PDA COLLEGE OF ENGINEERING,KALABURAGI

B E. Third Semester

Numerical Methods and Complex Analysis

(Common to Mechanical, IPE & Automobile)

[As per Choice Based Credit System (CBCS) scheme]
(From the academic year 2022-23)

Course Code	21MA31B	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 integration
3. Fourier Series and its application in engineering fields

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 9 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

Fourier series: Periodic functions, Fourier series with periods $(0, 2\pi)$, $(-\pi, \pi)$, $(0, 2l)$ and $(-l, l)$.

Half range Fourier series and Practical Harmonic analysis

RBT Levels: L1, L2 & L3

Module –IV 8 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 Higher Engineering Mathematics by B.S.Grewal, Khanna publishers; 40th Edition.2007

2 Engineering Mathematics by N. P. Bali and Manish Goyal. Laxmi publications, latest edition

Reference books:

1.Advanced Engineering Mathematics by E. Kreyszig, John Willey & sons 8th Edn.

2.A short course in differential equations – Rainvile E.D.9th Edition.

3.Advanced Engineering Mathematics by R.K.Jain & S.R.K Iyengar; Narosa publishing House.

4.Introductory methods of numerical analysis by S.S.Sastry

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

CO1: Solve the numerical problems in algebraic, transcendental equations. Computation of interpolation polynomials

CO2: Computation of Numerical differentiation and numerical integration.

CO3: Construction of Fourier series for vibrations.

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.