



# FORMAN CHRISTIAN COLLEGE, LAHORE

(A Chartered University)

Course Outline for Fall 2021

## **Instructor Information:**

Dr Burhan ul Haq (PhD Mathematics, LUMS)

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## **Office Hours:**

**Monday, Friday:** 2:00 PM - 2:50 PM

**Tuesday, Thursday:** 11:00 AM - 11:50 AM

## **Course Information:**

**Title:** Ring theory

**Course Code:** Math 402 (A)

**Credit Hours:** 4

**Lectures Time:** TR: 9:30-10:45 (S-417)

W: 2:00-2:50pm (S-413)

**Prerequisite:** Math 313 (Group Theory)

## **Recommended Books:**

- Contemporary Abstract Algebra by Joseph Gallian, 7<sup>th</sup> edition.
- A course in Abstract Algebra, V. Khanna and S. Bhambri

## **Course Contents**

Definition and examples of rings, subrings, special classes of rings, ideals and quotient rings, ring homomorphism, factorization in integral domains, fields.

## Course Description and Objectives

Abstract algebra is the study of algebraic structures which include groups, rings, fields, modules and vector spaces. This course is an introduction to ring theory. The pre-requisite of this course is group theory. The objective of the course is to achieve a good working knowledge of the main ideas and techniques of elementary ring theory.

## Course Policies:

- Students are expected to attend every class. Students must arrive at class on time, should remain in class for the entire class period and mobile phone should be switched off or on silence. Students failing to maintain atleast 70% attendance will not be allowed to appear for Final Exam.
- Course assessment will be through **quizzes, attendance, assignments, midterm and final exam.**
- Quizzes, Mid-term exam and final exam will be conducted on campus for both even and odd ID students. Assignments will be conducted on Moodle. There is **no make up** for the missed quizzes and assignments. Make up for quizzes, midterm and final exam is possible only under extremes cases if a student provides strong documentary evidence. In case of make-up exam there will be a 0-20% deduction in marks depending upon case to case basis.
- Academic dishonesty or cheating will result in zero points (grade F) and will be referred to AIC (Academic Integrity Committee) at FCC.

## **Course Evaluation**

Assignments	10%
Quizzes	15%
Attendance/Class participation	5%
Midterm Exam	30%
Final Exam	40%

<b><u>Grades</u></b>	<b><u>Quality Points</u></b>	<b><u>Numerical Value</u></b>	<b><u>Meaning</u></b>
A	4.00	93-100	Superior
A-	3.70	90-92	
B+	3.30	87-89	
B	3.00	83-86	Good
B-	2.70	80-82	Fair
C+	2.30	77-79	
C	2.00	73-76	Satisfactory
C-	1.70	70-72	
D+	1.30	67-69	
D	1.00	60-66	Passing
F	0.00	59 or below	Failing

## Course Outline

<b>Week</b>	<b>Topics</b>	<b>Assessment</b>
<b>1</b>	Discussion of course plan, basic definition and examples of rings and subrings.	
<b>2</b>	Elements in a ring: unit, invertible elements, nilpotent, idempotent, zero divisors. Characteristic of a ring.	
<b>3</b>	Integral domain and field. Ideals in a field.	
<b>4</b>	Operations on ideals : sum, product, intersection and union	<b>Quiz 1</b>
<b>5</b>	Operations on ideals (continue), properties of ideals	
<b>6</b>	Prime ideal, maximal ideal	<b>Assignment 1</b>
<b>7</b>	Quotient ring, criterion for prime and maximal ideals	
<b>8</b>	Properties of ring homomorphism	<b>Mid Term</b>
<b>9</b>	Properties of ring homomorphism (continue), isomorphism theorem	
<b>10</b>	Field of fractions and embedding of a ring into a field	<b>Quiz 2</b>
<b>11</b>	Euclidean rings	
<b>12</b>	Principal ideal domains	
<b>13</b>	Unique factorization domains	<b>Quiz 3</b>
<b>14</b>	Rings of Gaussian integars	<b>Assignment 2</b>
<b>15</b>	Polynomial rings	