

COURSE TITLE	APPLIED MATHEMATICS FOR ELECTRICAL ENGINEERING
COURSE CODE	01MA1303
COURSE CREDITS	5

Objective:

- 1 This subject aims to provide an essential background of numerical methods and systematic study of randomness (uncertainty) by probability-statistic to the students of engineering at graduate level.

Course Outcomes: After completion of this course, student will be able to:

- 1 Evaluate approximate roots of algebraic and transcendental equations.
- 2 Identify best suited Interpolation method to obtain intermediate values for tabular data.
- 3 Apply numerical methods to find integration and differentiation.
- 4 Implement the basic concepts of curve fitting to find best fit curve.
- 5 Solve problems involving probability, random variables, and standard probability distributions.
- 6 Utilize statistical method and tools to solve engineering problem.

Pre-requisite of course: The students are required to have a reasonable mastery over calculus, Differential equations and introductory knowledge of probability and statistics.

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
3	2	0	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	Numerical Solutions Roots of Algebraic and Transcendental Equations, Bisection Method, False position Method, Secant and Newton-Raphson methods, Fixed Point Iteration Method, Rate of convergence, Applications to electrical engineering problems	6
2	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.	6
3	Numerical Integration Newton-Cotes formula, Trapezoidal and Simpson's formulae, error formulae, Gaussian quadrature formulae, Applications to electrical engineering problems.	4

Contents : Unit	Topics	Contact Hours
4	Numerical solution of Ordinary Differential Equations Picard Method, Taylor Method, Euler method, nd Modified Euler's method and Runge-Kutta methods of 2nd order and 4th order, Applications to electrical engineering problems	4
5	Curve fitting by the numerical method Curve fitting by of method of least squares, fitting of straight lines, degree parabola and more general curves	4
6	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 functions	10
7	Basic Statistics Measure of central tendency: Mean, Median, Mode, Moments, Expectation, dispersion, skewness, kurtosis	8
Total Hours		42

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	Tutorial No.- 01 Fitting of straight lines, second degree parabola and more general curves by using virtual lab.	2
2	Tutorial No.- 02 Use of various numerical methods to find roots of Algebraic and Transcendental Equation by using virtual lab	6
3	Tutorial No.- 03 Calculation of tabular data by different Interpolation methods by using virtual lab	4
4	Tutorial No.- 04 Application of different numerical methods to find integration and differentiation by using virtual lab	2
5	Tutorial No.- 05 Study of randomness (uncertainty) by probability	4
6	Tutorial No.- 06 Application of statistical methodology and tools in the engineering	6
Total Hours		24

Textbook :

- 1 Numerical Methods for Engineers, Chapra S.C, Canale R. P., Tata McGraw Hill, 2003
- 2 Fundamentals of Mathematical Statistics, S.C. Gupta and V. K. Kapoor, Sultan Chand & Sons, 2018

References:

- 1 Advanced Engineering Mathematics (8th Edition), Advanced Engineering Mathematics (8th Edition), E. Kreyszig, John Wiley, 1999
- 2 A First Course in Probability, 6th Ed., A First Course in Probability, 6th Ed., S. Ross, Pearson Education India, 2014
- 3 Applied Statistics and Probability for Engineers, Applied Statistics and Probability for Engineers, D. C. Montgomery and G. C. Runger, Wiley, 2010

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
20.00	30.00	25.00	15.00	10.00	0.00

Instructional Method:

- 1 The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc
- 2 The internal evaluation will be done on the basis of continuous evaluation of students in the classroom.
- 3 Students will use supplementary resources such as online videos, NPTEL videos, recourses, Virtual Laboratory.

Supplementary Resources:

- 1 http://vlabs.iitb.ac.in/vlabs-dev/labs/numerical_lab/labs/straight-line-curve-fitting-pvg/index.html
- 2 http://vlabs.iitb.ac.in/vlabs-dev/labs/numerical_lab/labs/second-order-curve-fitting-pvg/theory.html
- 3 http://vlabs.iitb.ac.in/vlabs-dev/labs/numerical_lab/labs/newton-forward-interpolation-pvg/index.html
- 4 http://vlabs.iitb.ac.in/vlabs-dev/labs/numerical_lab/labs/lagrange-interpolation-pvg/index.html
- 5 http://vlabs.iitb.ac.in/vlabs-dev/labs/numerical_lab/labs/first-order-ordinary-differential-equation-pvg/index.html
- 6 http://vlabs.iitb.ac.in/vlabs-dev/labs/numerical_lab/labs/second-order-ordinary-differential-equation-pvg/index.html
- 7 https://onlinecourses.nptel.ac.in/noc23_ge35/preview
- 8 <https://trhejqxhwgxyzivhzmh92q.on.driv.tw/NMVLab/vlabNW.html>
- 9 <https://trhejqxhwgxyzivhzmh92q.on.driv.tw/NMVLab/vlabNW.html>
- 10 <https://trhejqxhwgxyzivhzmh92q.on.driv.tw/NMVLab/vlabNW.html>

Supplementary Resources:

11 <https://trhezjqxhwgxzivhzmh92q.on.drv.tw/NMVLab/vlabNW.html>