Course Specification

— (Bachelor)

Course Title: **Ring Theory**	
Course Code: **2023203-3**	
Program: Bachelor in Mathematics	
Department: Mathematics and Statistics Department	
College: **Faculty of Sciences**	
Institution: **Taif University**	
Version: 1	
Last Revision Date: 20/05/2023	

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: 3

2. Course type

A.	☐University	☐College	☒ Department	☐ Track	☐Others
B.	☒ Required			☐Elective	

3. Level/year at which this course is offered: Level 6 / Third Year

4. Course general 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.

5. Pre-requirements for this course (if any)**:**

Group Theory (2023106-3)

6. Co-requirements for this course (if any)**:**

None

7. Course Main Objective(s):

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.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	3Hr /Week	100%
2	E-learning		
3	Hybrid • Traditional classroom		

No	Mode of Instruction	Contact Hours	Percentage
	● E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	45
2.	**Laboratory/Studio**	NA
3.	**Field**	NA
4.	**Tutorial**	NA
5.	**Others (specify)**	NA
Total		**45**

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	Recognize basics properties of rings, division rings, fields, integral domains.	K2	● Lectures ● Group discussions `	● Quizzes ● Assignments
1.2	Outline the mathematical properties of the operations on subrings and ideals such as intersection, union, and the multiplication.	K2	● Lectures ● Group discussions	● Exams ● Assignments
2.0	**Skills**			
2.1	Apply appropriate properties of ring theory to prove some principles, theorems, formulas on finite rings.	S4	● Interactive classes ● Group discussions	● Quizzes ● Assignments
2.2	Explain the type of given element of a ring (unit, idempotent, nilpotent and zero-divisor).	S4	● Lectures ● Group discussions	● Exams ● Quizzes
2.3	Demonstrate some properties of factorization in	S4	● Lectures ● Self-learning through	● Exams ● Quizzes

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
	integral domain in solving various problems related to mathematical sciences or in postgraduate studies.		the website	• Assignments
3.0	**Values, autonomy, and responsibility**			
3.1	Work effectively within groups and independently.	V1	• 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.	V3	• Lectures • Group discussions	• Exams • Quizzes

C. Course Content

No	List of Topics	Contact Hours
1.	Definition of Rings and Examples	3
2.	Some Elementary Theorems in Ring Theory.	3
3.	Special Types of Elements in a Ring (Zero Divisors – Nilpotent – Idempotent – Units).	3
4.	Special Types of Rings (Integral Domain – Division Ring – Field).	3
5.	Definition and Examples of Subrings, Basic theorems on Subrings.	3
6.	Right Ideals, Left Ideals and Two-Sided Ideals	3
7.	Quotient of a Ring by a two-sided ideal	3
8.	**First Midterm exam**	3
9.	Prime Ideals and Maximal Ideals.	3
10.	Homomorphism and Isomorphism Mappings of Rings.	3
11.	The First Isomorphism Theorem and some applications.	3
12	The Second Isomorphism Theorem and The Third Isomorphism Theorem.	3
13.	**Second Midterm exam**	3
14.	Factorization in Integral Domains.	3
15	Principle Ideal Domains	3
	Total	45

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Quizzes	Continuous Evaluation	10 %
2.	Assignments, report	Continuous Evaluation	10 %
3.	Midterm 1 Exam	8-9	15%
4.	Midterm 2 Exam	12-13	15%
5.	Final Exam	15-16	50%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	John B. Fraleigh, A first course in abstract algebra, 7th Edition, Reading, Mass.: Addison-Wesley Pub. Co., 2015.
Supportive References	W. Keith Nicholson, Introduction to Abstract Algebra, 4th Edition, John Wiley & Sons., 2012.
Electronic Materials	Lecturers from YouTube, prepared by Dr. Salah El Nafaey, (see the following link), https://www.youtube.com/watch?v=OzNfAQYstyE&list=PLp5QO1iui UkNtvLwjssJYyQ3WbS9S8s2V
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Classrooms
Technology equipment (Projector, smart board, software)	Data show, Blackboard
Other equipment (Depending on the nature of the specialty)	None

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students, Program Leader	Direct & Indirect

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of students assessment	Faculty, Program Leader	Direct
Quality of learning resources	Students, Faculty	Indirect
The extent to which CLOs have been achieved	Faculty	Direct & Indirect
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	Department Council
REFERENCE NO.	4
DATE	October 2023

قسم الرياضيات والإحصاء
Mathematics and Statistics Department

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TAIF UNIVERSITY