EMT2101 ENGINEERING MATHEMATICS III

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 course builds on Engineering Mathematics II and covers Fourier and Laplace transforms and the special functions.

Course Objectives
By the end of the course students should be able to:
- Enhance their knowledge of engineering mathematics concepts
- Apply engineering mathematics concepts and theorems to electrical engineering

Detailed Course Content:

Fourier and Laplace transforms: **[14 Hours]**
Direct and inverse Fourier transforms and their applications; Direct and inverse Laplace transforms; some properties of Fourier and Laplace transforms; solutions of ordinary differential equations by transform techniques; transforms of partial fractions; derivatives, and products of functions; transforms of quadratic factors; the unit step function; the impulse function; translation and periodic functions; Solutions of simultaneous ordinary differential equations; Applications of transform methods to solutions of engineering problems:- oscillatory motion, plane motion, electric circuits; Differentiation and integration of transforms; transforms of periodic functions and convolutions; complex inverse transforms.

Gamma and beta functions: **[6 Hours]**
Integral definition and Properties of Gamma and Beta functions; Relations between Gamma and Beta functions; Definition of Gamma function for negative values of argument; Generalization of Laplace transforms by means of Gamma functions; Other applications of Gamma functions.

Bessel Functions: **[8 Hours]**
Bessel's equation and its solutions; characteristics and graphs of Bessel functions; the generating function of Bessel's functions; Integral representation of Bessel's functions; Integrals involving Bessel's functions; Orthogonally of Bessel's functions; Bessel series; Modified (hyperbolic) Bessel functions; Spherical Bessel functions; Behavior of Bessel functions at large and small value of argument; Applications.

Legendre functions: **[6 Hours]**

Legendre's equation and its solutions; Legendre's polynomial; The generating function of Legendre's polynomials; Orthogonality of Legendre's polynomials; Legendre's series; Relations between Legendre's polynomials and their derivatives; Legendre's functions of the second kind; The associated Legendre equation and its soluitons; Orthogonality relations for the associated Legendre's functions, characteristics and graphs of Legendre's polynomial and associated Legendre's functions, applications in electrical and telecommunication engineering.

Partial differential equations (PDE): **[12 Hours]**
Definition, origins and derivations of some PDE of mathematical physics and engineering: heat flow, wave & transmission line equations; classification of PDE; solutions of PDEs by separation of variables, transform, numerical methods; solutions of Laplace's equations in different co-ordinates systems.

Boundary value problems: **[8 Hours]**
Formal and rigorous solutions, insulated slab, other boundary conditions, another form of the heat equation, the vibrating string, discussion of the solution, prescribed initial velocity, an elastic bar, dirichlet problem, other types of boundary conditions, fourier series in two variables, periodic

boundary conditions.

Sturm-liuoville problems and applications: **[6 Hours]**

Regular sturm-liuoville problems, modifications, orthogonality of eigenfunctions, methods of solution, surface heat transfer, other boundary value problem.

Mode of Delivery: The course will be taught by using lectures, tutorials and assignments.

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%**

Learning Outcomes

On completion of this course the student should be able to:

- Demonstrate a firm understanding of the solution techniques for Linear Ordinary Differential Equations, Properties of Integral Transforms and Special functions
- Use the Integral Transforms in Circuit Analysis

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%**

References

[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, 1981. *Applied Differential Equations*. 3rd Edition. Prentice-Hall, Inc., Englewood Cliffs, N.J. 07632
[4] Mary L. Boas, 1983. *Mathematical Methods in the Physical Sciences*. 2nd Edition. John Wiley & Sons, INC. New York

[5] Thomas M. Creese and Robert M. Haralick, 1978. *Differential Equations for Engineers*. McGraw-Hill, N. Y.
US
[6] L. R. Mustoe, 1988. *Worked Examples in Advanced Engineering Mathematics.* John Wiley & Sons Ltd. Great Britain

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