Mohamed Khider University (MKUB)

Lesson's Plan: Algebra 1

HIND Bouredji

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Content

1. General Information

Faculty: Exact sciences natural and life sciences

Department: Informatics

Title of the Module: Algebra 1

Time devoted: 1 semester

Teaching unit: Fundamental

Target audience: First year License (1L) informatics

Coefficient: 03

Credits: 05

Time per week: 01:30 hours lessons and 01:30 hours TD

Teacher of lessons: ABDELMADJIJ Abba

Contact: hind.bouredji@univ-biskra.dz

Availability: In the laboratory and by email, I undertake to respond by email within 48 hours of receiving the message.

2. The Presentation of the Lesson

Algebra is a fundamental branch of mathematics that explores the relationships and patterns between numbers, quantities, and mathematical operations. It serves as a powerful tool for describing, analyzing, and solving problems in diverse fields ranging from science and engineering to economics and computer science. **Algebra 1**, also sometimes called First Year Algebra, is the foundation for many areas of math. It introduces you to essential concepts and tools that you'll use throughout your math studies.

Building Blocks:

Logic and Sets: This covers basic logical reasoning and how to represent collections of objects using sets.

Numbers: You'll revisit different number systems like integers, rational numbers, real numbers, and sometimes even complex numbers.

Algebraic Operations:

Expressions and Equations: Algebra 1 dives deep into working with mathematical expressions, which can include variables, numbers, and operations like addition, subtraction, multiplication, and division. You'll learn how to solve equations, which are essentially statements where two expressions are equal.

Functions and Relations:

Introduction to Functions: Functions are a central concept in math. They describe how one value (the input) affects another value (the output). Algebra 1 introduces basic function notation and how to analyze functions.

Additional Topics:

Polynomials: These are expressions that combine numbers and variables using addition, subtraction, and multiplication. You'll learn how to simplify polynomials, perform operations on them, and factor them.

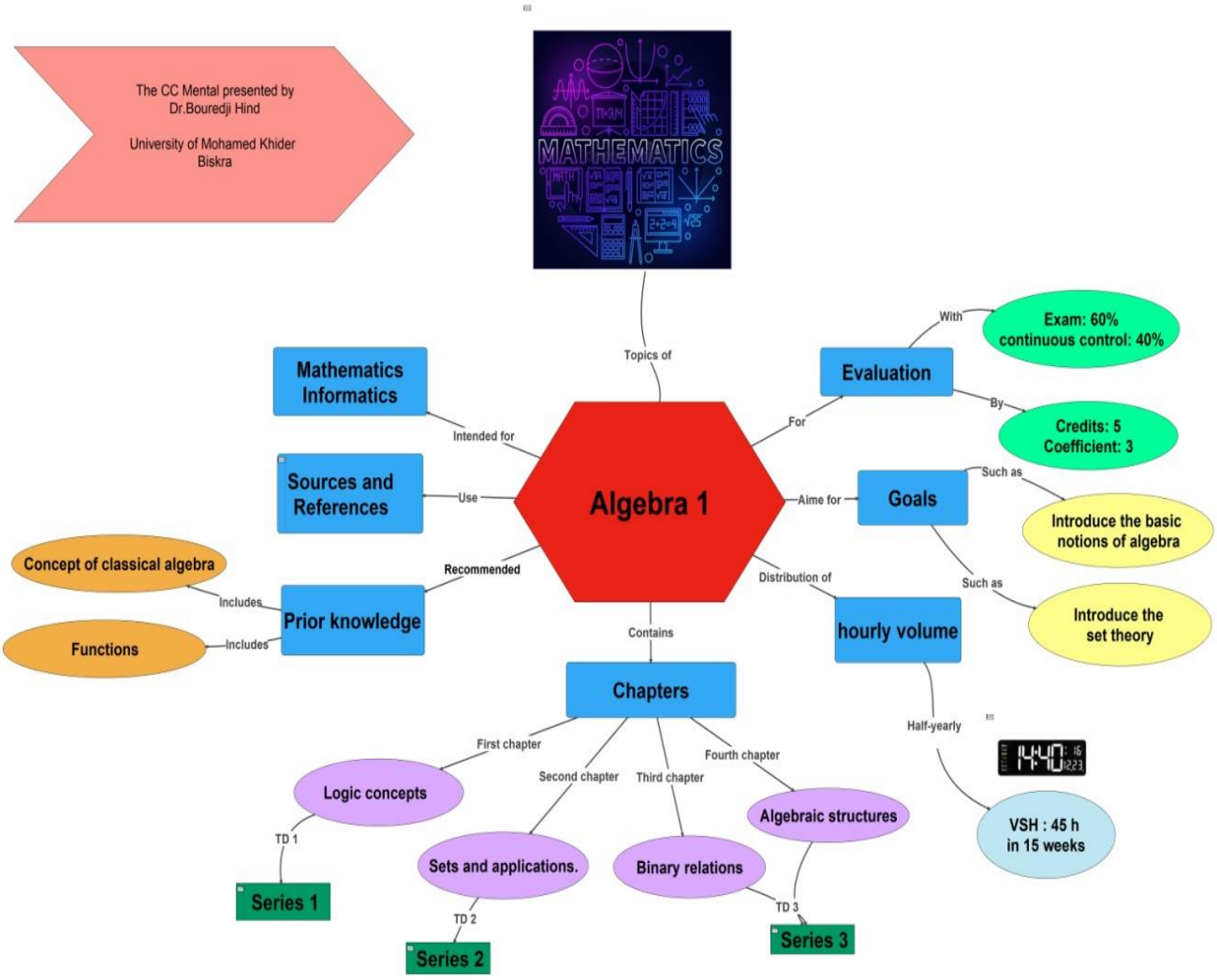
The main interest is guiding students to think analytically, solve problems logically, and make connections between mathematical concepts and the world around you.

3. Content of the Lesson

The lesson deals with different points which are related to each other and organized in chronological order. Each point is clarified with series of exercises to reinforce and simplify understanding. Here, an outline is put:

1. **Chapter one**: Logic concepts
    - Truth table, quantifiers, types of reasoning.
2. **Chapter two**: Sets and Applications
    - Definitions and examples.
    - Applications: Injections, surjection, bijection, direct image, reciprocal image, restriction and extension.
3. **Chapter three**: Binary relations on a set
    - Basic definitions: reflexive, symmetric, anti-symmetric, transitive relation.
    - Order relation-Definition. Total and partial order.
    - Equivalence relation: equivalence class.
4. **Chapter four**: Algebraic structures
    - Law of internal composition. Stable part. Properties of an internal composition law.
    - Groups: Definitions. Subgroups: Examples-Homomorphism of groups-isomorphism of groups. Examples of finite groups Z/nZ (n= 1, 2, 3,…) and the permutation group.
    - Rings: Definition- Under rings. Calculation rules in a ring. Invertible elements, divisors of zero-Homomorphism of ideal rings.
    - Fields: Definitions.
5. **Chapter five**: Rings of polynomials
    - Polynomial. Degree.
    - Construction of the ring of polynomials.
    - Arithmetic of polynomials: Divisibility, Euclidean division, Gcd and ppcm of two polynomials-Polynomials prime to each other, Decomposition into product of irreducible factors.
    - Roots of a polynomial: Roots and degree, Multiplicity of roots.

The following figure details the content of this course:



4. Pre-requisite

In order for the lesson to be understood, the student must have the following knowledge:

- Understanding of numbers, ratios, proportions, the order of operations, equality...
- You must have mathematics skills at the level of the last year of secondary before starting the module.
- You must know the functions (definition field, derivative...)

5. Objectives

The aim of this lesson typically revolves around developing the fundamental understanding and skills needed to work with mathematical expressions, equations, and functions. Here are some objectives commonly associated with algebra lessons:

- Define the main operators, the quantifiers, and their properties: not, and, or.
- Discover to reasoning by the direct proof, contra-positive proof, proof by contradiction, and proof by induction.
- Apply all these notions to the mathematical demonstration.
- Identify the uses of sets, applications.
- Define set notations and operations such as union, intersection, and complement.
- Explore fundamental types of application.

6. The Evaluation

The final evaluation is done through:

I. **A final table exam** which covers everything you have seen in this course during the semester, during this exam, which counts for 60% of the final grade.

II. **Continuous and regular evaluation** at the rate of the remaining 40%, it allows you to earn points throughout the semester, this continuous evaluation is carried out in different forms, it is:

- From the average of the marks of the written questions.
- Grades obtained for individual and collective projects
- From the average of the TD control score.

The final mark is calculated by the formula:

$$\text{Mark}=60\%(\text{ Final exam})+40\%(\text{Continuous evaluation})$$

Remark: The final mark which will ensure success of this course must be greater than or equal to 10.

7. Activities

In order to help you fully understand the different concepts of this course, we offer a certain number of activities.

- Students must attend the sessions and take notes about the information discussed. Students have the right to ask questions, discuss, and exchange information and points of and view. A set of activities are given to clarify and reinforce understanding.

- During the session everyone is invited to participate in the debates, which are generally initiated by your questions, with the aim of developing an exchange of ideas between you.

- Tutorials are scheduled at the end of each chapter so that you can consolidate and deepen your understanding of the current learning.

- Commitment to the standards of university and academic behavior and not engaging in any behavior that is inconsistent with religion, morals, traditions, customs, regulations and university laws.

- Review lessons in order to raise your level of academic achievement.

- Strengthening the relationship with professors directly through attendance, dialogue, and discussion, or through a forum or e-mail, to benefit from the professors' experiences and expertise in life, as well as to benefit from the professors' wealth of knowledge, which is something you cannot find in books and publications.

8. pedagogical Approach

Competence and performance are the two main pillars of this approach. In the sense that competence has to do with the knowledge needed for writing a good assignment. Performance has to do with application of what is learned in different essays. The teacher plays a major role in bridging the gap between competence and performance.

9. Operating methods

The course is organized in:

- Theoretical session to provide you with all the knowledge (basic definitions and the different types of actuators).
- Tutorial session (TD) at the end of each learning unit to help you mobilize the knowledge acquired.

10. References

O'leary, Michael L. A first course in mathematical logic and set theory. John Wiley & Sons, 2015.

J. Franchini et J. C. Jacquens, Algèbre : cours, exercices corrigés, travaux dirigés, Ellipses, Paris, 1996.

C. Degrave et D. Degrave, Algèbre 1ère année : cours, méthodes, exercices résolus, Bréal, 2003.

M. Mignotte et J. Nervi, Algèbre : licences sciences 1ère année, Ellipses, Paris, 2004