

Ministry of Higher Education and Scientific research



Department of Mathematic

College of Education

Salahhadin University

Subject: Foundations of Mathematics

First stage- Second Semester

Lecturer's name: Hogir Mohammed Yaseen

Academic Year: 2023/2024

## Course Book

1. Course name	Foundation of Mathematics
2. Lecturer in charge	Hogir Mohammed Yaseen
3. Department/ College	Mathematic: Education
4. Contact	e-mail: <a href="mailto:hogr.yaseen@su.edu.krd">hogr.yaseen@su.edu.krd</a> Tel: (optional)07504154982
5. Time (in hours) per week	For example Theory: 5 Hours per a Week
6. Office hours	Saterdag 10-12:30, 8-12 Sunday 10-12 Monday and 12-2 Wednesday
7. Course code	EdM0106
8. Teacher's academic profile	1. B.Sc. in Mathematics, 2007, Salahaddin University-Erbil 2. M.Sc. in Algebra, 2010, University of Salahaddin , UK. PhD, in representation of Lie algebras, University of Leicester 2018
9. Keywords	Logic, set , relation, Function, construction of Numbers, Group ,ring , Field.

## 10. Course program:

### Second semester

Week 1-2: Chapter Four: Functions

- Function, Domain, Codomain, Range,
- injective(one-to-one), Surjective(onto), Bijective
- Type of functions(Inclusion function, Characteristic function, Polynomial function, ...), Composition of functions, Inverse of functions

Week 3-6: Chapter Five: Cardinality, Equivalent sets, Finite sets

- Infinite sets, denumerable sets, countable sets, cantor sets, uncountable sets

Week 7: Review and exam

Week 8-14: Chapter Six: Construction of Numbers and proving some properties of them ( Natural numbers ( $\mathbb{N}$ ), The Integers( $\mathbb{Z}$ ), The Rational Numbers ( $\mathbb{Q}$ ), Irrational Numbers( $\mathbb{Q}^c$ ), Real Numbers and Complex Numbers).

Week 15 Chapter 7 even: Group + Ring + Field

## 11. Course objective:

**Foundations of mathematics** is the study of the basic mathematical concepts (Mathematical logic, set theory, Relation, function, Construction of numbers(Natural Numbers, Integers,Rational Numbers, Irrational Numbers, Real Number, Complex Number), Group, Ring, Field, Cardinality) and how they form hierarchies of more complex structures and concepts, especially the fundamentally important structures that form the language of mathematics.

In the second semester, first we study functions and their properties and, we use them to construction of numbers. In chapter four we study functions and their types and properties and some operations like composition on them. In chapter five we study Cardinality and Equivalent of sets. Moreover we study finite sets infinite sets, denumerable sets, countable sets, cantor sets, uncountable sets.

In chapter six we study constructing of numbers. Firstly, we start by historical background of numbers after that we explain the numbers by axioms step by step until students learn what is numbers(natural numbers, integers, rational numbers, irrational numbers, real numbers, complex numbers) and how to constructed them. Additionally, we prove some properties of them.

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Concerning the final chapter,, we define some operations on the numbers and also there are some new axioms(group, ring ,field) on the above sets.

### Course Requirement:

1. Students have an obligation to arrive on time and remain in the classroom for the duration of scheduled classes and activities.
2. Students have an obligation to write, homework's, 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.
3. Students have an obligation to show respectful behaviour with teacher and their class mates
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.

**Assessment scheme:** The assessment is divided up as follows:

- 1- Participation and Seminars 4 Marks +Quiz 4 marks+ Discussion lecture 7 marks
- 2- Midterm test = 25 Marks
- 3- Final Examination 60 Marks.

### 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.

### Course Reading List and References:

- [1] H Behnke, F Bachmann, and Fladt. Fundamentals of mathematics, 1974.
- [2] Alan G Hamilton. Numbers, sets and axioms: the apparatus of mathematics. Cambridge University Press, 1982.
- [3] Elliott Mendelson. Number systems and the foundations of analysis. Technical report, 1973.
- [4] Ian Stewart and David Tall. The foundations of mathematics. OUP Oxford, 2015.
- [5] Raymond L Wilder et al. Introduction to the Foundations of Mathematics. Courier Corporation, 2012
- [6] اساس الرياضيات جزء الاول والثاني