**B.E.**(Common to all Programmes)
**Outcome Based Education (OBE) and Choice Based Credit System (CBCS)**
**SEMESTER - IV**

## COMPLEX ANALYSIS, PROBABILITY AND STATISTICAL METHODS

(Common to all Programmes)
[As per Choice Based Credit System (CBCS) scheme]

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|---|---|---|---|
| Course Code | **18MAT41** | CIE Marks | 40 |
| Teaching Hours/Week (L:T:P) | (2:2:0) | SEE Marks | 60 |
| Credits | 3 | Exam Hours | 03 |

**Course Learning Objectives:**

- To provide an insight into applications of complex variables, conformal mapping and special functions arising in potential theory, quantum mechanics, heat conduction and field theory.
- To develop probability distribution of discrete, continuous random variables and joint probability distribution occurring in digital signal processing, design engineering and microwave engineering.

**Module-1**

**Calculus of complex functions:** Review of function of a complex variable, limits, continuity, and differentiability. Analytic functions: Cauchy-Riemann equations in Cartesian and polar forms and consequences. Construction of analytic functions: Milne-Thomson method-Problems.

**Module-2**

**Conformal transformations:** Introduction. Discussion of transformations: $w=z^2$ , $w=e^z$ , $w=z+\frac{1}{z},(z\neq 0)$ . Bilinear transformations- Problems.

**Complex integration**: Line integral of a complex function-Cauchy's theorem and Cauchy's integral formula and problems.

**Module-3**

**Probability Distributions:** Review of basic probability theory. Random variables (discrete and continuous), probability mass/density functions. Binomial, Poisson, exponential and normal distributions- problems (No derivation for mean and standard deviation)-Illustrative examples.

**Module-4**

**Curve Fitting:** Curve fitting by the method of least squares- fitting the curves of the form-

$y=ax+b, y=ax^b$ & $y=ax^2+bx+c.$

**Statistical Methods:** Correlation and regression-Karl Pearson's coefficient of correlation and rank correlation-problems. Regression analysis- lines of regression –problems.

**Module-5**

**Joint probability distribution:** Joint Probability distribution for two discrete random variables, expectation and covariance.

**Sampling Theory:** Introduction to sampling distributions, standard error,Type-I and Type-II errors. Test of hypothesis for means, student's t-distribution, Chi-square distribution as a test of goodness of fit.

**Course outcomes:** At the end of the course the student will be able to:

- CO1: Use the concepts of analytic function and complex potentials to solve the problems arising in electromagnetic field theory.
- CO2: Utilize conformal transformation and complex integral arising in aerofoil theory, fluid flow visualization and image processing.
- CO3: Apply discrete and continuous probability distributions in analyzing the probability models arising in engineering field.
- CO4: Make use of the correlation and regression analysis to fit a suitable mathematical model for the statistical data.
- CO5: Construct joint probability distributions and demonstrate the validity of testing the hypothesis.

**Question paper pattern:**

- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 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.

| Sl No | Title of the Book | Name of the Author/s | Name of the Publisher | Edition and Year |
|---|---|---|---|---|
| **Textbooks** | | | | |
| 1 | Advanced Engineering Mathematics | E. Kreyszig | John Wiley & Sons | 10th Edition,2016 |
| 2 | Higher Engineering Mathematics | B. S. Grewal | Khanna Publishers | 44th Edition, 2017 |
| 3 | Engineering Mathematics | Srimanta Pal et al | Oxford University Press | 3rd Edition,2016 |
| **Reference Books** | | | | |
| 1 | Advanced Engineering Mathematics | C. Ray Wylie, Louis C. Barrett | McGraw-Hill | 6th Edition 1995 |
| 2 | Introductory Methods of Numerical Analysis | S. S. Sastry | Prentice Hall of India | 4th Edition 2010 |
| 3 | Higher Engineering Mathematics | B.V. Ramana | McGraw-Hill | 11th Edition,2010 |
| 4 | A Textbook of Engineering Mathematics | N. P. Bali and Manish Goyal | Laxmi Publications | 6th Edition, 2014 |
| 5 | Advanced Engineering Mathematics | Chandrika Prasad and Reena Garg | Khanna Publishing, | 2018 |

**Web links and Video Lectures:**

1. http://nptel.ac.in/courses.php?disciplineID=111
2. http://www.class-central.com/subject/math(MOOCs)
3. http://academicearth.org/
4. VTU EDUSAT PROGRAMME - 20

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