DISCIPLINE SPECIFIC CORE COURSE – 7: Engineering Mathematics

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Engineering Mathematics ELDSC-7	4	3	00	1	Course Admission Eligibility	NIL

Learning Objectives

The Learning Objectives of this course are as follows:

- To provide the students with the skill and knowledge to perform calculations for solutions to the problems related to various topics that they would be taught during the course of this programme.
- To prepare the students with the mathematical tools they would require while studying and analysing problems in electronics networks, electronic and optical communications, semiconductor devices such as transistors, diodes, transient circuits in power devices, and problem solving in Electromagnetic theory, waveguides, and antennas.

Learning outcomes

The Learning Outcomes of this course are as follows:

- Use mathematical tools to solve/model the problems related to Electronics
- Solve linear differential equations using a variety of techniques, power series method and special functions
- Understand to solve N coupled equations using matrices, concept of Eigen values and Eigen vectors
- Familiarize with the concept of sequences and series, convergence and divergence
- Appreciate the complex variables and perform operations with complex numbers

SYLLABUS OF ELDSC-7 Total Hours- Theory: 45 Hours, Practicals: 30 Hours

UNIT – I (12 Hours)

Ordinary Differential Equations(ODE): Introduction to First Order Ordinary Differential Equations, Separable Ordinary Differential Equations, Exact Ordinary Differential Equations, Linear Ordinary Differential Equations.

Series Solutions of ODE: Power Series method, Legendre Polynomials, Bessel's equations and Frobenius method.

Special functions: Beta and gamma functions, error functions

UNIT – II (11 Hours)

Matrices: Introduction to Matrices, System of Linear Algebraic Equations, Solution of a system of Linear equations by LU decomposition, Gauss Jordan and Gauss-Seidel Method. Symmetric and Skew Symmetric Matrices, Hermitian and Skew Hermitian Matrices. Real and Complex Matrices.

Matrix Eigen Value Problems: Linear transformation, Eigen values and Eigen vectors, Properties of Eigen values and Eigen vectors.

UNIT – III (11 Hours)

Sequences and Series: Sequences and its kind, Limits of a sequence, Convergent, Divergent and oscillatory sequences.

Convergence of Infinite series, Tests of Convergence: Cauchy's Integral Test, D'Alembert's Ratio Test, Cauchy's nth Root Test, Alternating Series Test.

UNIT – IV (11 Hours)

Complex Variables Analysis: Complex Variables, Complex functions, Continuity, Differentiability, Analyticity, Cauchy-Riemann (C-R) Equations, Harmonic and Conjugate Harmonic Functions, Exponential Functions, Trigonometric Functions, Hyperbolic Functions.

Complex Integration: Line integral in Complex Plane, Cauchy's Integral Theorem, Cauchy's Integral Formula. Taylor series-exponential, logarithmic and trigonometric functions.

Practical component (if any) – Engineering Mathematics

(Scilab/MATLAB/ any other Mathematical Simulation software)

Learning outcomes

The Learning Outcomes of this course are as follows:

- Perform operations with various forms of complex numbers to solve equations
- Use mathematics as a tool for solving/modeling systems in electronics
- Prepare the technical report on the experiments carried.

LIST OF PRACTICALS (Total Practical Hours- 30 Hours)

1. Solution of First Order Differential Equations
2. To test convergence of a given series.
3. To test divergence of a given series.
4. Solution of linear system of equations using Gauss Elimination method.
5. Solution of linear system of equations using Gauss – Seidel method.
6. Solution of linear system of equations using L-U decomposition method.
7. Plots of the exponential, logarithmic and trigonometric functions and comparison with the plots of their Taylor series expansion till first 10 terms

Note: Students shall sincerely work towards completing all the above listed practicals for this course. In any circumstance, the completed number of practicals shall not be less than six.

Essential/recommended readings

1. E. Kreyszig, Advanced Engineering Mathematics, Wiley India (2010), 10th Edition
2. Murray Spiegel, Seymour Lipschutz, John Schiller, Outline of Complex Variables, Schaum Outline Series, Tata McGraw Hill (2009), 2nd Edition
3. C .R. Wylie and L. C. Barrett, Advanced Engineering Mathematics, Tata McGraw-Hill (2004)
4. B. V. Ramana, Higher Engineering Mathematics, Tata McGraw Hill (2006)

Suggestive readings

1. R. K. Jain, and S.R.K. Iyengar, Advanced Engineering Mathematics, Narosa Publishing House (2007).

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.