MA5155 APPLIED MATHEMATICS FOR ELECTRICAL ENGINEERS

DETAILED SYLLABUS

OBJECTIVES:

- The main objective of this course is to demonstrate various analytical skills in applied mathematics and extensive experience with the tactics of problem solving and logical thinking applicable for the students of electrical engineering. This course also will help the students to identify, formulate, abstract, and solve problems in electrical engineering using mathematical tools from a variety of mathematical areas, including matrix theory, calculus of variations, probability, linear programming and Fourier series.

UNIT I MATRIX THEORY

Cholesky decomposition - Generalized Eigenvectors - Canonical basis - QR Factorization – Least squares method - Singular value decomposition.

UNIT II CALCULUS OF VARIATIONS

Concept of variation and its properties – Euler's equation – Functional dependant on first and higher order derivatives – Functionals dependant on functions of several independent variables – Variational problems with moving boundaries – Isoperimetric problems - Direct methods: Ritz and Kantorovich methods.

UNIT III PROBABILITY AND RANDOM VARIABLES

Probability – Axioms of probability – Conditional probability – Baye's theorem - Random variables - Probability function – Moments – Moment generating functions and their properties – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma and Normal distributions – Function of a random variable.

UNIT IV LINEAR PROGRAMMING

Formulation – Graphical solution – Simplex method – Big M method - Two phase method - Transportation and Assignment models.

UNIT V FOURIER SERIES

Fourier trigonometric series: Periodic function as power signals – Convergence of series – Even and odd function: Cosine and sine series – Non periodic function: Extension to other intervals – Power signals: Exponential Fourier series – Parseval's theorem and power spectrum – Eigenvalue problems and orthogonal functions – Regular Sturm - Liouville systems – Generalized Fourier series.

REFERENCES:

1. Andrews L.C. and Phillips R.L., "Mathematical Techniques for Engineers and Scientists", Prentice Hall of India Pvt. Ltd., New Delhi, 2005.

2. Bronson, R. "Matrix Operation", Schaum's outline series, 2nd Edition, McGraw Hill, 2011.

3. Elsgolc, L. D. "Calculus of Variations", Dover Publications, New York, 2007.

4. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.

5. O'Neil, P.V., "Advanced Engineering Mathematics", Thomson Asia Pvt. Ltd., Singapore, 2003.

6. Taha, H.A., "Operations Research, An Introduction", 9th Edition, Pearson education, New Delhi, 2016.