**AEN 1101 MATHEMATICS**

**Lecturers** Mr. Allan Komakech (B.Sc. Agric. Eng, M.Sc. Agric. Eng)

 Mrs. Julia Kigozi (B.Sc. Agric. Eng.; M.Sc. Agric. Eng)

**Course Type**: **CORE (B.Sc. Agric. I, B.Sc. FST I, B.Sc. LUM I, B.Sc. Hort. I, B.AGM I)**

**1. COURSE DESCRIPTION**

**Course Credits (CU)**: **2 CU i.e. 30 Contact Hours per semester**

**Course Duration**: **15 weeks (30 hours) i.e. 15 LH, 30 TH**

**COURSE DESCRIPTION**

Introduction, Arithmetic, Introduction to Algebra, Graphs and functions, Linear equations, Quadratic equations, Financial mathematics, Introduction to Calculus, Partial differentiation, Further topics in Calculus, Matrix Algebra ).

**2. COURSE OBJECTIVES**

Upon successful completion of this course, students will

1. Demonstrate numerical skills needed for basic economic calculations.
2. Demonstrate ability to use algebraic techniques essential for elementary mathematics.
3. Apply a variety of mathematical techniques to solve problems and make decisions.

**3. RECOMMENDED REFERENCES FOR READING**

1. K.A. Stroud, 2001, *Engineering mathematics*, 5th Edition, Macmillan publishers.

2. L. Bostock & S. Chandler, 2000, *Mathematics-The Core Course for A level*, 3rd Edition, Nelson Thornes Publishers.

3. J.K Backhouse, 1993, *Pure mathematics,* P.J.K publishers

**4. COURSE CONTENT, METHODS OF INSTRUCTION, TOOLS AND EQUIPMENT REQUIRED**

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| **TOPIC** | **CONTENT** | **METHOD OF INSTRUCTION / Time allocated** | **TOOLS / EQUIPMENT NEEDED** |
| 1. **LECTURE 1 INTRODUCTION**  | * Why study mathematics
* Calculators and computers
* Tips on excelling in mathematics
 | Interactive lectures (2 hrs) | Chalk / BB or Markers / Flip charts |
| 2. **LECTURE 2 ARITHMETIC** | * Revision of basic concepts
* Multiple operations
* Brackets, Fractions, Elasticity of demand, Decimals, Negative numbers, Powers, Roots and fractional powers, Logarithms.
* Solving problems
 | Interactive lectures (1 hrs)Tutorials (2 hrs) | Chalk / BB or Markers / Flip charts |
| 3. **LECTURE 3: INTRODUCTION TO ALGEBRA** | * Representation
* Evaluation
* Simplification: Addition and Subtraction
* Simplification: Multiplication
* Simplification: Factorizing
* Simplification: Division
* Simplification: Solving simple equations
* Solving problems
 | Interactive lectures (1 hrs)Tutorials (2 hrs) | Chalk / BB or Markers / Flip charts |
| 4. **LECTURE 4: GRAPHS AND FUNCTIONS** | * Functions
* Inverse functions
* Graphs of linear functions
* Fitting linear functions
* Slope
* Non-linear functions
* Composite functions
* Using Excel to plot functions
* Functions with two independent variables
* Solving problems
 | Interactive lectures (1 hrs)Tutorials (2 hrs) | Chalk / BB or Markers / Flip charts |
| 5. LECTURE 5: LINEAR EQUATIONS | * Simultaneous linear equation systems
* Graphical solutions
* Equating to the same variable
* Substitution method
* Row operation (Elimination) method
* More than two unknowns
* Solving problems
 | Interactive lectures (1 hrs)Tutorials (2 hrs) | Chalk / BB or Markers / Flip charts |
| 6. **LECTURE 6: QUADRATIC EQUATIONS** | * Solving quadratic equations
* Graphical solution
* Factorization
* The quadratic formula
* Quadratic simultaneous equations
* Polynomials
* Solving problems
 | Interactive lectures (1 hrs)Tutorials (2 hrs) | Chalk / BB or Markers / Flip charts |
| 7. **LECTURE 7: FINANCIAL MATHEMATICS I** | * Discrete and continuous growth
* Interest
* Part year investment and the annual equivalent rate
* Time periods, initial amounts and interest rates
* Investment appraisal: net present value
* Solving problems
 | Interactive lectures (1 hrs)Tutorials (2 hrs) | Chalk / BB or Markers / Flip charts |
| 8. **LECTURE 8: FINANCIAL MATHEMATICS II** | * The internal rate of return
* Geometric series and annuities
* Perpetual annuities
* Loan repayments
* Solving problems
 | Interactive lectures (1 hrs)Tutorials (2 hrs) | Chalk / BB or Markers / Flip charts |
| 9. **LECTURE 9: INTRODUCTION TO CALCULUS**  | * The differential calculus
* Rules for differentiation
* Partial differentiation
* Solving problems
 | Interactive lectures (1 hrs)Tutorials (2 hrs) | Chalk / BB or Markers / Flip charts |
| 10. **LECTURE 10: APPLICATION OF CALCULUS** | * Marginal revenue and total revenue
* Marginal cost and total cost
* Profit maximization
* Solving problems
 | Interactive lectures (1 hrs)Tutorials (2 hrs) | Chalk / BB or Markers / Flip charts |
| 11. **LECTURE 11: FURTHER CALCULUS** | * Overview
* The chain rule
* The product rule
* The quotient rule
* Integration
* Definite integrals
* Solving problems
 | Interactive lectures (2 hrs)Tutorials (4 hrs) | Chalk / BB or Markers / Flip charts |
| 12. **LECTURE 12: MATRIX ALGEBRA I** | * Introduction to matrices and vectors
* Basic principles of matrix multiplication
* Matrix multiplication – the general case
* The matrix inverse and the solution of simultaneous equations
* Solving problems
 | Interactive lectures (1 hrs)Tutorials (2 hrs) | Chalk / BB or Markers / Flip charts |
| 13. **LECTURE 13: MATRIX ALGEBRA II** | * Determinants
* Minors, cofactors and the Laplace expansion
* The transpose matrix, the cofactor matrix, the adjoint and the matrix inverse formula
* Application of the matrix inverse to the solution of linear simultaneous equations
* Cramer’s rule
* Solving problems
 | Interactive lectures (1 hrs)Tutorials (2 hrs) | Chalk / BB or Markers / Flip charts |
|  | * Evaluation
 | Tests (2 hrs) |  |

**5. SUMMARY OF TIME NEEDED**

Interactive lectures covering theory 15 hrs

Class-based Tutorials 28 hrs

Evaluation 02 hrs

**6. OVERALL COURSE EVALUATION**

Continuous Assessment Test I 15%

Continuous Assessment Test II 15%

Assignments 10%

Final examination 60%