III Semister

PDA COLLEGE OF ENGINEERING,KALABURAGI

B E. Third Semester

Numerical Analysis & Statistical Methods

(Common to Civil and CCT)

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

(From the academic year 2022-23)

Course Code	21MA31A	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. Numerical methods to solve algebraic and Transcendental equations
2. Interpolation methods , Numerical differentiation and Numerical integration
3. Numerical solutions ordinary differential equations
4. Curve fitting by the method of least squares and correlation
5. Introduction to theories of functions of complex variables and contour integration

Module-I **9 hours**

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 **8 hours**

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

Numerical integration: Introduction, Trapezoidal rule, Simpson's $1/3^{rd}$, Simpson's $3/8^{th}$ rule and Weddle's rule. (all rules without proof).

Numerical solutions of first order and first degree ordinary differential equations: Taylors series method, Runge –Kutta method of fourth order, modified Euler's method and Milne's-Thomson's predictor and corrector methods and problems.(all formulae without proof **RBT Levels: L1, L2 & L3**

Module –III **8 hours**

Statistical methods:

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* $y = ae^{bx}$.
Correlation and lines of regression, angle between two regression lines and Rank correlation **RBT Levels: L1, L2 & L3**

Module –IV 9 Hours

Functions of Complex variables: Introduction, limit, continuity, differentiability—Definitions. Analytic function, Cauchy-Riemann equations in Cartesian and polar forms. Applications of analytic function. Conformal transformation. Discussion of transformations: $W=z^2$,$W=e^z$. Bilinear transformations and problems

RBT Levels: L1, L2 & L3

Module-V 8 Hours

Complex integration: line integrals, Cauchy's theorem, Cauchy's integral formula. Taylor's and Laurent's series (Statements only). Singularities, poles, residues, Cauchy's residue theorem. (statement only) and problems.

RBT Levels: L1, L2 & L3

Text Books:

1. B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 43rd Ed.,2015.
2. E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 10thEd.(Reprint),2016.

Reference books:

1. Early Transcendental Calculus- James Stewart, Thomson Books, 5e 2007
2. N.P.Bali and Manish Goyal: A Text Book of Engineering Mathematics, Laxmi Publishers, 7th Ed., 2010.
3. B.V.Ramana: "Higher Engineering Mathematics" 11th Edition, Tata McGraw-Hill, 2010.
4. Statistical Methods Authored By Gupta S.P. Publisher: Sultan Chand & Sons. Publishing Year: 2021
5. Fundamentals of Mathematical Statistics Authored By Gupta S.C.& Kapoor V.K. Publisher:Sultan Chand & Sons.Publishing Year: 2020

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

CO1: Solve algebraic and transcendental equations by numerical methods and computation of interpolating polynomials using given data.

CO2: Compute derivatives of the functions numerically using given data and Evaluate integrations numerically. Apply numerical methods to solve ordinary differential equations

CO3: Apply the method of least square to estimate the parameters in regression model

CO4: Understand C-R equations, analytic functions and its properties.

CO5: Evaluation of complex integrals using the residue theorem and represent functions as Taylor's and Laurent's series.

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.