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Ministry of Science and Higher Education - Ethiopia



COMMON COURSES FOR ETHIOPIAN HLIS

Draft Mathematics Common Course Syllabus for First Year Social Science Students

Prepared by:

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MATH FOR SOCIAL SCIENCES

(Math 101)

Course title: Freshman mathematics for Social Sciences

Credit hours: 4 (ECTS 7) **Tutorial hrs:2**

Course Descriptive

The course intends to prepare social science students in the basic concepts and materials from mathematics that necessitate a good foundation to treat basic mathematical models in social science. This course rigorously discusses the basic concepts of logic and set theory, the real and complex number systems, mathematical induction, least upper bound and greatest lower bound, functions and types of functions, polynomial and rational functions, logarithmic and exponential functions, trigonometric functions, hyperbolic functions and their graphs and analytic geometry.

Course objectives

Upon completion of the course, successful students will be able to:

- ✓ understand propositional logic and set theory,
- ✓ understand the fundamental properties of real numbers,
- ✓ understand relations and functions and their properties,
- ✓ solve equations and inequalities
- ✓ understand the notion of matrices and determinant.
- ✓ use matrices and determinant to solve system of linear equations,
- ✓ solve system of linear inequalities,
- ✓ evaluate limits of elementary functions,
- ✓ understand the notion continuity of functions,
- ✓ evaluate derivatives of elementary functions,
- ✓ apply derivatives to solve problems,
- ✓ evaluate integrals of elementary functions,
- ✓ apply integrals to solve problems,
- ✓ solve application problems using differentiations and integrations.
- ✓ solve financial problems using mathematics of finance,

- ✓ understand some notions of elementary statistics: mean, mode, median, variance and standard deviation

Chapter 1: Logic and set theory (10 lecture hours)

1.1. logic

1.1.1. Definition and examples of proposition

1.1.2. Logical connectives

1.1.3. Compound (or complex) propositions

1.1.4. Tautology and contradiction

1.1.5. Open proposition and quantifiers

1.2. Set theory.

1.2.1 The concept of a set

1.2.2. Description of sets

1.2.3. Set operations and vena diagrams.

Chapter 2: The real number system (8 lecture hours)

2.1 The real number system

2.1.1. The natural numbers, Principle of mathematical induction and the Well ordering principle

2.1.2. The integers, rational numbers and irrational numbers

2.1.3. Upper bound and lower bound: least upper bound and greatest lower bound;

2.2. Solving equation and inequalities; Linear and quadratic equation.

Chapter 3: Functions (10 lecture hours)

3.1. Review of relations and functions

3.2. Real-valued functions and their properties

3.3. Types of functions (one-to-one, onto) and inverse of a function

3.4. Polynomials, zero's of polynomials, rational functions, and their graphs

3.5. Definitions and basic properties of logarithmic, exponential, hyperbolic, trigonometric functions, and their graphs.

Chapter 4: Matrices and determinant (14 lecture hours)

4.1.Definition of a matrix

4.2. Algebra of matrices

4.3.Types of matrices: square, identity, scalar, diagonal, triangular, symmetric, and skew symmetric matrices

4.4. Elementary row and column operations

4.5. Row reduced echelon form of a matrix

4.6. Rank of a matrix using elementary row/column operations

4.7. System of linear equations

4.8. Definition of a determinant

4.9. Properties of determents

4.10. Ad joint and inverse of a matrix

4.11.Cramer's rule for solving system of linear equations (homogenous and non homogenous)

Chapter 5. Introduction calculus (14 lecture hours)

5.1. Limits and continuity

5.2. Derivatives

5.3. Applications of derivatives

5.4. Integrals and their applications

Chapter 6: Introduction to business and consumers (8 lecture hours)

6.1. Application of purchasing

6.2. Percent increase and percent decrease

6.3. percent profit and loss

6.4. Merchandising: markup, based on cost and selling price

Teaching –learning methods

Four contact hours of lectures and two hours of tutorials per week.

Assessment methods

- Assignments / quizzes / 20%

- Tests 40%
- Final examination 40%

Redding and text books: -

- Alemayehu Haile and Yismaw Alemu, Mathematics an introductory course, Department of mathematics, AAU
- Demissu Gemeda, **An Introduction to Linear Algebra**, Department of Mathematics, AAU, 2000
- Yismaw Alemu, Mathematics for Social Sciences