EMT1101 Engineering Mathematics I

Period per Week			Contact Hour per Semester	Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WE	WCM	CU
45	00	30	60	100	60	40	4

Rationale

Engineering Mathematics is fundamental to the study of Computer Engineering. It provides the necessary analytical skills for the study of more advanced subjects such as Electronics, Discrete Mathematics and for the design of Algorithms among others. Applied Mathematics is an edifice of computing and is as such crucial for Computer Engineering.

Objectives

- The purpose of this course is to provide an introductory treatment of mathematical concepts fundamental to Engineering.
- It consolidates and advances the material covered in Advanced Level Mathematics (UNEB). This course also provides the mathematical tools needed in other semesters' course units.
- To develop the analytical and critical thinking abilities fundamental to problem solving in Engineering.

Course Content

1. ***Concept of a Function***
   - Definition, Properties, Range, Domain of the elementary (Algebraic and Transcendental) Functions of a Real Variable
   - Concept of a limit of a function of a real variable
   - Continuity
   - Indeterminate forms and L'Hopital's Rule
2. ***Complex Variable Algebra***
   - Cartesian and Polar Algebra representations;
   - Absolute Values; Products, Powers and Quotients; Extraction of Roots;
   - De Moivre's Theorem;
   - Exponential and Hyperbolic Functions of the Complex Variable.
3. ***Differential Calculus***
   - The Derivative: Definitions, notation, properties and Theorems;
   - Differentiation of elementary functions of a real variable.
   - Applications: Optimization, Curve Sketching, Approximations
   - Multivariable Differentiation: Partial Derivatives, Optimization and approximations.
4. ***Integral Calculus***
   - The Integral: Definition and Properties
   - Fundamental theorem of Calculus
   - Techniques of Integration
   - Definite Integral; its interpretation as area under a curve
   - Applications of the Definite Integral: Length of a curve, area bound between curves, volume of revolution, moments

- Improper Integrals and their evaluation using limits
- Integration of a Continuous Function; Inequalities; The Definite Integral as a Function of its Upper Limit
- Differentiation of an Integral Containing a Parameter; Double Integrals and their Applications

5. Linear Transformations and Matrices

- Definitions and types of matrices
- Operations on Matrices: Sums, Products, Transposition of Matrices, Equality of Matrices;
- Determinants: Definition and Properties; Minors and Cofactors; Evaluation of Determinants by Cofactors; Rank of a Matrix; Inverse Matrices
- Solution of Systems of Linear Algebraic Equations; Consistent and Inconsistent Equations; Systems of Homogeneous Equations; Cramer's Rule; The Gauss-Jordan Method, Gaussian Elimination.

Learning Outcomes

- Firm grounding in the concepts learned at advanced level

Recommended and Reference Books

[1] C. Ray Wylie and Louis C. Barrett, *Advanced Engineering Mathematics*, 6th ed., McGraw Hill, New York, 1995.

[2] Erwin Kreyszig, *Advanced Engineering Mathematics,* 8th ed., John Wiley and Sons.

[3] Murray R Spiegel, *Theory and Problems of Vector Analysis,* SI (Metric) ed., McGraw Hill

[4] K. A. Stroud, *Engineering Mathematics*, 5th ed., Palgrave Macmillan, 2005

[5] Bajpai, Calus, Fairley and Walker, *Mathematics for Engineers and Scientists*

[6] Edward & Penney, *Calculus*, International ed., Prentice Hall, 2002

[7] J.L. Smyrl, *Introduction to University Mathematics*, Edward Arnold, 1978