



## Course Specifications

<b>Course Title:</b>	<b>Ring Theory</b>
<b>Course Code:</b>	<b>2023203-3</b>
<b>Program:</b>	<b>Bachelor in Mathematics.</b>
<b>Department:</b>	<b>Mathematics and Statistics Department</b>
<b>College:</b>	<b>Faculty of Sciences</b>
<b>Institution:</b>	<b>Taif University</b>

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## A. Course Identification

<b>1. Credit hours:</b>	<b>Three Hours</b>
<b>2. Course type</b>	
a.	University <input type="checkbox"/> College <input type="checkbox"/> Department <input checked="" type="checkbox"/> Others <input type="checkbox"/>
b.	Required <input checked="" type="checkbox"/> Elective <input type="checkbox"/>
<b>3. Level/year at which this course is offered:</b>	<b>9<sup>th</sup> level / 3<sup>rd</sup> year</b>
<b>4. Pre-requisites for this course (if any):</b>	<b>Group Theory (2023106-3)</b>
<b>5. Co-requisites for this course (if any):</b>	<b>None</b>

### 6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	4Hr /Week	100
2	Blended		
3	E-learning		
4	Distance learning		
5	Other		

### 7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	40
2	Laboratory/Studio	
3	Tutorial	
4	Others (specify)	
	<b>Total</b>	<b>40</b>

## B. Course Objectives and Learning Outcomes

### 1. Course Description

This course introduces Ring Theory. The main objective of this course is studying the elementary theorems and properties of Ring Theory such as: Definitions, Examples, Subring, Zero Divisors, Nilpotent, Idempotent, Units, Integral Domains, Division Ring, Field, Characteristic of a Ring, Ideals, Quotient Ring, Ring Homomorphism (and Isomorphism), Isomorphism Theorems, Prime Ideal, Maximal Ideal, Principal Ideal Ring, Characteristic of a ring and Factorization in Integral Domains.

### 2. Course Main Objective

This course is designed mainly for the students majoring in mathematics. The student should be taught as follows:

1. Introducing the basic principles of Ring Theory.
2. Analyzing the different types of the ring elements.
3. Deriving the factor ring of a given ring and a given two-sided ideal.
4. Demonstrating the ideals from a given finite ring.

Knowing the type of a given ideal in the meaning of a prime ideal and a maximal ideal.

### 3. Course Learning Outcomes

CLOs		Aligned PLOs
<b>1</b>	<b>Knowledge and Understanding:</b>	
1.1	Recognize basics properties of rings, division rings, fields, integral domains.	K2
1.2	Outline the mathematical properties of the operations on subrings and ideals such as intersection, union, and the multiplication.	K2
<b>2</b>	<b>Skills:</b>	
2.1	Apply appropriate properties of ring theory to prove some principles, theorems, formulas on finite rings.	S4
2.2	Explain the type of given element of a ring (unit, idempotent, nilpotent and zero-divisor).	S4
2.3	Demonstrate some properties of factorization in integral domain in solving various problems related to mathematical sciences or in postgraduate studies.	S4
<b>3</b>	<b>Values:</b>	
3.1	Work effectively within groups and independently.	V1
3.2	Articulate ethical behaviour associated with institutional Guidelines in classroom, and in Lab.	V3

### C. Course Content

No	List of Topics	Contact Hours
1	Definition of Rings and Examples.	4
2	Some Elementary Theorems in Ring Theory.	4
3	Special Types of Elements in a Ring (Zero Divisors – Nilpotent –Idempotent – Units) & Special Types of Rings (Integral Domain – Division Ring – Field).	4
4	Definition and Examples of Subrings, Basic theorems on Subrings.	4
5	Right Ideals, Left Ideals and Two-Sided Ideals.	4
6	<b>Midterm exam,</b> Quotient of a Ring by a two-sided ideal & Prime Ideals and Maximal Ideals.	4
7	Homomorphism and Isomorphism Mappings of Rings.	4
8	The First Isomorphism Theorem and some applications.	4
9	The Second Isomorphism Theorem and The Third Isomorphism Theorem.	4
10	Factorization in Integral Domains.	4
<b>Total</b>		<b>40</b>

## D. Teaching and Assessment

### 1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	<b>Knowledge and Understanding:</b>		
1.1	Recognize basics properties of rings, division rings, fields, integral domains.	<ul style="list-style-type: none"> <li>Lectures</li> <li>Group discussions</li> </ul>	<ul style="list-style-type: none"> <li>Quizzes</li> <li>Assignments</li> </ul>
1.2	Outline the mathematical properties of the operations on subrings and ideals such as intersection, union, and the multiplication.	<ul style="list-style-type: none"> <li>Lectures</li> <li>Group discussions</li> </ul>	<ul style="list-style-type: none"> <li>Exams</li> <li>Assignments</li> </ul>
2.0	<b>Skills</b>		
2.1	Apply appropriate properties of ring theory to prove some principles, theorems, formulas on finite rings.	<ul style="list-style-type: none"> <li>Interactive classes</li> <li>Group discussions</li> </ul>	<ul style="list-style-type: none"> <li>Quizzes</li> <li>Assignments</li> </ul>
2.2	Explain the type of given element of a ring (unit, idempotent, nilpotent and zero-divisor).	<ul style="list-style-type: none"> <li>Lectures</li> <li>Group discussions</li> </ul>	<ul style="list-style-type: none"> <li>Exams</li> <li>Quizzes</li> </ul>
2.3	Demonstrate some properties of factorization in integral domain in solving various problems related to mathematical sciences or in postgraduate studies.	<ul style="list-style-type: none"> <li>Lectures</li> <li>Self-learning through the website</li> </ul>	<ul style="list-style-type: none"> <li>Exams</li> <li>Quizzes</li> <li>Assignments</li> </ul>
3.0	<b>Values</b>		
3.1	Work effectively within groups and independently.	Interactive classes. Give students tasks of duties.	Assessment of design projects that have elements of interpersonal skills.
3.2	Articulate ethical behaviour associated with institutional Guidelines in classroom, and in Lab.	<ul style="list-style-type: none"> <li>Lectures</li> <li>Group discussions</li> </ul>	<ul style="list-style-type: none"> <li>Exams</li> <li>Quizzes</li> </ul>

### 2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Quizzes + Home works	Continues	10 %
2	Midterm exam	5 <sup>th</sup> -6 <sup>th</sup>	30 %
3	Class Work (Homework- report- class test....)	8 <sup>th</sup>	10 %
4	Final exam	11 <sup>th</sup>	50 %

\*Assessment task (i.e., written test, oral test, oral presentation, group project, essay, etc.)

## E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice:

6 hours per week (as defined in the teaching schedule of the faculty member) for academic advice and consultations.

Teaching staff is also available using Blackboard web site and Taif University “Edugate” System.

## F. Learning Resources and Facilities

### 1. Learning Resources

<b>Required Textbooks</b>	<b>W. Keith Nicholson, Introduction to Abstract Algebra, 4th Edition, John Wiley &amp; Sons., 2012.</b>
<b>Essential References Materials</b>	<b>John B. Fraleigh, A first course in abstract algebra, 7th Edition, Reading, Mass.: Addison-Wesley Pub. Co., 2015.</b>
<b>Electronic Materials</b>	<b>Lecturers from YouTube, prepared by Dr. Salah El Nafaey, (see the following link),</b> <a href="https://www.youtube.com/watch?v=OzNfAQYstyE&amp;list=PLp5QO1iuiUkNtvLwjssJYyQ3WbS9S8s2V">https://www.youtube.com/watch?v=OzNfAQYstyE&amp;list=PLp5QO1iuiUkNtvLwjssJYyQ3WbS9S8s2V</a>
<b>Other Learning Materials</b>	

### 2. Facilities Required

<b>Item</b>	<b>Resources</b>
<b>Accommodation</b> (Classrooms, laboratories, demonstration rooms/labs, etc.)	<b>Lecture halls, containing white boards, and electronic monitors - The seats fit the number of students - Laboratories equipped with suitable numbers of computers</b>
<b>Technology Resources</b> (AV, data show, Smart Board, software, etc.)	<b>Laptop and projector.</b>
<b>Other Resources</b> (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	<b>Wi-Fi internet connections</b>

### G. Course Quality Evaluation

<b>Evaluation Areas/Issues</b>	<b>Evaluators</b>	<b>Evaluation Methods</b>
Effectiveness of teaching and assessment	Students	Indirect
Quality of learning resources	Peer Reviewer Students	Direct Indirect
Extent of achieving the course learning outcomes	Peer Reviewer Students	Direct Indirect

**Evaluation areas** (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)

**Evaluators** (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify))

**Assessment Methods** (Direct, Indirect)

### H. Specification Approval Data

<b>Council / Committee</b>	<b>Department of Mathematics and Statistics</b>
<b>Reference No.</b>	<b>11</b>
<b>Date</b>	<b>12-7-1443 H</b>

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Mathematics and Statistics  
Department

