

1

2

**Course information**

Title: Algebra I

Code: MAT 115

Credits: 3 Hours

Entry requirements : SSSCE Elective Mathematics

**Instructor(s) information**

Name: Dr. P. O. Cofie

Position: Senior Lecturer

Office and office hours: HOD's Office, MWF 9:00 – 11:00 AM.

Tel: 233-27539-5151/ 233-244711380

Fax:

Email: [pocofie@yahoo.com](mailto:pocofie@yahoo.com)

**Introduction:**

This Course is intended to give the necessary foundation to students for further studies in mathematics. To be prepared for further studies in mathematics students need not only technical skill but also a clear understanding of concepts. A student also needs an appreciation that mathematics contains great ideas that can be used to model real-world situations. MAT 115 presents many opportunities for students to discover this practical power of mathematics.

**Subject content:**

Operations on sets- union and intersection, De Morgan's laws and other properties. The real number system and properties of the operations on them. Linear equations and inequalities in one and two variables (application to Linear Programming). Quadratic equations. Sum and products of roots of quadratic equations. Quadratic inequalities. Arithmetic of complex numbers. Polynomials and rational functions. Indices and logarithms.

**Connection with other courses:**

This Course serves as pre-requisite to the following courses: MAT 125: Introductory Calculus, MAT 127: Discrete mathematics, MAT 235: Intermediate Calculus, and MAT 236: Probability.

**Learning objectives:**

By the end of the course students will be able to:

- (i) Perform basic set operations.
- (ii) Distinguish between all the properties of real numbers.
- (iii) Solve linear, quadratic, and other polynomial equations.
- (iv) Solve rational equations, equations containing radicals and absolute value equations.
- (v) Represent the equations in (iii) and (iv) graphically.
- (vi) Solve inequalities in one and two variables.
- (vii) Solve problems involving indicial and logarithmic equations.
- (viii) Explain and work problems on complex numbers.

**Literature**

Compulsory study texts:

1. Stewart, J. , Redlin L. and Watson S. (2002); Precalculus Mathematics for Calculus 4<sup>th</sup> Ed. Brooks/Cole- Thompson Learning, Pacific Grove, CA, U.S.A.
2. Morash R. P. (1987). A Bridge to Abstract Abstract Mathematics; Random House Inc., New York.
3. Bick T. A. (1997). Introduction to Abstract Mathematics; Acadmic Press.
4. Fraleigh, J. B. (1989). A First Course in Abstract Algebra.

**Materials:**

- (i) Scientific or graphic calculator
- (ii) Computers
- (iii) Exercise books/graph books
- (iv) Mathematical sets

**Course schedule**

<b>Week</b>	<b>Content topics</b>	<b>Learning activities</b>	<b>Pre – Lesson Preparation</b>
1.	Commutative, associative and distributive properties of union and intersection of sets. De Morgan's laws. Cartesian product of sets.	Students in small groups work to establish these properties.	Students should review sets and their properties and write some examples of sets. See pages 8-10 of reference textbook 1
2.	Construction of the real number system;	In groups students	Intensive reading activity for Students to

	Properties of addition and multiplication on the set of real numbers. Relation of order in the system of real numbers.	will discuss and verify the closure property.	find out what the real number system is. Section 1.1, page 3-5 and study examples 1 and 2.
3.	Linear equations in one and two variables.	With the guide of the instructor, students solve and graph linear equations in one and two variables.	Hands-on on using a graphing calculator or computer to solve

Week			
4.	Linear Inequalities in one and two variables. Solving absolute value inequalities.	In groups students will discuss how distances can be used to solve absolute value inequalities.	In particular, students will discuss what $ x-1 $ and $ x-3 $ represent and use that interpretation to solve the inequality $ x-1  <  x-3 $ geometrically. Students will further discuss what the general solution of the inequality $ x-a  <  x-b $ is, if $a < b$ .
5.	Applications of linear inequalities in linear programming		
6.	Graphical representation of quadratic functions. Solving quadratic equations by Factorization method. Types of roots of a quadratic equations.	In small groups, students will discuss when a graph represents a function. Use of graphic calculators and computers to sketch graphs of given functions	Hands-on on using a graphing calculator or computer to solve problems on quadratics
7	Solving quadratic equations by Method of completing the square Sum and products of roots	With the guide of the instructor, students establish the method of completing the square.	Students to review expansion of binomial expression and the notion of a perfect square.
8	Arithmetic operations on Complex numbers	Students to find the sum, difference, product and quotient of	Read section 3.4 of reference textbook I and study examples 1, 2 and 3

		complex numbers	
9	Polynomials, addition and subtraction of polynomials, division of polynomials,	Students to find the sum, difference, product and quotient of polynomials	Do exercise 2.9 # 69, a, b, c, and d. Read section 3.1 of reference textbook I and study examples 1 and 2.
10	The Remainder and the Factor Theorem.	Discuss the synthetic division, the remainder and the factor theorems and compare with the division algorithm.	Work through examples 1 and 2 of page 273.
11	Rational Algebraic Functions	Students to use their calculators to explore $f(x) = \frac{1}{x}$ and identify various asymptotes and sketch graphs of given rational functions. Students to simplify rational expressions.	Students to establish the following possibilities: $\frac{1}{\text{BIG NUMBER}} = \text{small number}$ $\frac{1}{\text{small number}} = \text{BIG NUMBER}$ See section 3.6 of page 308. Example 8 and 9 of page 41
12	Indices and indicial equations.	Solve $2^x = 7$ and establish the guidelines for solving exponential equations.	Study section 4.1 and 4.4 of the reference textbook and work through example 4 on page 338 and examples 1 and 2 on page 365.
13	Logarithms functions and solutions to logarithmic equations	In groups, students will discuss whether the equation given in question 62 on page 363 of reference textbook 1 are	Study section 4.1 and 4.4 of the reference textbook Work through example 7 on page 354 and do exercise 4.2 # 78 and example 6 on page 368.

		identities.	
--	--	-------------	--

## **Assignments**

Assignment 1: Exercise 1.1 # 23 – 28 from PRECALCULUS textbook, Exercise 1.2 # 2 from the textbook

Entitled BRIDGE TO ABSTRACT MATHEMATICS.

Assignment 2: Exercise 1.1 # 1 – 12 from PRECALCULUS textbook.

Assignment 3: Exercise 1.6 # 1 – 3, 9-12..

Assignment 4: Exercise 1.7 # 25, 26, 31,32, 47, 48, 58, 60, 69, 73 and 88 from the PRECALCULUS textbook.

Assignment 5:

Assignment 6: Exercise 2.6 # 13, 14, 17, 19, 21, 40 and 42 from the PRECALCULUS textbook.

Assignment 7:

Assignment 8: Exercise 3.4 # 1, 3, 5, 7, 9, 11, 15, 53 and 55 from the PRECALCULUS textbook.

Assignment 9: Exercise 3.2 # 1, 3, 5, 11, 13, 15, 25 and 27 from the PRECALCULUS textbook.

Assignment 10 Exercise 3.2 # 31-33, 39-41 from the PRECALCULUS textbook.

Assignment 11: Exercise 1.4 # 3, 59 and 63; Exercise 3.6 # 1, 3, 7, 8, 9, 11, 25, and 69 from the

PRECALCULUS textbook.

Assignment 12: Exercise 1.2 # 34 and 38, Exercise 4.2 # 14 and 20, Exercise 4.3 # 22,26,46,48,

from the PRECALCULUS textbook.

Assignment 13: Exercise 4.3 # 3, 4, 15 and 39; Exercise 4.4 # 1, 17 and 20; Exercise 4.5 # 1

from the PRECALCULUS textbook.

## **Mode of Assessment**

There will be three class tests and a comprehensive final examination. The dates for the class tests are as follows:

Test 1 - 26<sup>th</sup> September, 2007

Test 2 - 2<sup>nd</sup> November, 2007

Test 3 - 7<sup>th</sup> December, 2007

Final Exam - Yet to be determined

**Grading policies:** Assignment - 10%

Class contribution and Attendance - 5%

Class tests - 25%

Final exam - 60%

Assessment rules:

### **Course policies**

Attendance: Students are expected to attend all lectures and also be in class on time.

Code of conduct: Students are expected to behave well in class. All cell phones must be turned off before the

start of every lecture.

Cheating/Plagiarism: