. (ILO-3;	Accuracy in		-Groups of students				
	PI-1, PI-2)	applying the		are asked to look for				
	Students are able to	original exponential		their own cases that				
	apply the concept of	and		are related to the				
	original exponential	logarithmic		original exponential and logarithmic				
	and logarithmic	function		functions and solve				
	functions correctly.	concepts.		these problems in				
	(ILO-3; PI-1; ILO-	1		their respective				
	4,PI-2)			groups.				
	,			-Discussions and				
				questions and				
				answers about lecture				
				materials and				
				assignments. [1 x 2 x 50 minutes]				

Week/ Meet	Course Outcomes (2)	Indicator (3)	Assessment (4)	-	/Forms of Lear Time estimate		¥47 * 1 /	
(1)				Synchronou s*	Asynch	ronous**	Subject, references (10)	Weight (11)
				Face to face Offline (5)	Individual (7)	Collaboration (8)		

12	Students are able to analyze the results of calculations in group assignments related to cases of exponential and logarithmic functions. (ILO-2; PI-1) Students are able to interpret the data taken and the results of the process of each step in solving decision-making problems using original exponential and logarithmic functions. (ILO-3;PI-1) Students are able to communicate orally and in writing about material related to real exponential and logarithmic functions. (ILO-4; PI-1,2,3)	Accuracy in analyzing calculation results in group assignments related to cases of original exponential and logarithmic functions. Accuracy in interpreting the data taken and the process results of each step in solving decision- making problems with original exponential and logarithmic functions. Accuracy in communicating uarbally and in	Group Report • Final Semester (5%)	Group presentation Discussion and question and Answer lecture material and group assignments. [1 x 2 x 50 minutes]	Students look for references and learn about lecture material. [1 x 2 x 60 minutes]	Students discuss in groups about lecture material and tasks to be carried out. * [1 x 2 x 60 minutes]	Original and applied exponential and logarithmic functions.	7%
	PI-1,2,3)	5						
		writing about						
		material related to						
		real exponential and						
		logarithmic						
		functions.						

Week/ Meet	Course Outcomes (2)			Activities/	Subject,	Weight		
(1)	Course Outcomes (2)	Indicator (3)	Assessment (4)	Synchronous*	Asynch	ronous**	references (10)	(11)
				Face to face	Individual	Collaboration		~ /
				Offline (5)	(7)	(8)		

13	Students are able to	Accuracy in defining	* Final Semester	- Studying;	Students	Students		6%
	define inverse	inverse	(10%)	The lecturer gave	look for	discuss in	Trigonom	
	trigonometric and	trigonometric and		several case examples	references	groups	etric	
	inverse hyperbolic	inverse hyperbolic		related to lecture	and learn	about	inverse	
	functions. (ILO-2;	functions.		material on the topic	about	lecture	and	
	PI-1)			of exponential	lecture	material	hyperboli	
		Accuracy in		functions and	material.	and	c inverse	
	Students are able to	identifying decision			[1 x 2 x 60	tasks to be	functions	
	identify decision-	making problems		- The lecturer asks	minutes]	carried out.	and their	
	making problems	that require the		questions that make		* [1 x 2 x 60	applicatio	
	that require the	concept of inverse		students think about		minutes]	ns.	
	concepts of inverse	trigonometric and		how to solve the				
	trigonometric and	inverse hyperbolic		given case.				
	inverse hyperbolic	functions.		given cube.				
	functions. (ILO-3;			-Groups of students				
	PI-1, PI-2)	Accuracy in		are asked to look for				
		applying the		their own cases that				
	Students are able to	concept of inverse		are related to the				
	apply the concepts	trigonometric and		original exponential				
	of inverse	inverse		and logarithmic				
	trigonometric and	hyperbolic		functions and solve				
	inverse hyperbolic	functions.		these problems in				
	functions correctly.			their respective				
	(ILO-3; PI-1; ILO-			groups.				
	4,PI-2)			-Discussions and questions and				
				answers about lecture				
				materials and				
				assignments.				
				$[1 \times 2 \times 50 \text{ minutes}]$				

Week/ Meet	Course Outcomes (2)	2) Indicator (3)	Assessment (4)	Activities/Forms of Learning [Time estimated]			Subject,	Weight
(1) C				Synchrono us*	Asynch	ronous**	references (10)	Weight (11)
				Face to face Offline (5)	Individual (7)	Collaboration (8)		

14	Students are able to analyze the results of	Accuracy in analyzing calculation results in	Group Report	•Group	Students look for	Students discuss in	Trigonometric inverse	6%
	calculations in group assignments related to	group assignments	<ul> <li>Final Semester (10%)</li> </ul>	presentation	references	groups about	and hyperbolic	
	cases of inverse	related to cases of		D: · 1	and learn	lecture	inverse	
	trigonometric and	inverse trigonometric		•Discussion and	about	material and	functions and	
	inverse hyperbolic	and inverse		question and	lecture	tasks to be	their	
	functions. (ILO-2; PI-1)	hyperbolic functions.		Answer lecture	material. [1 x 2 x 60	carried out.	applications.	
	Students are able to	A		material and	minutes]	* [1 x 2 x 60 minutes]		
	interpret the data	Accuracy in		group	minutes	minuces		
	taken and the results of	interpreting the data taken and the process		assignments. [1 x 2 x 50				
	the process of each	results of each step in		minutes]				
	step in solving problems	solving decision-		minucesj				
	decision making with	making problems						
	inverse trigonometric	using inverse						
	and inverse hyperbolic	trigonometric and						
	functions. (ILO-3;PI-1)	inverse hyperbolic						
	Students are able to	functions.						
	communicate orally and in writing about	Accuracy in						
	material related to	communicating						
	inverse	verbally and in						
	trigonometric and	writing about						
	inverse hyperbolic	material related to						
	functions. (ILO-4;	inverse						
	PI-1,2,3)	trigonometric and						
	. ,	inverse						
		hyperbolic						
		functions.						

#### Assessment rubric

Assessment at each meeting is related to the following criteria:

a. Accuracy in defining .....\*)b. Accuracy in defining decision-making problems that require concepts \*)c. Accuracy in applying concepts \*)

d. Accuracy in analyzing calculation results in group assignments related to cases in .....\*)

e. Accuracy in interpreting the data taken and the results of the process of each step in solving decision-making problems with \*)

f. Accuracy in communicating verbally and in writing about related material \*)

\*) Complex numbers, roots of complex numbers, limits and continuity, Cauchy-Riemann equation, analytic functions, original exponential and logarithmic functions,

trigonometric inverse and hyperbolic inverse functions.

Group	Criterio n 1			Criterion 6			FINAL EXAM SCORES		
	4	3	2	1	4	3	2	1	
1									
2									
4									
5									
•									

# Value (i-th criterion) = score × 100, final value of exam $\dots *$ = value 1 + $\dots *$ + value 6

## Criterion 1:

score	Indicat		
	or		
4	Presents definitions precisely, clearly and can interpret the meaning well		
3	Presenting the definition precisely, clearly, cannot interpret the meaning properly		
2	Presents definitions precisely, clearly, and cannot interpret the meaning.		
1	Unable to present definitions precisely, clearly.		

### Criterion 2:

score	Indicat
	or
4	Define decision-making problems that require the concept*) correctly, and
	the reasons can be explained well
3	Define decision making problems that require the concept of *) correctly, and the reasons
	cannot be explained well.
2	Define a decision-making problem that requires the concept of*) correctly, and the reasons
	cannot be explained well.
1	Unable to define decision-making problems that require concepts *).

Criterion 3:

score	Indicat
	or
4	Can apply the concept of*) correctly, and the reasons can be explained well
3	Can apply the concept*) correctly, and the reasons cannot be explained well
2	Can apply the concept of*) correctly, and the reasons cannot be explained well
1	Unable to apply concept*)

## Criterion 4:

score	Indicator
4	Can analyze the results of calculations in group assignments related to cases in*) correctly, and the reasons can be explained well
3	Can analyze the results of calculations in group assignments related to cases in*) correctly, and the reasons cannot be explained well
2	Can analyze the results of calculations in group assignments related to cases in*) correctly, and the reasons cannot be explained well
1	Unable to analyze calculation results in group assignments related to cases on*)

## Criterion 5:

Skor	Indicato				
	r				
4	Can interpret the data taken and the results of the process of each step in solving				
	decision-making problems *) correctly, and the reasons can be explained well				
3	Can interpret the data taken and the results of the process of each step in solving decision-				
	making problems with *) correctly, and the reasons cannot be explained well				
2	Can interpret the data taken and the results of the process of each step in solving				
	decision-making problems correctly *) and the reasons cannot be explained well				
1	Unable to interpret the data taken and the results of the process of each step in solving the				
	problem				
	decision making with *)				

Criterion 6:

score	Indicator
4	Can write reports in accordance with scientific principles and present the results of group work very well on related material*)
3	Can write reports in accordance with scientific principles and present the results of group work well on related material*)
2	Can write reports in accordance with scientific principles and present the results of group work in a concise manner good about related material*)
1	Can write reports in accordance with scientific principles and present the results of group work

### Assessment Plan Table:

		Assessment				
No.	CLO	Mid Semester	Final Semester	Group Task (Case Base Method)	Weight (%)	
1	Students are able to define complex numbers (ILO-2; PI-1);	5%	5%		10%	
2	Students are able to identify decision-making problems that require complex number concepts (ILO-2; PI-1, PI-2);	10%	10%		20%	
3	Students are able to apply the concept of complex numbers correctly (ILO-2; PI-1; ILO-3, PI-2)	10%		10%	20%	
4	Students are able to analyze the results of calculations in group assignments related to cases of complex numbers. (ILO-4; PI-1);		10 %	15%	25%	
5	Students are able to interpret the data taken and the results process each step in solving decision-making problems with complex numbers. (ILO-4,;PI-1,2);			15%	15%	
6	Students are able to communicate orally and in writing about material related to complex numbers. (CP-4; PI-1,2,3)			10%	10%	
	Total	25%	25%	50%	100%	