**MET 1204 Fundamentals of Matrix Algebra and Vector Calculus (3CU)**

**Description**

The Course is about the basics of Matrix Algebra, Complex numbers and the back Vector Calculus in applications.

**Objectives**

The course will help the students to achieve the following objectives

* Describe the different types of matrices and their applications
* Understand the concept of Eigenvalues and Eigenvectors and their applications in problem solving

**Learning outcomes**

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

* Manipulate matrices and linear systems.
* Find Eigenvalues and Eigenvectors.
* Do arithmetic of complex numbers.
* Manipulate vectors, vector functions, multiple integrals and vector fields

**Intellectual, Practical and transferable skills**

* Problem solving
* Analytical
* communication

**Teaching and learning patterns**

The mode of learning involves direct contact with students in form of lectures, Tutorials and assignments

**Indicative content**

* Matrix Algebra: Matrices and matrix operations, diagonal, triangular symmetric matrices and elementary matrices, determinants, matrix inverse. Elementary row operations, echelon and row reduced echelon matrices.
* Systems of Linear Equations: Existence of a solution. Gaussion Elimination, Cramer’s rule. Non homogeneous System of linear equations.
* Eigenvalues and Eigenvectors: Definition of Eigenvalues and Eigenvectors. Eigenvectors for ***n x n*** matrices. Diagonalisation and similarity of matrices.
* Complex Numbers: Complex plane, addition, subtraction. Multiplication and division of complex numbers. Polar form of complex number, principle value, argument and Argand diagrams. Roots of Complex numbers and D’moivre’s theorem.
* Vector Calculus: Vectors in space, dot and cross product. Curvature, Torsion, Planetary motion and satellites, partial derivatives, line in integrals, Green and Stoves’s Theorem. Double and triple integrals.

**Assessment Method**

The assessment method is structured to include course work, and final examination. Course work consists of assignments, reports and tests and accounts for 30% of the final grade. The final examination will account for 70% of the final grading

**Core Reference materials**

* **Thomas, George B., and Ross L. Finney** (1988): Calculus and Analytic Geometry, 7th Edition, *Addison Wesley.*
* **Howard Anton** (2000): Elementary Linear Algebra, J*ohn Wiley & Sons*