NIRMA UNIVERSITY
Institute of Technology
B.Tech. in Electrical Engineering
Semester-III

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Course Code	**2MA303**
Course Title	**Applied Mathematics for Electrical Engineering**

Course Learning Outcomes (CLO):

At the end of the course, students will be able to-

1. comprehend and apply vector calculus and complex analysis in engineering problems
2. make use of numerical methods
3. apply the concept of Fourier series to solve electrical engineering problems
4. use Laplace transformation technique to solve differential equations

Syllabus: **Teaching hours: 45**

Unit 1: Vector differential calculus **05**

Scalar and vector point function, Differentiation of vector field, Gradient of a scalar field and directional derivatives, Divergence and curl of a vector field, Solenoidal, irrotational and conservative fields

Unit 2: Function of complex variables **09**

Limit continuity and Differentiation of a function of complex variables, Cauchy Riemann equations in Cartesian and polar form, Analytic function, Harmonic functions and orthogonal curves, Application of Cauchy Riemann equations in electrostatic problems, integration of function of complex variables, Cauchy's integral theorem, Cauchy's integral formula

Unit 3: Laplace Transforms **10**

Definition, Linearity property, Laplace transforms of elementary functions, Shifting theorem, Inverse Laplace transforms of derivatives and integrals, Convolution theorem, Application of Laplace transforms in solving ordinary differential equations and electric circuit problems, Laplace transforms of periodic, Unit step and Impulse functions

Unit 4: Fourier Series **08**

Periodic functions, Dirichlet's conditions, Fourier series, Euler's formulae, Fourier expansion of periodic functions with period 2π, Fourier series for discontinues function, Fourier series of even and odd functions, Fourier series of periodic functions with arbitrary periods, half range Fourier series, Harmonic analysis

Unit 5: Numerical Methods **08**

Solution of Transcendental and Algebraic Equations: Newton-Raphson, Bisection, False position, Iteration methods, Convergence of these methods. Solution of System of Linear Equations: Gauss-Seidel and Gauss-Jacobi's methods. Numerical Solutions of Ordinary

Differential Equations: Solution of initial value problems: Picard's method, Taylor series method, 4^{th} order Runge – Kutta method

Unit 6: Statistics **05**

Measure of Central Tendency and Dispersion, Correlation and Regression

Tutorial: **Tutorial Hours: 15**

This shall consists of at least 8 tutorials based on the syllabus.

Self-Study:

Self-study contents will be declared at the commencement of the semester. Around 10% of the questions will be asked from the self-study contents.

Suggested Readings:

1. Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley.
2. Peter V. O'neil, Advanced Engineering Mathematics, Thomson–Books/Cole.
3. Dr.B.S.Grewal, Higher Engineering Mathematics, Khanna Publishers.
4. S. C. Chapra and R. P. Canale, Numerical Methods for Engineers with Programming and Software Applications, McGraw-Hill Publications.
5. M. K. Jain and S. R. K. Iyengar, R. K. Jain-Numerical Methods for Scientific &Engineering Computation, New age International Publication.

L = Lecture, T = Tutorial, P = Practical, C = Credit

w.e.f. academic year 2019-20 and onwards