



**Department of Mathematics**

**College of Basic Education**

**Salahaddin University-Erbil**

**Subject: Abstract Algebra**

**Course Book – Year 3**

**Lecturer's name: Dr. Sanhan M. S. Khasraw**

**Academic Year: 2021/2022**

# Course Book

<b>1. Course name</b>	Abstract Algebra
<b>2. Lecturer in charge</b>	Dr. Sanhan Muhammad Salih Khasraw
<b>3. Department/ Faculty</b>	Mathematics/Basic Education
<b>4. Contact</b>	e-mail: sanhan.khasraw@su.edu.krd Tel: (optional)
<b>5. Time (in hours) per week</b>	Theory: 3
<b>6. Office hours</b>	By appointments
<b>7. Course code</b>	
<b>8. Teacher's academic profile</b>	1. PhD in Algebra, 2015, University of Birmingham, UK. 2. M.Sc. in Algebra, 2005, Salahaddin University-Erbil 3. B.Sc. in Mathematics, 1999, Salahaddin University-Erbil.
<b>9. Keywords</b>	Sets, Vector spaces, Linear transformations.
<b>10. Course overview:</b>	<p>This course aims to introduce the basic ideas and techniques of abstract algebra for use in many other lecture courses. The course will also introduce some basic ideas of abstract algebra and techniques of proof which will be useful for future courses in pure mathematics. The main aim of the course is</p> <ol style="list-style-type: none"> <li>1. To introduce the concept of groups, subgroups, congruence classes, group of integers modulo <math>n</math> and symmetric group on <math>n</math> symbols.</li> <li>2. To introduce the concept of group homomorphisms,</li> <li>3. To introduce the concept of rings, subrings and ring homomorphisms.</li> <li>4. To introduce the concept of integral domains and fields.</li> </ol>
<b>11. Course objective:</b>	<p>Students will be able to apply the concepts and methods described in the syllabus, they will be able to solve problems using linear algebra, they will know a number of applications of linear algebra, and they will be able to follow complex logical arguments and develop modest logical arguments. The text and class discussion will introduce the concepts, methods, applications, and logical arguments; students will practice them and solve problems on daily assignments, and they will be tested on quizzes, midterms, and the final.</p>
<b>12. Student's obligation</b>	<ol style="list-style-type: none"> <li>1. Students have an obligation to arrive on time and remain in the classroom for the duration of scheduled classes and activities.</li> <li>2. Students have an obligation to write, homeworks, tests and final examinations at the times scheduled by the teacher or the College. Students have an obligation to inform themselves of, and respect, College examination procedures.</li> <li>3. Students have an obligation to show respectful behaviour and appropriate classroom</li> </ol>

deportment. Should a student be disruptive and/or disrespectful, the teacher has the right to exclude the disruptive student from learning activities (classes) and may refer the case to the Director of Student Services under the Student Code of Conduct.

4. Electronic/communication devices (including cell phones, mp3 players, etc.) have the effect of disturbing the teacher and other students. All these devices must be turned off and put away. Students who do not observe these rules will be asked to leave the classroom

### 13. Forms of teaching

Different forms of teaching will be used to reach the objectives of these courses to the students: power point presentation for the course outline, head titles, definition, discussion and conclusions. Also, we shall use the blackboard for solving and explaining the examples.

### 14. Assessment scheme

The assessment is divided up as follows:

1. 30% from two 2-hour class tests during the year;
2. 10% from example classes.

### 15. Student learning outcome:

After completing Abstract Algebra, the student should be able to:

1. To develop understanding of algebraic structures as abstractions of more familiar number system
2. To acquire ability to work with concepts of group.
3. To develop the deeper understanding of algebra needed to teach high school algebra.
4. To develop awareness and appreciation of formal axiomatic systems and their applications.

### 16. Course Reading List and References:

1. An introduction to modern abstract algebra, David M. Burton(1967)
2. A First Course in Abstract Algebra, Fraleigh, 1982.
3. Abstract Algebra, Dummit and Foote, 2004.

### 17. The Topics:

### Lecturer's name

Week 1: General review on set theory, calculus, linear algebra,  
mathematical system and semigroups.

Week 2: Groups and abelian groups.

Week 3: Integral powers and some notes about nonabelian groups.

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<p>Week 4: The group of integers modulo <math>n</math>.</p> <p>Week 5: Congruences class modulo <math>n</math> and the group <math>(\mathbb{Z}_n, +_n)</math>.</p> <p>Week 6: The symmetric groups.</p> <p>Week 7: Exam.</p> <p>Week 8: Subgroups.</p> <p>Week 9: Cyclic groups, order of the group, order of an element and the product of subgroups.</p> <p>Week 10: Cosets, index of a subgroups and Lagrange theorem .</p> <p>Week 11: Normal subgroups and quotient groups.</p> <p>Week 12: Commutator subgroups.</p> <p>Week 13: Exam.</p> <p>Week 14: Homomorphisms, kernel and isomorphic groups.</p> <p>Week15: Exam.</p>	
<p><b>18. Practical Topics (If there is any)</b></p>	
<p>The practical of all topics in part-17 will be given during the academic year.</p>	<p>Dr. Sanhan</p>
<p><b>19. Examinations:</b></p> <p><b>1. <i>Compositional:</i></b> In this type of exam the questions usually starts with Explain how, What are the reasons for...?, Why...?, How....? With their typical answers Examples should be provided</p> <p><b>2. <i>True or false type of exams:</i></b></p> <p>In this type of exam a short sentence about a specific subject will be provided, and then students will comment on the trueness or falseness of this particular sentence. Examples should be provided</p> <p><b>3. <i>Multiple choices:</i></b> In this type of exam there will be a number of phrases next or below a statement, students will match the correct phrase. Examples should be provided.</p> <p><b>Will do</b></p>	

**20. Extra notes:**

N/A

**21. Peer review**

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