EMT1101 ENGINEERING MATHEMATICS I

Hours per Semester				Weighted Total Mark	Weighted Exam Mark	Weighted Continuous Assessment Mark	Credit Units
LH	PH	TH	CH	WTM	WEM	WCM	CU
60	0	00	60	100	60	40	4

Brief Course Description

This is an introductory course giving students the required basic mathematical background and sets foundation for other Engineering courses. It provides an introductory treatment of some mathematical concepts and techniques.

Course Objectives

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

- Have a good understanding of the basic concepts of Engineering Mathematics
- Apply the mathematical principles for solving Engineering problems.

Detailed Course Content:

Functions: **[6 Hours]**

Elementary, transcendental, Exponential, hyperbolic & logarithmic functions of a real variable

Differential calculus: **[15 Hours]**

Differential of functions of one and several variables: the derivative (definitions & theorems); Rules of differentiation, the differentiability theorem; Differentiation of functions with exponential functions, logarithmic functions, or hyperbolic functions; Some consequences of differentiability; Maxima and minima; identification of extrema; Indeterminate forms – l'Hopital's rule; Identification of extrema using second derivative; Partial &Total differentiation; Differentiation by chain rule; Change of variables; implicit functions & the derivatives of inverse circular functions. Higher order partial derivatives.

Integral calculus: **[15 Hours]**

Fundamentals of integration; Definite integrals, area under the curve, Volume of solids, & surfaces of revolution; Integration of a continuous function; Inequalities; The definite integral as a function of its upper limit; Indefinite integrals; Differentiation of an integral containing a parameter; Application of definite integrals; Double integrals & their applications; Systematic integration – by substitution, parts, reduction formulae; integration of rational (partial) functions.

Infinite series: **[12 Hours]**

Sequences – definition & examples; Convergence; Sequences of real & complex numbers; Limit theorems of sequences; Series – power series, convergence of power series; Maclaurin's and Taylor series; Fourier series; Periodic functions; Trigonometric Fourier series; Exponential Fourier series and Euler's formula; Fourier series of odd and even functions and of function of arbitrary periods; Half range Fourier series expansions; Determination of Fourier series without integration; Some limits theorems of series; Fourier series applications to electric circuits and Mechatronic systems.

Ordinary differential equations (ODE): **[12 Hours]**

Definitions; Differential equations of first order and degree; Formation of differential equations of first order and degree – with separate variables, homogeneous, linear; Exact differential equations; Applications of elementary ODE – Cartesian coordinates, orthogonal trajectories, physical applications; Linear ODE of orders greater than one; Complementary functions (CF) and particular integral (PI); The D-operator; Ordinary rules for finding complementary functions; Cauchy's

homogeneous linear differential equations; Legendre's linear differential equation; Applications of linear ODE in Mechatronic systems (RL,RC, LC, RLC, Springs).

Learning Outcomes

- Firm grounding in the concepts learned at advanced level

Method of Teaching /Delivery

The course will be taught by using lectures, tutorials and assignments.

Mode of Assessment

Assignments, tests and final examination. Their relative contributions to the final grade are :

Requirement	**Percentage contribution**
Course work (Assignments, tests)	40
% Final examination	60
% **Total**	**100%**

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

Possible Lecturers:

Dr. E. Lugujjo
Dr. T. Togboa
Dr. M. K.
Musaazi Ms. M.
Tumwebaze
Mr. P. I.
Musasizi