اعتماد
NCAAA

T4

2020

Course Specifications

Course Title:	**Group Theory**
Course Code:	**MATH 328**
Program:	**B.S.(Mathematics)**
Department:	**Mathematics**
College:	**Science**
Institution:	**Majmaah University**

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Table of Contents

A. Course Identification

1. Credit hours:	**4 Credit hours**

2. Course type
a.   University ☐   College ☐   **Department** ■   Others ☐
b.   **Required** ■   Elective ☐

3. Level/year at which this course is offered: **Sixth Level**

4. Pre-requisites for this course (if any): **Linear Algebra (1), MATH 242**

5. Co-requisites for this course (if any):

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom		
2	Blended	12	20%
3	E-learning	12	20%
4	Distance learning	36	60%
5	Other		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	Lecture	45
2	Laboratory/Studio	
3	Tutorial	15
4	Others (specify)	
	Total	60

B. Course Objectives and Learning Outcomes

1. Course Description:

Recognize groups and some examples of groups – Subgroups - Cyclic groups - Normal subgroup- Factor group.

Define homomorphism's - Fundamental theorems of isomorphism's- Auto morphisms - Caley theorem and its generalization - Simple groups – Permutation groups - Class equation

Proving some theorems on homomorphism's - Fundamental theorems of isomorphism's- Auto morphisms - Caley theorem and its generalization - Simple groups – Permutation groups - Class equation

Describe Group action on a set- P-groups - Cauchy theorem- Solow's theorems- **External and internal direct product of group- Burnside theorem- Dihedral- Quaternions- Groups of auto morphisms on finite and infinite cyclic groups.**

2. Course Main Objective:
Generally, Students are expected to
1- To enable the students to understand the concepts of Groups.
2- The course aims at providing the student with the proper knowledge, cognitive skills, interpersonal skills, responsibility, communication skills, use of information technology skills and self – kinetics skills.
Specially, Study of main concepts of group theory as follows:
1.   Studying the axioms of group theory and some examples of groups- Subgroups- Cyclic groups- Lagrange theorem- Normal subgroup- Factor group- homomorphism's
2.   Proving the Fundamental theorems of isomorphism's
3.   Understanding the concept of Auto morphisms Caley theorem.
4.   Studying simple groups- permutation groups- class equation - group action on a set- p-groups - Cauchy theorem- Solow's theorems - external and internal direct product of group - Burnside theorem.

3. Course Learning Outcomes

	CLOs	Aligned PLOs
1	**Knowledge and Understanding**	
1.1	**Recognize** groups and some examples of groups – Subgroups - Cyclic groups - Normal subgroup- Factor group.	K4
1.2	**Define** homeomorphisms - Fundamental theorems of isomorphism- Auto morphisms - Caley theorem and its generalization - Simple groups – Permutation groups - Class equation	K4
1.3	**Proving some theorems on** homeomorphisms - Fundamental theorems of isomorphism- Auto morphisms - Caley theorem and its generalization - Simple groups – Permutation groups - Class equation	K4
1.4	**Describe** Group action on a set- P-groups - Cauchy theorem- Solow's theorems-External and internal direct product of group- Burnside theorem- Dihedral- Quaternions- Groups of auto morphisms on finite and infinite cyclic groups.	K4
2	**Skills :**	
2.1	The students will **explain and interpret** a general knowledge of groups.	S2
2.2	Enable students to **analyses** the mathematical problems.	S2
2.3	Ability to understand and analyze the mathematical problems	S2
2...	Ability to think analytically and critically;	S2
3	**Values:**	
3.1	The student should illustrate how take up responsibility.	C2
3.2	Must be shown the ability of working independently and with groups.	C2
3.3	Students can actively and critically participate in class activities;	C2
3...		

C. Course Content

No	List of Topics	Contact Hours
1	Groups and some examples of groups – Subgroups - Cyclic groups - Normal subgroup- Factor group.	**12**

2	Homeomorphisms - Fundamental theorems of isomorphism- Auto morphisms	**8**
3	Caley theorem and its generalization - Simple groups – Permutation groups - Class equation	**12**
4	Group action on a set- P-groups - Cauchy theorem	**8**
5	Solow's theorems- External and internal direct product of group	**12**
6	Burnside theorem- Dihedral- Quaternions- Groups of auto morphisms on finite and infinite cyclic groups.	**8**
Total		60

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	**Knowledge and Understanding**		
1.1	**Recognize** groups and some examples of groups – Subgroups - Cyclic groups - Normal subgroup- Factor group.	Start each chapter by general idea and the benefit of it.	Exams Midterms Final examination.
1.2	**Define** homeomorphisms - Fundamental theorems of isomorphism- Auto morphisms - Caley theorem and its generalization - Simple groups – Permutation groups - Class equation	**Demonstrate** the course information and principles through lectures.	Home work.
1.3	**Proving some theorems on** homeomorphisms - Fundamental theorems of isomorphism- Auto morphisms - Caley theorem and its generalization - Simple groups – Permutation groups - Class equation	**Provide** main ways to deal with the exercises.	Continuous discussions with the students during the lectures.
1.4	**Describe** Group action on a set- P-groups - Cauchy theorem- Solow's theorems-External and internal direct product of group- Burnside theorem- Dihedral- Quaternions- Groups of auto morphisms on finite and infinite cyclic groups.	**Provide** main ways to deal with the exercises.	Continuous discussions with the students during the lectures.
2	**Skills :**		
2.1	The students will **explain and interpret** a general knowledge of groups.	**Encourage** the student to look for some complicated problems in the different references.	Midterm exams Quizzes.
2.2	Enable students to **analyses** the mathematical problems.	**Ask** the student to attend lectures for	Doing homework.

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
		practice solving problem.	Check the problems solution.
2.3	Ability to understand and analyze the mathematical problems	Homework assignments.	Quizzes
2.4	Ability to think analytically and critically;	Lectures	Assignments
3	**Values:**		
3.1	The student should illustrate how take up responsibility.	Ask the students to search the internet and use the library.	Quizzes of some previous lectures. Ask the absent students about last lecture.
3.2	Must be shown the ability of working independently and with groups.	Teach them how to cover missed lectures. Give students tasks of duties	Discussion during the lecture.
3.3	Students can actively and critically participate in class activities;	Encourage them how to attend lectures regularly by assigning marks for attendance.	Quizzes

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	**Written Midterm Exam 1**	**4th**	**20**
2	**Written Midterm Exam 2**	**8th**	**20**
3	**Homework + Attendance + Presentation**	**During semester**	**10**
4	**Quiz**	**13th**	**10**
5	**Final Examination**	**14th**	**40**
8	**Total**		**100**

*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 :
1- 4-office hours per week in the lecturer schedule.

2- The contact with students by e-mail and website (Black Board system).

F. Learning Resources and Facilities

1. Learning Resources

Required Textbooks	1. Marshall Hall, Jr.: The theory of groups, Amer Mathematical, 1975.
	2. J. Rose: A course in group theory, Dover Publications, Inc., 1994

Essential References Materials	1. Marshall Hall, Jr.: The theory of groups, Amer Mathematical, 1975.
Electronic Materials	http://poincare.matf.bg.ac.rs/~zarkom/Book_Shaums_Group_theory.pdf https://www.alibris.com/search/books/subject/Mathematics-Group-Theory https://artofproblemsolving.com/.../c71t29371f71h1267857s1_group_theory_book
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	• **Lecture room with speakers and internet access.** • **Classroom with capacity of 30-students.** • **Library**
Technology Resources (AV, data show, Smart Board, software, etc.)	• **Desktop or laptop with internet facility** • **Data show to facilitate going over students' papers in class**
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment	Peer Reviewer	Direct
Extent of achievement of course learning outcomes	Program Leaders	Direct
Quality of learning resources	Students	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

Council / Committee	Mathematics Department
Reference No.	27
Date	8/8/1442 H - 21/3/2021 G

Head of Department

Dr. Muqrin Almuqrin