

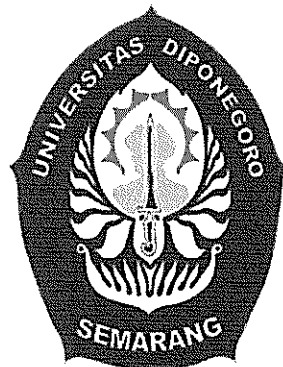
**STUDYING CONTRACT
LEARNING PROGRAM OUTLINE
LEARNING UNIT PROGRAM**

ALGEBRA II

COURSE CODE: PAM 302

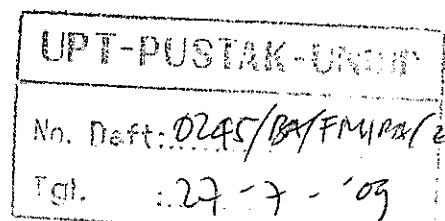
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SEMESTER V



BY:

**Drs. YD Sumanto, M.Si
Suryoto, M.Si**



**DEPARTMENT OF MATHEMATIC
FACULTY OF MATHEMATIC AND NATURAL SCIENCES
DIPONEGORO UNIVERSITY
SEMARANG**

STUDY CONTRACT

Course Title	: Algebra II
Code	: MAT 323
Lecturer	: Drs. Y. D. Sumanto, M.Si Suryoto, S.Si, M.Si
Days / Time	: DDDDD, HH.MM – HH.MM DDDDD, HH.MM – HH.MM
Class room	: E.101 & A.203

1. Benefits of The Course

Mathematics as a basic science has an important role in daily activities. We aware or not, mathematics always used in a simple activity till an abstract and difficult problem. Algebra is a branch of mathematics which gives many contributions to daily activities, especially to solve an abstract problem.

This course gives a basic of deductive reasoning more abstract. So, this course offered to students at bachelor degree (3rd years student) so that they have a comprehensive illustration about concept of advanced algebra to give a strong foundation in mathematically reasoning to solve real problems.

2. Course Description

This course is an advanced abstract algebra that study an algebraic structure of a not void set with two binary operations, their main properties and relation among the specific form of such algebraic structure.

This course exert deeply give concept of advanced abstract algebra start from a familiar subject to strange matter and from a real things to the abstract one.

3. Instructional Objective

After finish this course, student will be able to mention some main algebraic structure with their basic properties.

4. Lecture Strategy

In this course, majority use a lecture method. However, students are expected to take an active part in learning to ask about unclearly concept / difficult matter or give an opinion, perhaps they found by study literature or personal idea. For the certain topic, students are expected to do some exercises and the result are discussed in class.

5. References

The main references used in this course are :

1. Herstein, I. N., **Abstract Algebra**, Prentice-Hall, New Jersey, 1996.
2. Fraleigh, J. B., **A First Course in Abstract Algebra**, Addison-Wesley Publishing Company, Massachusetts, 1997.
3. Durbin, J. R., **Modern Algebra : An Introduction**, John Wiley & Sons, Inc., New York, 2000.

6. Tasks

1. Before the class, students are expected to read the subject, at least one of those references mentioned at point 5.
2. At beginning the class, a quiz is given about 15 minutes, after finish at least two or more sub topics according to schedule.
3. After one chapter finished, students are given homework and surrendered next week. Because of this course include 5 topics (chapters), there are 5 tasks to do at one semester.
4. Midtest will be done after 12 times meeting and final exam be done after this class. Test are given in essay or analysis test.

7. Criteria of Scoring

Scoring is given by lecturer and criteria of scoring used in this course is :

Grade	Point	Range
A	4	≥ 90
AB	3.5	80 – 89
B	3	70 – 79
BC	2.5	60 – 69
C	2	50 – 59
CD	1.5	40 – 49
D	1	30 – 39
E	0	≤ 29

Final score decision is based on this scoring indicator such as :

Quiz	10 %
Tasks	10 %
Midtest	40 %
Final exam	40 %

8. Schedule

LECTURING	TOPICS	REFERENCES
1	First Lecture : Give a general description of study contract and topic of course, introduce to students.	---
2	Ring : Introduction □ Definition of a Ring □ Basic Properties of a Ring	[1], [2], [3]
3	The Specific Rings	[1], [2], [3]
4	Quiz I The Characteristic of a Ring	[1], [2], [3]
	Task I	
5	Division Ring	[1], [2], [3]
6	Field	[1], [2], [3]
7	Integral Domain	[1], [2], [3]
8	The Field of Quotients	[1], [2], [3]
	Task II	
9	Quiz II Definition of Polynomial	[1], [2], [3]
10	The Evaluation Homomorphism	[1], [2], [3]
11	Factorization of Polynomial	[1], [2], [3]
12	Irreducible Polynomial	[1], [2], [3]
	Task III	
13	Midtest	
14	Ring Homomorphism	[1], [2], [3]
15	Properties of Ring Homomorphism	[1], [2], [3]
16	Properties of Ring Homomorphism (Advanced)	[1], [2], [3]
17	Kernel and image of Homomorphism	[1], [2], [3]
18	Quiz III The Construction of Factor Ring (Quotient Ring)	[1], [2], [3]
19	Prime and Maximal Ideals	[1], [2], [3]
	Task IV	
20	Quiz IV Unique Factorization Domain (UFD)	[2], [3]
21	Principal Ideal Domain (PID)	[2], [3]
22	Quiz V Euclidean Domain	[2], [3]
23	Relation among UFD, PID and Euclidean domain	[2], [3]
	Task V	
24	Final exam	

OUTLINE OF TEACHING PROGRAM

COURSE TITLE
COURSE CODE / CREDIT
SHORT DESCRIPTION

GENERAL INSTRUCTIONAL OBJECTIVE

: Algebra II
 : MAT 323 / 4 Credit Hours (CH)
 : This course study an algebraic structure from a non void set with two binary operations, their properties and relation among specific form of this algebraic structure.
 : After finish this course, students will be able to mention some principal algebraic structure and their properties.

No.	Specific Instructional Objectives	Topic	Sub Topics	Time Estimation	References
		3	4	5	6
1	Students will be able to describe definition of ring, some examples and their properties.	Rings	1. Definition of a Ring 2. Basic Properties of a Ring 3. The Specific Rings 4. The Characteristic of a Ring	3 times (3 x 100 minutes)	[1], [2], [3]
2	Students will be able to mention some specific rings, their properties and to explain relation among these specific rings.	The Specific Rings	1. Division Ring 2. Field 3. Integral Domain 4. The field of Quotients	4 times (4 x 100 minutes)	[1], [2], [3]
3	Students will be able to explain definition of polynomial under a ring and their main properties.	Ring of Polynomial	1. Definition of Polynomial 2. The Evaluation Homomorphism 3. Factorization of Polynomial 4. Irreducible Polynomial	5 times (5 x 100 minutes)	[1], [2], [3]
4	Students will be able to explain how to construct a new ring over a subring of another ring.	Factor Ring and Ideal	1. Ring Homomorphism 2. Properties of Homomorphism 3. Kernel and Image of Ring Homomorphism 4. The Construction of Factor Ring 5. Prime and Maximal Ideals	7 times (7 x 100 minutes)	[1], [2], [3]
5	Students will be able to explain relation among the specific commutative rings via factorization.	Factorization over a Commutative Ring	1. Unique Factorization Domain 2. Principal Ideal Domain 3. Euclidean Domain	5 times (5 x 100 minutes)	[2], [3]

REFERENCES :

1. Herstein, I. N., *Abstract Algebra*, Prentice-Hall, New Jersey, 1996.
2. Fraleigh, J. B., *A First Course in Abstract Algebra*, Addison-Wesley Publishing Company, Massachusetts, 1997.
3. Durbin, J. R., *Modern Algebra : An Introduction*, John Wiley & Sons, Inc., New York, 2000.

LEARNING PLAN UNIT

Course Title	: Algebra II
Course Code	: MAT 323
Time Allocation	: 3 x 100 minutes
Lecturing	: 1, 2 and 3

A. Instructional Objectives

1. General

After finish this course (at the end of semester), students will be able to mention some principal algebraic structure and their properties.

2. Specific

After study this course (at end of the 3rd lecturing), students will be able to explain definition of a ring, give some examples of ring and their properties.

B. Topic : Rings

C. Sub Topics :

1. Definition of a Ring
2. Basic Properties of a Ring
3. The Specific Rings
4. The Characteristic of a Ring

D. Teaching & Learning Activities

Stage	Lecturer Activities	Student Activities	Tools and Learning Media
Introduction	<ol style="list-style-type: none">1. Describing about matter of course at the first, second and third lecturing.2. Explaining benefits of studi a ring.3. Explaining about competence of general and specific instructional objectives at the 1st, 2nd and 3rd lecturing.	<p>Paying attention</p> <p>Paying attention</p> <p>Paying attention</p>	
Presentation	<ol style="list-style-type: none">4. Explaining about a ring :<ol style="list-style-type: none">a. Ask to students about a ring.b. Writing solution on the board.c. Conclude about a ring.d. Giving some notations and terminology use in ring theory.	<p>Giving an opinion</p>	<p>Black board (white board)</p> <p>Black board/ OHP</p>
	<ol style="list-style-type: none">5. Explaining Basic Properties of a Ring :<ol style="list-style-type: none">a. Ask to student about basic properties of a ringb. Writing solution on the board.c. Summarize and describing basic properties of a ring.d. Giving some proofs of these properties.	<p>Giving an opinion</p> <p>Paying attention</p>	<p>Black board (white board)</p> <p>Black board / OHP</p> <p>Black board (white board)</p>
	<ol style="list-style-type: none">6. Describing some specific form of a ring :<ol style="list-style-type: none">a. Ask to students about the specific rings.b. Writing solution on the board.c. Describing and explaining some specific rings	<p>Giving an opinion</p> <p>Paying attention</p>	<p>Black board (white board)</p> <p>Black board/ OHP</p>
	<ol style="list-style-type: none">d. Request to students to give some exaples of the specific rings.7. Explaining definition of characteristic of a ring.	<p>Paying attention</p>	<p>Black board/</p>

			OHP
Closing	8. Conclude the lecturing : a. Giving an evaluation as a comment on the student result. b. Giving exercises as homework to evaluating. c. Giving a general description about the next subject / topic.	Taking notes	Black board

LEARNING PLAN UNIT

Course Title : Algebra II
Course Code : MAT 323
Time Allocation : 4 x 100 minutes
Lecturing : 4, 5, 6 and 7

A. Instructional Objectives

1. General

After finish this course (at the end of semester), students will be able to mention some principal algebraic structure and their properties.

2. Specific

After study this course (at end of the 7th lecturing), students will be able to mention some specific rings, their properties and to explain relation among these specific rings.

B. Topic : The Specific Rings

C. Sub Topics :

1. Division Ring
2. Field
3. Integral Domain
4. The Field of Quotients

D. Teaching & Learning Activities

Stage	Lecturer Activities	Student Activities	Tools and Learning Media
Introduction	<ol style="list-style-type: none">1. Describing about matter of course at the fourth, fifth, sixth and seventh lecturing.2. Explaining benefits of study a ring.3. Explaining about competence of general and specific instructional objectives at the 4th, 5th, 6th and 7th lecturing.	<p>Paying attention</p> <p>Paying attention</p> <p>Paying attention</p>	
Presentation	<ol style="list-style-type: none">4. Explaining about a division ring :<ol style="list-style-type: none">a. Ask to students about a division ring.b. Writing solution on the board.c. Conclude about a division ring.d. Giving some notations and terminology use in a division ring.5. Explaining about field :<ol style="list-style-type: none">a. Ask to student about field.b. Writing solution on the board.c. Conclude about a field.d. Giving some properties of field.6. Describing some specific form of a ring :<ol style="list-style-type: none">a. Ask to students about an integral domain.b. Writing solution on the board.c. Conclude about an integral domain.d. Request to students to give some examples of integral domain.7. Explaining definition of field of quotients :	<p>Giving an opinion</p> <p>Giving an opinion</p> <p>Paying attention</p> <p>Giving an opinion</p> <p>Paying attention</p>	<p>Black board (white board)</p> <p>Black board/ OHP</p> <p>Black board (white board) Black board / OHP</p> <p>Black board (white board) Black board/ OHP</p>

	<ul style="list-style-type: none"> a. Ask to students about the field of quotients. b. Writing solution on the board. c. Conclude about the field of quotients. d. Describing and explaining how to construct a field of quotients. 	<p>Giving an opinion</p> <p>Paying attention</p>	<p>Black board (white board)</p> <p>Black board/ OHP</p>
Closing	<ul style="list-style-type: none"> 8. Conclude the lecturing : <ul style="list-style-type: none"> a. Giving an evaluation as a comment on the student result. b. Giving exercises as homework to evaluating. c. Giving a general description about the next subject / topic. 	<p>Taking notes</p>	<p>Black board</p>

	<p>polynomial.</p> <p>d. Giving an algorithm to factorize a polynomial.</p> <p>7. Explaining about an irreducible polynomial :</p> <p>a. Ask to students about an irreducible polynomial.</p> <p>b. Writing solution on the board.</p> <p>c. Conclude about an irreducible polynomial.</p> <p>d. Giving and explaining uniqueness of factorization of polynomial over a field.</p>	<p>Paying attention</p> <p>Giving an opinion</p> <p>Paying attention</p>	<p>OHP</p> <p>Black board/ OHP</p> <p>Black board (white board)</p> <p>Black board/ OHP</p>
Closing	<p>8. Conclude the lecturing :</p> <p>a. Giving an evaluation as a comment on the student result.</p> <p>b. Giving exercises as homework to evaluating.</p> <p>c. Giving a general description about the next subject / topic.</p>	<p>Taking notes</p>	<p>Black board</p>

LEARNING PLAN UNIT

Course Title : Algebra II
 Course Code : MAT 323
 Time Allocation : 7 x 100 minutes
 Lecturing : 13, 14, 15, 16, 17, 18 and 19

A. Instructional Objectives

1. General
 After finish this course (at the end of semester), students will be able to mention some principal algebraic structure and their properties.
2. Specific
 After study this course (at end of the 19th lecturing), students be able to explain how to construct a new ring over a subring of another ring.

B. Topic : Factor Ring and Ideal

C. Sub Topics :

1. Ring Homomorphism
2. Properties of Ring Homomorphism
3. Kernel and Image of Ring Homomorphism
4. The Construction of Factor Ring
5. Prime and Maximal Ideals

D. Teaching & Learning Activities

Stage	Lecturer Activities	Student Activities	Tools and Learning Media
Introduction	1. Describing about matter of course at the 13 th , 14 th , 15 th , 16 th , 17 th , 18 th and 19 th lecturing. 2. Explaining benefits of study a factor ring and Ideal. 3. Explaining about competence of general and specific instructional objectives at the 13 th , 14 th , 15 th , 16 th , 17 th , 18 th and 19 th lecturing.	Paying attention Paying attention Paying attention	
Presentation	4. Explaining about a ring homomorphism : a. Ask to students about a ring homomorphism. b. Writing solution on the board. c. Conclude about a ring homomorphism. 5. Explaining about properties of homomorphism : a. Ask to students about the main properties of ring homomorphism. b. Writing solution on the board. c. Summarize and explaining about the main properties of ring homomorphism. d. Giving some proofs of these properties. 6. Explaining about Kernel and Image of ring homomorphism : a. Ask to students about kernel and image of ring homomorphism. b. Writing solution on the board. c. Giving and explaining about kernel and image	Giving an opinion Giving an opinion Paying attention Giving an opinion Paying attention	Black board (white board) Black board / OHP Black board (white board) Black board / OHP Black board (white board) Black board/

	<p>of ring homomorphism.</p> <p>d. Explaining about properties of kernel and image of homomorphism.</p> <p>7. Explaining about how to construct factor ring:</p> <p>a. Giving definition of ideal and its relationship between construction a factor ring.</p> <p>b. Explaining how to construct a factor ring.</p> <p>8. Explaining about prim and maximal ideals :</p> <p>a. Ask to student about prim and maximal ideals</p> <p>b. Writing solution on the board.</p> <p>c. Conclude about prim and maximal ideals.</p> <p>d. Giving contribution of these ideals to characterize commutative rings.</p>	<p>Paying attention</p> <p>Paying attention</p> <p>Paying attention</p> <p>Giving an opinion</p> <p>Paying attention</p>	<p>OHP</p> <p>Black board/ OHP</p> <p>Black board/ OHP</p> <p>Black board/ OHP</p> <p>Black board (white board)</p> <p>Black board/ OHP</p>
Closing	<p>9. Conclude the lecturing.</p> <p>a. Giving an evaluation as a comment on the student result.</p> <p>b. Giving exercises as homework to evaluating.</p> <p>c. Giving a general description about the next subject / topic.</p>	<p>Taking notes</p>	<p>Black board</p>

LEARNING PLAN UNIT

Course Title : Algebra II
 Course Code : MAT 323
 Time Allocation : 5 x 100 minutes
 Lecturing : 20, 21, 22, 23 and 24

A. Instructional Objectives

1. General

After finish this course (at the end of semester), students will be able to mention some principal algebraic structure and their properties.

2. Specific

After study this course (at end of the 24th lecturing), students will be able to explain relation among the specific commutative rings via factorization.

B. Topic : Factorization over a Commutative Ring

C. Sub Topics :

1. Unique Factorization Domain
2. Principal Ideal Domain
3. Euclidean Domain

D. Teaching & Learning Activities

Stage	Lecturer Activities	Student Activities	Tools and Learning Media
Introduction	1. Describing about matter of course at the 20 th , 21 st , 22 nd , 23 rd and 24 th lecturing. 2. Explaining benefits of studi a factorization over a commutative ring. 3. Explaining about competence of general and specific instructional objectives at the 20 th , 21 st , 22 nd , 23 rd and 24 th lecturing.	Paying attention Paying attention Paying attention	
Presentation	4. Explaining about an Unique Factorization Domain : a. Ask to students about an unique factorization domain. b. Writing solution on the board. c. Conclude about an unique factorization domain. d. Giving some notations and terminology use in the unique factorization domain. e. Explaining about properties of an unique factorization domain. 5. Explaining about a Principal Ideal Domain : a. Ask to students about principal ideal domain. b. Writing solution on the board. c. Conclude about a principal ideal domain. d. Giving properties of a principal ideal domain. e. Ask to students about relationship between an unique factorization domain and a principal ideal domain. f. Writing solution on the board.	Giving an opinion Paying attention Giving an opinion Paying attention Giving an opinion	Black board (white board) Black board/ OHP Black board / OHP Black board (white board) Black board/ OHP Black board

	<p>g. Conclude about relationship between an unique factorization domain and a principal ideal domain.</p> <p>6. Explaining about Euclidean Domain :</p> <p>a. Ask to students about an Euclidean domain.</p> <p>b. Writing solution on the board</p> <p>c. Conclude about an Euclidean domain.</p>	Giving an opinion	<p>(white board)</p> <p>Black board (white board)</p>
Closing	<p>7. Conclude the lecturing.</p> <p>a. Giving an evaluation as a comment on the student result.</p> <p>b. Giving exercises as homework to evaluating.</p>	Taking notes	Black board