Faculty: Science	
Department: Mathematics	**Program: Bachelor's**

Course Plan

First: Course Information

Course No.: (0301341)	***Course Title: Modern Algebra 1***	***Credit Hours: 3***
Prerequisite: Logic & Set Theory (0103151)	***Section No.: 1***	***Lecture Time: 11:00 – 12:00***
Level in JNQF	7	
Type Of Course:	☐ *Obligatory Faculty Requirement* ☐ *Elective University Requirement* ☐ *Obligatory University Requirement* ☐ *Faculty Requirement* ☐ *Course Elective Specialty Requirement* ■ *Obligatory Specialization requirement*	
Type of Learning:	■ ***Face-to-Face Learning*** ☐ ***Blended Learning (2 Face-to-Face + 1Asynchronous)*** ☐ ***Online Learning (2 Synchronous+1 Asynchronous)***	

Third: Course Description

Groups and subgroups, Abelian groups, Cyclic groups, Cosets, Lagrange's theorem, Normal subgroups and quotient groups, First isomorphism theorem, Rings and sub rings, Integral domains, Ideals, Fields, Quotient rings

Fourth: Course Objectives

Upon completion of this course, the student should be able to

1. Understand definitions, examples, and theorems pertaining to groups and rings.
2. Follow and to construct a formal mathematical proof using each of the following methods: a direct proof, a proof by contradiction and a proof by induction.
3. Demonstrate an understanding of the relationship of abstract algebra to other branches of mathematics and to related fields.
4. Independently explore related topics using resources other than the text.

Fifth: Learning Source

Main Reference:	***Contemporary Abstract Algebra***	
Author: Joseph Gallian	***Issue No.:*** 8th Edition	***Publication Year: 2013***
Additional Sources & Websites	***A First Course in Abstract Algebra, by John Fraleigh***	
Teaching Type:	***Classroom*** ☐ ***Laboratory*** ☐ ***Workshop*** ☐ ***MS Teams*** ☐ ***Moodle***	

Sixth: Learning Outcomes

Level descriptor according to (JNQF)	**CILOs Code**	**CILOs**	**Associated PILOs Code** Choose one PILO for each CILO*	**Assessment method**** Choose at least two methods	**Scores out of 100** State the total score identified for each CILO	**Minimum acceptable Score/percentage (%)** The percentage should not be less than 50% ***
Knowledge	K1	1. Define and illustrate the concept of group, subgroup, order of group, order of element, cyclic group, center of group, normal subgroup and factor group. 2. Define and illustrate the concept of permutation group, cycle notation, disjoint cycles, even and odd permutation, and Dihedral group. 3. Define and illustrate the concept of external direct product. 4. Define and illustrate the concept of homomorphism and isomorphism. 5. Define and illustrate the concept of ring, integral domain, field and Ideal.	PK1	First Exam, Second Exam, Final Exam,	12	6 (50%)
	K2	1.Comprehend properties pertaining to groups and rings. 2. Comprehend the meaning of isomorphism.	PK2	First Exam, Second Exam, Final Exam	10	5 (50%)
	K3	1. Reach to properties of groups (rings) via basic theorems. 2.Prove some basic theorems in abstract algebra.	PK3, PK4	First Exam, Second Exam, Final Exam	12	6 (50%)
Skills	S1	1.Find and determine the most important properties of a group (ring) 2. Find the kernel and range of homeomorphism	PS1	First Exam, Second Exam, Final Exam, Assignment	14	7 (50%)
	S2	Computing the order, inverse and centralizer of an element by using the Cayley table.	PS2	First Exam, Second Exam, Final Exam	14	7 (50%)

	S3	Reach to algebraic properties of a group (ring) by analyzing basic information about this group (ring).	PS2	First Exam, Second Exam, Final Exam	12	6 (50%)
	S4	Constructing a proof of theorems.	PS2	Second Exam, Final Exam, Assignment	10	5 (50%)
Competencies	C1	Working in a team to handle some advanced topics in number theory	PC3	Assignment	4	2 (50%)
	C2	Develop the personal skills and capacity to carry responsibility	PC1	Second Exam, Final Exam, Assignment	12	6 (50%)

***Refer to document ( ) and page 2 in document ( )**
**** Refer to document ( )**
****80% of the students must achieve the minimum acceptable percentage or higher for each CILO**

Seventh: Course Structure

Lecture Date	Intended Teaching Outcomes (ILOs)	Topics	Teaching Procedures*	Teaching Methods**	References***
		Introduction	Face-to-Face	Lectures, cooperative learning and discussion	
	K1, K2, S1, S2	Definition and Examples of Groups	Face-to-Face	Lectures, cooperative learning and discussion	42-44
	K1, K2, S1, S2, C1	Properties of Groups	Face-to-Face	Lectures, cooperative learning and discussion	45-49
	K1, K2, S1, S2, C1	Powers of elements	Face-to-Face	Lectures, cooperative learning and discussion	50-53
	K1, K2, S1, S2, C1, C2	Order of a group	Face-to-Face	Lectures, cooperative learning and discussion	54-58
	K1, K2, K3, S1, S2, C1, C2	Order of an element	Face-to-Face	Lectures, cooperative learning and discussion	60-61
	K1, K2, K3, S1, S2, C1, C2	Subgroups	Face-to-Face	Lectures, cooperative learning and discussion	61-64
	K1, K2, K3, S1, S2, S3, C1	Subgroup Tests	Face-to-Face	Lectures, cooperative learning and discussion	61-64
	K1, K2, S1, S2, S4, C1, C2	Subgroups Generated by an element	Face-to-Face	Lectures, cooperative learning and discussion	65-66
	K1, K2, K3, S1, S2, S5, C1, C2	Center of a group	Face-to-Face	Lectures, cooperative learning and discussion	67-68
	K1, K2, K3, S1, S2, S3, C1, C2	Centralizer of an element	Face-to-Face	Lectures, cooperative learning and discussion	67-68
	K1, K2, K3, S1, S2, S3, C1, C2	Cyclic Groups	Face-to-Face	Lectures, cooperative learning and discussion	77-79
	K1, K2, K3, S1, S2	Generators of finite cyclic groups	Face-to-Face	Lectures, cooperative learning and discussion	80-81

	K1, K2, K3, S1, S2, S3, C1, C2	Classification of Subgroups of cyclic groups	Face-to-Face	Lectures, cooperative learning and discussion	82-83
	K1, K2, K3, S1, S2, S3, C1, C2	Infinite cyclic groups	Face-to-Face	Lectures, cooperative learning and discussion	84-86
	K1, K2, K3, S1, S2, S3, C1, C2,	Exercises	Face-to-Face	Lectures, cooperative learning and discussion	87-92
	First Exam				
	K1, K2, K3, S1, S2, S3, C1, C2	Permutation groups	Face-to-Face	Lectures, cooperative learning and discussion	99-102
	K1, K2, K3, S1, S2, S3, C1, C2	Cycle notation	Face-to-Face	Lectures, cooperative learning and discussion	102-105
	K1, K2, K3, S1, S2, S3, S4, C1, C2	Order of permutation	Face-to-Face	Lectures, cooperative learning and discussion	106-108
	K1, K2, K3, S1, S2, S3, S4, C1	Even and odd permutations	Face-to-Face	Lectures, cooperative learning and discussion	109-112
	K1, K2, K3, S1, S2, S3, C1, C2	The Dihedral group	Face-to-Face	Lectures, cooperative learning and discussion	113-117
	K1, K2, K3, S1, S2, S3, C1, C2	Exercises on permutation groups	Face-to-Face	Lectures, cooperative learning and discussion	118-123
	K1, K2, K3, S1, S2, S3, C1, C2	Cosets	Face-to-Face	Lectures, cooperative learning and discussion	144-147
	K1, K2, K3, S1, S2, S3, C1, C2	Lagrange's Theorem	Face-to-Face	Lectures, cooperative learning and discussion	147-149
	K1, K2, K3, S1, S2, S3, C1, C2	Exercises	Face-to-Face	Lectures, cooperative learning and discussion	156-160
	K1, K2, K3, S1, S2, S3, C1, C2	Normal subgroups	Face-to-Face	Lectures, cooperative learning and discussion	184-187
	K1, K2, K3, S1, S2, S3, C1, C2	Factor groups	Face-to-Face	Lectures, cooperative learning and discussion	187-190
	K1, K2, K3, S1, S2, S3, C1, C2	External direct product	Face-to-Face	Lectures, cooperative learning and discussion	202-206
	K1, K2, K3, S1, S2, S3, C1, C2	Isomorphism	Face-to-Face	Lectures, cooperative learning and discussion	207-208
	K1, K2, K3, S1, S2, S3, C1, C2	Examples of Isomorphism	Face-to-Face	Lectures, cooperative learning and discussion	208-209
	K1, K2, K3, S1, S2, S3, C1, C2	Properties of Isomorphism	Face-to-Face	Lectures, cooperative learning and discussion	210-213
	K1, K2, K3, S1, S2, S3, C1, C2	First Isomorphism Theorem	Face-to-Face	Lectures, cooperative learning and discussion	214-217
	Second Exam				
	K1, K2, K3, S1, S2, S3, C1, C2	Introduction to ring	Face-to-Face	Lectures, cooperative learning and discussion	245-248
	K1, K2, K3, S1, S2, S3, C1, C2	Subrings	Face-to-Face	Lectures, cooperative learning and discussion	248-250
	K1, K2, K3, S1, S2, S3, C1, C2	Integral domains	Face-to-Face	Lectures, cooperative learning and discussion	255-267
	K1, K2, K3, S1, S2, S3, C1, C2	Fields	Face-to-Face	Lectures, cooperative learning and discussion	255-267

	K1, K2, K3, S1, S2, S3, C1, C2	Ideal	Face-to-Face	Lectures, cooperative learning and discussion	267-270
	K1, K2, K3, S1, S2, S3, C1, C2	Factor rings	Face-to-Face	Lectures, cooperative learning and discussion	267-270
	K1, K2, K3, S1, S2, S3, C1, C2	Examples of Rings	Face-to-Face	Lectures, cooperative learning and discussion	
	K1, K2, K3, S1, S2, S3, C1, C2	Revision	Face-to-Face	Lectures, cooperative learning and discussion	
	Final Exam				

* Learning procedures: (Face-to-Face, synchronous, and asynchronous). * * Teaching methods: (Lecture, video….).
** * Reference: (Pages of the book, recorded lecture, video….).

Eighth: Assessment methods

Methods	Direct Teaching	Specific Course Output to be measured *State the score identified for each CILO for each method of assessment out of 100 **If any CILO will not be assessed in the course, mark NA.								
		K1	K2	K3	S1	S2	S3	S4	C1	C2
First Exam	20	4	3	4	4	3	2			
Second Exam	20	2	2	1	3	5	3	2		2
Final Exam	50	6	5	7	5	6	7	6		8
Assignment	10				2			2	4	2
Total	100	12	10	12	14	14	12	10	4	12

Eighth: Course Policies

- All course policies are applied on all teaching patterns (online, blended, and face-to-face Learning) as follows:
  a. Punctuality.
  b. Participation and interaction.
  c. Attendance and exams.
- Academic integrity: (cheating and plagiarism are prohibited).