MODULE PORTFOLIO
ODD SEMESTER ACADEMIC YEAR 2020/2021

MODULE NAME	:	Elementary Number Theory	LECTURER:
MODULE CODE	:	4420102136	
CLASS	:	2020	
SEMESTER	:	3	
DATE	:		Team
COURSE LEARNING OUTCOMES	:	**Programme Learning Outcomes (PLO)** **Knowledge (KNO-1): Demonstrating mathematical knowledge and mathematical insight.** CLO-1: Identify and explain solving simple problems using the concepts and properties of division, number base, prime numbers, GCD and LCM, congruence, residual system, Euler's theorem, linear congruence, simultaneous linear congruence system, congruence system linear CLO-2: Capable of thinking in a structured manner, reasoning, proving simply the characteristics of division, number base, prime numbers, GCD and LCM, congruence, residual system, Euler's theorem, linear congruence, simultaneous linear congruence system, linear congruence system. **Skill (SKI-1): Formulating and solving fundamental mathematical problems.** CLO-3: Develop some mathematical models of a problems by using concept of divisibility, congruence, and some theorem. **Competences (COM-1): Proving mathematical statements by various methods.** CLO-4: Proving some properties of congruence	

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Correlation Between PLO and CLO Elementary Number Theory

Elementary Number Theory	KNO-1	SKI-1	COM-1
CLO-1	√		
CLO-2	√		
CLO-3		√	
CLO-4			√

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<tr><td>LEARNING STRATEGIES</td><td>:</td><td>Lectures are carried out by activating students with the following strategies: Lectures. Discussions. Practices. Presentations. And Group Assignments</td></tr>
<tr><td>ASSESSMENT</td><td>:</td><td>

The assessment carried out during the lecture includes the following three components.

1. Assignment (Assignment and final project)
2. Midterm Exam (UTS)
3. Final Exam (UAS)

1. Assignment

- Assignments were given every two weeks in one semester
- The assignments and final project was carried out to see the achievements of the PLO and CLO which are in accordance with the characteristics of the Elementary Number Theory module

2. Midterm Exam (UTS)

- UTS was held at the 8th meeting
- UTS was carried out in the classroom with an implementation time of 100 minutes according to the module schedule
- The UTS was carried out to see the achievements of the PLO and CLO which are in accordance with the characteristics of Elementary Number Theory module

3. Final Exam (UAS)

- UAS was held at the 16th meeting
- UAS was carried out in the classroom with an implementation time of 100 minutes which follows the UAS implementation schedule of the department

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- The UAS was carried out to see the achievements of the PLO and CLO which are in accordance with the characteristics of the Elementary Number Theory module

Assessmen Plan

Elementary Number Theory	KNO-1	SKI-1	COM-1
CLO-1	Assignments, UTS, UAS		
CLO-2	Assignments, UTS, UAS		
CLO-3		Assignments and UAS	
CLO-4			Assignments

Weight of Test Ability

Elementary Number Theory	KNO-1	SKI-1	COM-1
Assignments	30%	40%	30%
UTS	50%	50%	-
UAS	50%	50%	-

The Calculation of PLO's Weight

	T	UTS	UAS	
KNO-1	0,3	0,5	0,5	**1,3**
SKI-1	0,4	0,5	0,5	**1,4**
COM-1	0,3	0	0	**0,3**
	1	**1**	**1**	**3**

LEARNING OUTCOMES :

The Calculation of PLO for each students and the predicate of PLO for each student

NO	NIM	SCORE OF PLO			PREDICATE OF PLO		
		KNO-1	SKI-1	COM-1	KNO-1	SKI-1	COM-1
1	20030214001	90,88	90,81	90,00	E	E	E
2	20030214002	90,44	90,00	85,00	E	E	E
3	20030214003	95,29	94,86	90,00	E	E	E
4	20030214004	73,24	74,19	85,00	G	G	E
5	20030214005	87,94	87,30	80,00	E	E	E
6	20030214006	91,76	91,22	85,00	E	E	E
7	20030214007	79,41	79,46	80,00	G	G	E
8	20030214008	53,24	55,41	80,00	F	S	E
9	20030214009	91,03	90,95	90,00	E	E	E
10	20030214010	91,62	91,49	90,00	E	E	E
11	20030214011	87,65	87,84	90,00	E	E	E
12	20030214012	77,79	78,38	85,00	G	G	E
13	20030214014	92,21	91,62	85,00	E	E	E

			14	20030214015	83,53	84,05	90,00		E	E	E	
			15	20030214017	83,38	83,51	85,00		E	E	E	
			16	20030214018	78,38	79,32	90,00		G	G	E	
			17	20030214019	67,65	68,65	80,00		S	S	E	
			18	20030214020	88,38	88,11	85,00		E	E	E	
			19	20030214021	88,68	88,38	85,00		E	E	E	
			20	20030214022	87,35	87,57	90,00		E	E	E	
			21	20030214023	83,82	83,92	85,00		E	E	E	
			22	20030214024	64,71	65,54	75,00		S	S	G	
			23	20030214025	87,79	87,57	85,00		E	E	E	
			24	20030214026	84,26	84,73	90,00		E	E	E	
			25	20030214027	87,79	87,97	90,00		E	E	E	
			26	20030214028	89,56	89,19	85,00		E	E	E	
			27	20030214029	80,00	80,81	90,00		E	E	E	
			28	20030214030	86,76	86,62	85,00		E	E	E	
			29	20030214031	87,35	86,76	80,00		E	E	E	
			30	20030214032	94,71	93,51	80,00		E	E	E	
			31	20030214033	85,74	85,27	80,00		E	E	E	
			32	20030214034	93,53	92,43	80,00		E	E	E	
			33	20030214035	91,76	90,81	80,00		E	E	E	
			34	20030214036	94,71	93,51	80,00		E	E	E	
			35	20030214037	94,12	92,97	80,00		E	E	E	
			36	20030214038	94,12	92,97	80,00		E	E	E	
			37	20030214040	55,00	57,03	80,00		S	S	E	
			38	20030214041	83,53	80,00	40,00		E	E	F	
			39	20030214042	94,71	93,51	80,00		E	E	E	
			40	20030214043	94,71	93,51	80,00		E	E	E	
			41	20030214044	94,12	92,97	80,00		E	E	E	
			42	20030214045	72,35	72,57	75,00		G	G	G	

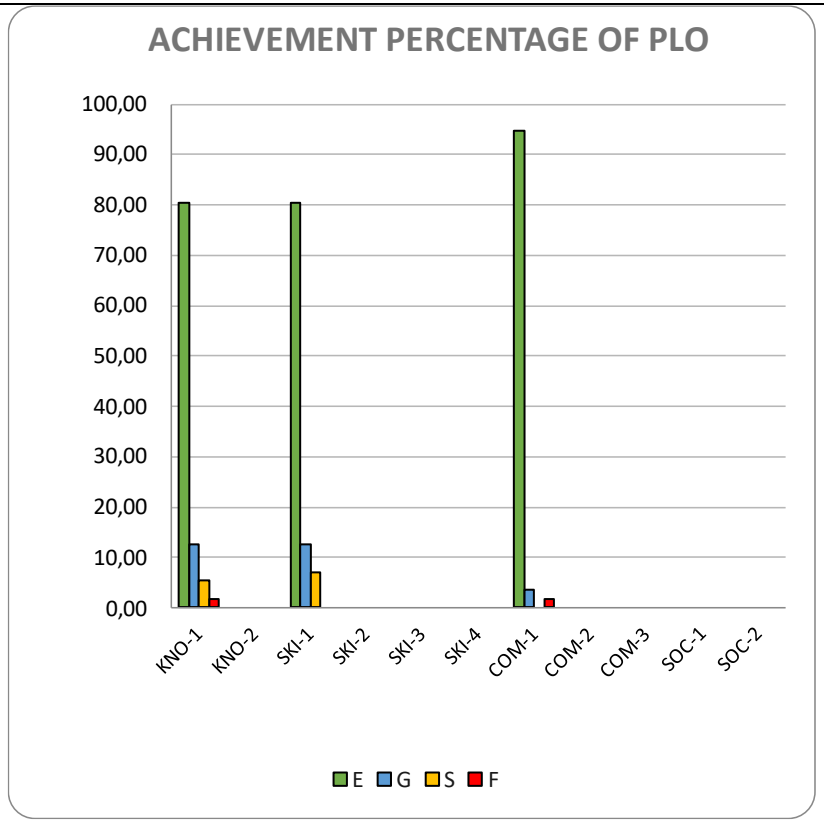
43	20030214046	94,71	93,51	80,00	E	E	E
44	20030214047	76,91	77,16	80,00	G	G	E
45	20030214048	88,09	87,43	80,00	E	E	E
46	20030214049	94,71	93,51	80,00	E	E	E
47	20030214050	94,12	92,97	80,00	E	E	E
48	20030214051	85,88	85,41	80,00	E	E	E
49	20030214052	94,12	92,97	80,00	E	E	E
50	20030214053	88,09	87,43	80,00	E	E	E
51	20030214054	94,12	92,97	80,00	E	E	E
52	20030214055	86,03	85,54	80,00	E	E	E
53	20030214056	92,65	91,62	80,00	E	E	E
54	20030214058	77,50	77,70	80,00	G	G	E
55	20030214059	94,71	93,51	80,00	E	E	E
56	20030214060	93,53	92,43	80,00	E	E	E

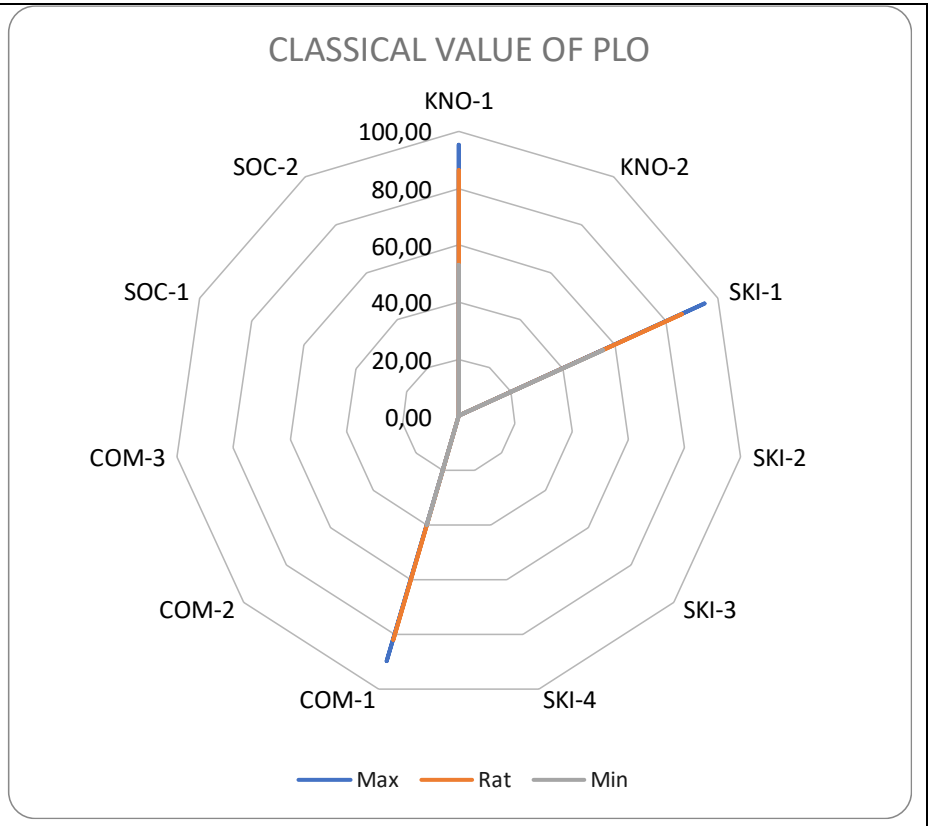
E = Excellent
G = Good
S = Satisfy
F = Fail

LEARNING OUTCOMES ANALYSIS	:	**PLO Assessment Rubric**					
		PLO	**Description**	**Excellent** $x \geq 80$	**Good** $70 \leq x < 80$	**Satisfy** $55 \leq x < 70$	**Fail** $x < 55$
		KNO-1	Demonstrating mathematical knowledge and mathematical insight	Student be able to identify and explain solving simple problems using the concepts and properties of division, number base, prime numbers, GCD and LCM, congruence, residual system, Euler's theorem, linear congruence, simultaneous linear congruence system, congruence system linear with score at least 80.	Student be able to identify and explain solving simple problems using the concepts and properties of division, number base, prime numbers, GCD and LCM, congruence, residual system, Euler's theorem, linear congruence, simultaneous linear congruence system, congruence system linear with score at least 70 and less than 80.	Student be able to identify and explain solving simple problems using the concepts and properties of division, number base, prime numbers, GCD and LCM, congruence, residual system, Euler's theorem, linear congruence, simultaneous linear congruence system, congruence system linear with score at least 55 and less than 70.	Student be able to identify and explain solving simple problems using the concepts and properties of division, number base, prime numbers, GCD and LCM, congruence, residual system, Euler's theorem, linear congruence, simultaneous linear congruence system, congruence system linear with score less than 55.
		SKI-1	Formulating and solving fundamental mathematical problems	Student be able to develop some mathematical models of a problems by using concept of divisibility, congruence, and some theorem with score at least 80.	Student be able to develop some mathematical models of a problems by using concept of divisibility, congruence, and some theorem with score at least 70 and less than 80.	Student be able to develop some mathematical models of a problems by using concept of divisibility, congruence, and some theorem with score at least 55 and less than 70	Student be able to develop some mathematical models of a problems by using concept of divisibility, congruence, and some theorem with score less than 55.

COM- 1	Proving mathematical statements by various methods	Student be able to prove some properties of congruence with score at least 80.	Student be able to prove some properties of congruence with score at least 70 and less than 80.	Student be able to prove some properties of congruence with score at least 55 and less than 70	Student be able to prove some properties of congruence with score less than 55.

	CLASSICAL VALUE OF PLO		
	KNO-1	**SKI-1**	**COM-1**
Max	95,29	94,86	90,00
Rat	86,25	85,92	82,14
Min	53,24	55,41	40,00
	ACHIEVEMENT NUMBER OF PLO		
E	45,00	45,00	53,00
G	7,00	7,00	2,00
S	3,00	4,00	0,00
F	1,00	0,00	1,00
	56,00	56,00	56,00
	ACHIEVEMENT PERCENTAGE OF PLO (%)		
E	80,36	80,36	94,64
G	12,50	12,50	3,57
S	5,36	7,14	0,00
F	1,79	0,00	1,79
	100,00	100,00	100,00





STUDENT'S LEARNING	:	overall, the students in elementary number theory class have mastered the concept of the course. Of the 64 students, 80.36% of students achieved excellent criteria in KNO-1 and SKI-, and 94.64% of students achieved excellent criteria in COM-1. However, there is one student who failed in KNO-1 and COM-1.

PERFORMANCE ANALYSIS		
RECOMMENDATION FOR FUTURE LEARNING	:	Several recommendations based on the last course of elementary number theory for better course in the future are as follow: 1. Motivate the students more to find ideas of theorem by themselves. The students should be asked to share their opinion in class. 2. Several assignments by the students can be extended and developed.
RECOMMEDATION FOR INSTITUTION	:	NA

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DOCUMENT OF ODD SEMESTER FINAL EXAMINATION
ACADEMIC YEAR OF 2020/2021

Course/Code	: Elementary Number Theory
Lecturer	: Team
Program/Class	: S1/2019 D and E
Date and Time	: Monday, January 4, 2020
Duration	: 100 minutes
Type	: Closed

1. Write answer you on sheet paper accompanied
2. Avoid use pencil in write answer.
3. Photo /scan sheet answer you like that so that answer you could read with good.
4. Sort answer from number about smallest and upload answers you in one file (pdf) with filename: **NIM_NAMA**.
5. Work on by independent **without any resources but yourself**.

1. Find the solution of Diophantine equation $754x + 221y = 13$ (Score 15)
2. Prove that $(an + b)^m \equiv b^m (mod\ n)$ (Score 15)
3. Find the smallest positive integer x if $61! \equiv x - 1 (mod\ 71)$ (Score 15)
4. If this month is May, then find out what is the next 239^{43} month? (Score 15)
5. Find the smallest positive value for this congruence system (Score 20)

$$x \equiv 1\ (mod\ 2)$$
$$2x \equiv 2\ (mod\ 5)$$
$$10x \equiv 5\ (mod\ 15)$$

6. Find the solution of this system (Score 20)

$$x + 2y \equiv 4\ (mod\ 5)$$
$$3x + y + z \equiv 0\ (mod\ 5)$$
$$x + y + 2z \equiv 3\ (mod\ 5)$$

----------GOOD LUCK----------

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BLUE PRINT OF ODD SEMESTER FINAL EXAMINATION

Examination Subjects : Elementary Number Theory

Lectures : Team

Program : Mathematics

No.	Indicator	Test	Key of the answer	Cognitive Domain	Score
1.	Using the properties of congruence to solve the specified problem	Find the solution of Diophantine equation $754x + 221y = 13$	• Diophantine rule	C3	15
2.	Proving the congruence properties of numbers	Prove that $(an + b)^m \equiv b^m (mod\ n)$	• Congruence properties	C4	15
3.	Solve mathematical problems related to residual systems	Find the smallest positive integer x if $61! \equiv x - 1 (mod\ 71)$	• Congruence	C4	15
4	Solve mathematical problems related to Euler's theorem	If this month is May, then find out what is the next 239^{43} month?	• Euler theorem	C4	15
5	Solve mathematical problems related to simultaneous linear congruence systems	Find the smallest positive value for this congruence system $x \equiv 1\ (mod\ 2)$ $2x \equiv 2\ (mod\ 5)$ $10x \equiv 5\ (mod\ 15)$	• Linear Congruence System	C4	20
6	Determine the solution of mathematical problems related to the linear congruence system	Find the solution of this system $x + 2y \equiv 4\ (mod\ 5)$ $3x + y + z \equiv 0\ (mod\ 5)$ $x + y + 2z \equiv 3\ (mod\ 5)$	• Linear Congruence System	C4	20

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DOCUMENT OF ODD SEMESTER MIDTERM EXAMINATION
ACADEMIC YEAR 2020/2021

Course/Code	:	Elementary Number Theory
Lecturer	:	Team
Program/Class	:	S1/2019 D and E
Date and Time	:	Monday, November 2, 2020
Duration	:	100 Minutes
Type	:	Closed

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1. Write your answers on a sheet of paper with **identification** on each sheet.
2. Avoid using a pencil in writing answers.
3. Photograph/scan your answer sheet so that your answers can be read properly.
4. Sort the answers from the smallest question number and upload your answers in one file (pdf) with the file name: **NIM_NAMA**.
5. Work independently **without any resources but yourself**

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1. Given x and y are integer. Prove that $2x + 3y$ can be divided by 17 if and only if $9x + 5y$ can be divided by 17. [Score 10]
2. Given $p, q \in \mathbb{Z}, p > 0, q > 0$. Prove if $p|q$ then $p \leq q$. [Score 10]
3. a. By using Euclid algorithm, find (a, b) if a is 4 last digit number of your student registration and b is 4 last digit number of your phone number. If the first number is 0 then replace with 1. [Score 15]

   b. Determine an integer x and y such that $ax + by = (a, b)$. [Score 10]
4. Find the result of this operation

   a. $(710523)_8 + (54321)_6 = (\dots)_{16}$ [Score 10]

   b. $(312231)_3 \times (323412)_5 = (\dots)_7$ [Score 10]
5. Given $p, q \in \mathbb{Z}$. Prove that $(p, q).[p, q] = pq$. [Score 15]
6. Mother ask Dani to buy two kind of fruits, namely mango and apple. Mother gives him money about Rp. 100.000,- to get as many as possible fruits which the number of apple should be bigger than mango. If the price of one mango is Rp. 700,- rupiah and one apple is Rp. 1.300,- then find out how many fruits that Dani can buy.

   [Score 20]

----------Good Luck----------

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BLUE PRINT OF ODD SEMESTER MIDTERM EXAMINATION

Examination Subjects : Elementary Number Theory

Lectures : Team

Program : Mathematics

No.	Indicator	Test	Key of the answer	Cognitive Domain	Score
1.	Able to solve mathematical problems with the properties of division and division algorithm	Given x and y are integer. Prove that $2x + 3y$ can be divided by 17 if and only if $9x + 5y$ can be divided by 17.	• Prove ($\Rightarrow$) • Prove ($\Leftarrow$)	C4	10
2.	Able to explain the proof of the division properties	Given $p, q \in \mathbb{Z}, p > 0, q > 0$. Prove if $p\|q$ then $p \leq q$.	• By using some theorem in division, it can be proved that if $p\|q$ then $p \leq q$.	C4	10
3.	Able to apply Euclid's algorithm in solving problems	a) By using Euclid algorithm, find (a, b) if a is 4 last digit number of your student registration and b is 4 last digit number of your phone number. If the first number is 0 then replace with 1. b) Determine an integer x and y such that $ax + by = (a, b)$.	• Arrange the number a and b into the $ax + by = (a, b)$ • By using Euclid algorithm, the (a, b) can be determined	C5	15 10
4	Able to represent a number in various bases and their operations	Find the result of this operation a) $(710523)_8 + (54321)_6 = (\dots)_{16}$ b) $(312231)_3 \times (323412)_5 = (\dots)_7$	• Use the role of basis and their operation to find out the solution	C4	10 10

5	Able to solve problems related to the relationship between GCD and LCM	Given $p, q \in \mathbb{Z}$. Prove that $(p, q).[p, q] = pq$.	• Use some theorem in GCD and LCM	C4	15
6	Able to apply the characteristics of GCD in solving problems	Mother ask Dani to buy two kind of fruits, namely mango and apple. Mother gives him money about Rp. 100.000,- to get as many as possible fruits which the number of apple should be bigger than mango. If the price of one mango is Rp. 700,- rupiah and one apple is Rp. 1.300,- then find out how many fruits that Dani can buy.	• Construct the mathematical model from the given question • By using GCD, the number of fruit can be determined	C5	20