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Course Manual Template-Mat 101 (UCC)

Course information

Title: Algebra and Trigonometry

Code: MAT 101

Credits: 3 Hours

Entry requirements : SSSCE Elective Mathematics

Instructor(s) information

Name: Mr. E. Yankson/ Mr. D.D. Agyei

Position: Lecturer

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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 101 presents many opportunities for students to discover this practical power of mathematics.

Subject content:

Commutative, associative and distributive properties of union and intersection of sets. De Morgan's laws. Cartesian product of sets. The real number system; natural numbers, integers, rational and irrational numbers. Properties of addition and multiplication on the set of real numbers. Relation of order in the system of real numbers. Linear, quadratic and other polynomial functions, rational algebraic functions, absolute value functions, functions containing radicals and their graphical representation. Inequalities in one and two variables. Application to linear programming. Indices and logarithms, their laws and applications. Binomial Theorem for integral and rational indices and their application. Linear and exponential series. Operations on matrices up to 3×3 . Inverse of a matrix. Determinants and their use in solving systems of linear equations.

Circular functions of angles of any magnitude and their graphs. Trigonometric formula including multiple angles, half angles and identities. Solution to trigonometric equations.

Connection with other courses:

This Course serves as pre-requisite to the following courses: MAT 102: Analytic Geometry and Calculus, MAT 201: Introduction to Abstract Algebra, MAT 202: Vector Algebra and

Differential Equations and MAT 203: Further Calculus. The knowledge acquired in this course is also applicable to some level 200 Economics and Physics Courses.

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 logarithmic equations.
- (viii) Perform operations on matrices.
- (ix) Find inverse and determinant of matrices.
- (x) Use the knowledge of determinants to solve systems of linear equations.
- (xi) Sketch the graphs of circular functions.
- (xii) Solve trigonometric equations.

Literature and materials

Compulsory study texts:

1. Stewart, J. , Redlin L. and Watson S. (2002); Precalculus Mathematics for Calculus 4th 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; Academic Press.
4. Fraleigh, J. B. (1989). A First Course in Abstract Algebra.

Type of course

Lecture

Course schedule

Week	Content topics	Learning activities	Pre – Lesson Preparation
<p>1. Chapter one of the textbook entitled BRIDGE TO ABSTRACT MATHEMATICS</p>	<p>Commutative, associative and distributive properties of union and intersection of sets. De Morgan's laws. Cartesian product of sets.</p>	<p>Listen to lectures and do some in-class problems.</p>	<p>Students should find out what a set is and write some examples of sets.</p>
<p>2. Pages 3 to 13 of the PRECALCULUS textbook</p>	<p>The real number system; natural numbers, integers, rational and irrational numbers. Properties of addition and multiplication on the set of real numbers. Relation of order in the system of real numbers.</p>	<p>Listen to lectures and do some in-class problems. In groups students will discuss why the sum, the difference, and the product of two rational numbers are rational numbers. Also, whether the product and sum of two irrational numbers are necessarily irrational.</p>	<p>Students should find out what the real number system is. Students should list five numbers from each of the following; natural numbers, integers, rational and irrational numbers.</p>
<p>3. Pages 48 to 53 and chapter two of the PRECALCULUS textbook</p>	<p>- Linear function, zeros of a linear function, graphical representation of linear functions. - Quadratic functions, solving quadratic equations; (a) Factorization method (b) Method of completing the square (c) Graphical method of solving quadratic equations.</p>	<p>Listen to lectures and do some in-class problems. In groups students will find examples of functions from everyday life. For example, Height is a function of age.</p>	<p>Students should find out what a function is. They should also write some of the importance of functions. Students should write at least four types of functions.</p>

Week			
<p>4.</p> <p>Chapter three of the PRECALCULUS textbook</p>	<p>Graphical representation of quadratic functions. Types of roots of a quadratic equation, sum and product of roots. Polynomials, addition and subtraction of polynomials, division of polynomials, The Remainder and the Factor Theorem. Rational Algebraic Functions.</p>	<p>Listen to lectures and do some in-class problems.</p> <p>In groups students will discuss when a graph represents a function.</p> <p>Students will use computers to sketch graphs of some functions.</p>	<p>Students should find equation is. They should also find out the importance of representing functions graphically. Students should also find out what the root of an out what a polynomial is.</p>
<p>5.</p> <p>Pages 55 to 57 , and 77 to 88 of the PRECALCULUS textbook</p>	<p>Explicit and implicit functions. Even and Odd functions. Absolute value functions. Solving equations involving radicals Inequalities. Rules for dealing with inequalities. Solving linear nonlinear inequalities. Solving absolute value inequalities. Application of inequalities to linear programming.</p>	<p>Listen to lectures and do some in-class problems.</p> <p>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 $a < b$.</p>	<p>Students should find out what inequalities are. They should also find out how the solution of an inequality differs from that of an equation.</p>
<p>6.</p> <p>Pages 14 to 24, 349 to 373, and 848 to 860 of the PRECALCULUS textbook</p>	<p>Indices, laws of indices. Logarithms and laws of logarithms. Binomial Theorem, Binomial Theorem for integral and rational indices. Approximations using the</p>	<p>Listen to lectures and do some in-class problems.</p> <p>In groups students will discuss whether the equations given in question 62 on</p>	<p>Students should find out what logarithmic functions are. They should also find out how it differs from the other functions already discussed.</p>

	Binomial Theorem.	page 363 of the PRECALCULUS textbook are identities.	
7. Chapter ten of the PRECALCULUS textbook.	Arithmetical Progression (A.P.), Formula for the n th term of an A.P., arithmetic mean, sum of the first n terms of an A.P. Geometrical progression (G.P.), Formula for the n th term of a G.P., Geometric mean, sum of the first n terms of a G.P.	Listen to lectures and do some in-class problems. In groups students will discuss whether the sequences given in question 74 on page 832 of the PRECALCULUS textbook are Arithmetic or Geometric.	Students should find out what sequences are. Students should write some applications of sequences.
8. Pages 661 to 683 of the PRECALCULUS textbook.	Algebra of Matrices, Inverse of Matrices, Solving a system of equations using the Matrix inverse.	Listen to lectures and do some in-class problems. In groups students will discuss question 52 on page 671 of the PRECALCULUS the textbook.	Students should find out what matrices are. Students should also find out the importance of matrices.
9. Pages 688 to 699 of the PRECALCULUS textbook.	Determinants and Cramer's rule. Solving a system with two or three variables using Cramer's rule.	Listen to lectures and do some in-class problems. In groups students will discuss question 59 on page 699 of the PRECALCULUS the textbook.	Students should find out what determinants are. Students should also find out some of the applications of determinants.
10. Chapter six of the PRECALCULUS textbook.	Circular functions of the acute angle. Radian measure, trigonometric functions of the angles $0^\circ, 30^\circ, 45^\circ, 60^\circ, 90^\circ$. Circular functions of the general angle.	Listen to lectures and do some in-class problems. In groups students will discuss question 71 on page 441 of the PRECALCULUS the textbook.	Students should find out what circular functions are. Students should also find out how they differ from the functions already discussed.
11. Pages 560 to 568 of the PRECALCULUS textbook.	Inverse trigonometric functions, trigonometric functions of the compound angles, trigonometric functions of multiple and submultiple angles.	Listen to lectures and do some in-class problems.	Students should find out what inverse trigonometric functions are. Students should also find out how they

			differ from last week's circular functions.
12. Pages 428 to 441, and 570 to 579 of the PRECALCULUS textbook.	Graphical representation of trigonometric functions, solving of trigonometric equations.	Listen to lectures and do some in-class problems. Students will use computers to sketch graphs of trigonometric functions.	Students should determine whether the graphical methods already discussed can be used to graph trigonometric functions. Students should also find out how trigonometric equations differ from the other equations already discussed.
13. Pages 535 to 558 of the PRECALCULUS textbook.	Addition and subtraction Theorems, Angles of a triangle and trigonometric identities.	Listen to lectures and do some in-class problems.	Students should find out some of the applications of trigonometric 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 1.5 # 17 – 38 (even) , Exercise 2.1 # 24,30,32, 34,44,46,48,52, and 56 from

the PRECALCULUS textbook.

Assignment 4: Exercise 3.2 # 2,8,12,20,26,28,40,42 and 44 from the PRECALCULUS textbook.

Assignment 5: Exercise 1.5 # 46, and 48, Exercise 1.7 # 26,32,38,48,58,60,62 and 64 from the PRECALCULUS

textbook.

Assignment 6: Exercise 1.2 # 34 and 38, Exercise 4.2 # 14 and 20, Exercise 4.3 # 22,26,46,48, Exercise 10.6 #

#2,6,14,26,28,40,42 from the PRECALCULUS textbook.

Assignment 7: Exercise 10.1 # 2,8,12,24,26 and 36, Exercise 10.2 # 2,6,12,20,24, and 34, Exercise 10.3 #

2,6,12,20,34, and 36 from the PRECALCULUS textbook.

Assignment 8: Exercise 8.5 # 2,4,6,8,10,34,36,38 and 46 from the PRECALCULUS textbook.

Assignment 9: Exercise 8.7 # 2,4,6,16,18,22,24,26,28,30 and 34 from the PRECALCULUS textbook.

Assignment 10: Exercise 6.1 # 2,6,18,20,26, and 28, Exercise 6.2 # 2,6, and 10, Exercise 6.3 # 2,4,8,26,42, and

44, Exercise 6.4 #10,14,16, and 20, Exercise 6.5 # 2,16, and 22 from the

PRECALCULUS

textbook.

Assignment 11: Exercise 7.4 # 2,4,10,18,24,32 and 40 from the PRECALCULUS textbook.

Assignment 12: Exercise 5.3 # 2,8,10,24,32 and 34, Exercise 7.5 # 2,6,14,18,34,37 and 40 from the

PRECALCULUS textbook.

Assignment 13: Exercise 7.1 # 20,24,28,30,34,58,70 and 80, Exercise 7.2 # 2,12,14,18,22,28,34 and 38 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 - 26th September, 2007

Test 2 - 2nd November, 2007

Test 3 - 7th 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:

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