SARVAJANIK UNIVERSITY

Bachelor of Technology
Subject Code: BTAS11303

Semester – III
Subject Name: Applied Mathematics for Electrical Engineering

Type of course: Basic Science Course

Prerequisite: The students are required to have a reasonable understanding of Calculus, Differential Equations and Linear algebra and introductory knowledge of probability and statistics.

Rationale:
There is different kind of systems which requires through mathematical analysis tools. The type of systems which requires such tools are linear systems, nonlinear systems and dynamical systems. Apart from them, it requires systematic study of uncertainty (randomness) by probability - statistics and curve fitting. The different methods like numerical methods are required to be studied.

Teaching Scheme:

TEACHING SCHEME				Theory Marks			Practical Marks		Total
3	0	2	4	**60**	**15**	**25**	**20**	**30**	**150**

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests CA2: Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems TEE: Term End Examination TEP: Term End Practical Exam (Performance and viva on practical skills learned in course) CA3: Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Content:

Sr. No.	Content	Total Hrs	% Weightage
01	**Numerical Solutions:** Roots of Algebraic and Transcendental Equations: Bisection, false position, Secant and Newton-Raphson methods, Fixed Point Iteration, Rate of convergence, Applications to electrical engineering problems.	06	15 %
02	**Interpolation:** Finite Differences, Forward, Backward and Central operators, Interpolation by polynomials: Newton's forward ,Backward interpolation formulae, Newton's divided formulae and Lagrange's interpolation formulae for unequal intervals, Applications to electrical engineering problems.	06	15 %
03	**Numerical Integration:** Newton-Cotes formula, Trapezoidal and Simpson's formulae, error formulae, Gaussian quadrature formulae, Applications to electrical engineering problems	04	10%
04	**Numerical solution of Ordinary Differential Equations:** Picard, Taylor, Euler methods and Runge-Kutta methods, Applications to electrical engineering problems	04	10%
05	**Curve fitting by the numerical method:** Curve fitting by of method of least squares, fitting of straight lines, second degree parabola and more general curves.	04	10%

06	**Basic Probability:** Experiment, definition of probability, conditional probability,independent events, Bayes' rule, Bernoulli trials, Random variables, discrete random variable, probability mass function, continuous random variable, probability density function, cumulative distribution function, properties of cumulative distribution function, Applications to electrical engineering problems.	10	20 %

07	**Basic Statistics:** Measure of central tendency: Mean, Median, Mode, Moments, Expectation, dispersion, skewness, kurtosis, Applications to electrical engineering problems.	08	20%

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
15	**35**	**20**	**0**	**0**	**0**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

(1) E. Kreyszig, Advanced Engineering Mathematics, John Wiley (1999)
(2) J. L. Devore, Probability and Statistics for Engineering and the Sciences, Cengage Learning
(3) Chapra S.C, Canale, R P, Numerical Methods for Engineers , Tata McGraw Hill, 2003.
(4) Gerald C. F. and Wheatley P.O. , Applied Numerical Analysis (5th Edition), Addison-Wesley, Singapore, 1998
(5) P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall.
(6) S. Ross, A First Course in Probability, 6th Ed., Pearson Education India.
(7) W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, Wiley.
(8) D. C. Montgomery and G. C. Runger, Applied Statistics and Probability for Engineers, Wiley.

Course Outcomes:

After learning the course, the students should be able to:

Sr. No.	**CO statement**	**Marks % weightage**
CO-1	solve algebraic equation related to electric engineering problem by using numerical methods and understand convergent of it	15
CO-2	find unknown value of given data by using various interpolation methods and curve fitting	25
CO-3	calculate integration and solve differential equations by using numerical methods	20
CO-4	understand the terminologies of basic probability, two types of random variables, their probability functions and apply it in electrical problems	20
CO-5	analyze given data, interpret salient features of data, represent data using classification and exploratory techniques, to evaluate measures of central tendency and dispersion and compare two different data	20

The following methods are to be executed in C/MATLAB platform.

1. To find the roots of polynomial using
    1) Bisection Method.
    2) False Position Method.
    3) Secant Method.
2. To find the solution of set of nonlinear equations using Newton – Raphson Method.
3. To find the numerical integration using Trapezoidal Rule.
    1) Simpson's 1/3 Method.
    2) Simpson's 3/8 Method.
4. To find the Interpolating polynomial using
    1) Linear Lagrangian Method
    2) Newton's Forward Method
    3) Newton's Backward Method
    4) Divided Difference Method
5. To find the solution to set of Linear Simultaneous equations suing
    1) Gauss Elimination Method
    2) Gauss Jordan Method
    3) Gauss – Seidel Method
6. To find the solution of ordinary differential equation using
    1) Euler's Method
    2) Modified Euler's Method
    3) Runge-Kutta 2^{nd} Order Method
    4) Runge-Kutta 4^{th} Order Method
7. To Find the mean, median, mode and standard deviation

List of Open Source Software/learning website:

- E-materials available at the website of NPTEL- http://nptel.ac.in/