

PDA COLLEGE OF ENGINEERING, KALABURAGI
B E. Third Semester

Numerical Methods and Optimization Techniques

(Common to CSE & CSD)

[As per Choice Based Credit System (CBCS) scheme]

(From the academic year 2022-23)

Course Code	21MA31D	CIE Marks	50
Credits	03	SEE Marks	50
Contact Hours/Week (L-T-P)	3-0-0	Total Marks	100
Contact Hours	42	Exam Hours	03

Course Learning Objectives: To enable the students to obtain the knowledge of Engineering Mathematics in the following topics

1. Interpolation methods , Numerical differentiation and Numerical integration
2. Solve the problems using probability theory.
3. Numerical solution of ordinary differential equations.
4. Methods of least squares to fit straight line and second degree parabola
5. Linear programming problems

Module-I

9hours

Solution of Algebraic And Transcendental Equations: Bisection method Newton's- Raphson method and Regula falsi method.

Finite differences: Forward and Backward differences, Interpolation, Newton's Forward and Backward interpolation formulae and examples. Langrange's interpolation and inverse interpolation formulae and examples. (all formulae and rules without proof)

RBT Levels: L1, L2 & L3

Module-II

9 hours

Numerical differentiation: Numerical differentiation using Newton's forward and backward interpolation formulae and problems.

Numerical integration: Itroduction, Simpson's $1/3^{\text{rd}}$, Simpson's $3/8^{\text{th}}$ rule and Weddle's rule (all formulae without proof)

Time series and Forecasting:

Moving averages, smoothening of curves, forecasting models and methods, Statistical Quality control methods

RBT Levels: L1, L2 & L3

<p style="text-align: center;">Module-III 8 hours</p> <p>Numerical solutions of first order and first degree ordinary differential equations:</p> <p>Taylor's series method, Runge –Kutta method of fourth order, modified Euler's method and Milne's and Adam's-Bashforth predictor and corrector methods and problems. Numerical solution of Simultaneous ordinary differential equations of first order and second order differential equations by Runge-kutta method. (all formulae without proof)</p> <p>RBT Levels: L1, L2 & L3</p>
<p style="text-align: center;">Module –IV 8 hours</p> <p>Statistical methods:</p> <p>Curve fitting by the method of least squares: Straight line, second degree parabola and the curves of the form $y = ab^x$, $y = ax^b$ and $y = ae^{bx}$.</p> <p>Correlation and lines of regression, angle between two regression lines and rank correlation.</p> <p>RBT Levels: L1, L2 & L3</p>
<p style="text-align: center;">Module –V 8 hours</p> <p>Optimization techniques:</p> <p>Linear Programming, Mathematical formulation of linear Programming problem (LPP), Types of solutions, Graphical Method, basic feasible solution, canonical and standard forms and simplex method.</p> <p>RBT Levels: L1, L2 & L3</p>
<p>Text books:</p> <p>1 Higher Engineering Mathematics by B.S.Grewal, Khanna publishers; 40th Edition.2007</p> <p>2 Engineering Mathematics by N. P. Bali and Manish Goyal. Laxmi publications, latest edition</p> <p>Reference books:</p> <p>1.Advanced Engineering Mathematics by E. Kreyszig, John Willey & sons 8th Edn.</p> <p>2.A short course in differential equations – Rainville E.D.9th Edition.</p> <p>3.Advanced Engineering Mathematics by R.K.Jain & S.R.K Iyengar; Narosa publishing House.</p> <p>4.Introductory methods of numerical analysis by S.S.Sastry</p> <p>4. Statistical Methods Authored By Gupta S.P. Publisher: Sultan Chand & Sons. Publishing Year: 2021</p> <p>5. Fundamentals of Mathematical Statistics Authored By Gupta S.C.& Kapoor V.K. Publisher:Sultan Chand & Sons.Publishing Year: 2020</p>

Course Outcomes: On completion of this course, students are able to:

CO1: Solve the numerical problems in algebraic and transcendental equations and computation of interpolating polynomials using given data.

CO2: Compute derivatives of the functions numerically using given data and Evaluate integrations numerically.

CO3: Apply numerical methods to solve ordinary differential equations.

CO4: Apply the method of least square to estimate the parameters in regression model

CO5: Apply optimization techniques and LPP for real life problems.

Method of Examination:

Note:- The SEE question paper will be set for 100 marks and the marks scored by the student will be proportionately reduced to 50.

- The question paper will have **ten** full questions carrying equal marks.
- Each full question carries **20**marks.
- There will be **two** full questions (with a **maximum** of **four** sub questions) from each module.
- Each full question will have sub question covering all the topics under a module.

The students will have to answer **five** full questions, selecting **one** full question from each module.