

**B. E. COMMON TO ALL PROGRAMMES**  
**Choice Based Credit System (CBCS) and Outcome Based Education (OBE)**  
**SEMESTER - IV**

**COMPLEX ANALYSIS, PROBABILITY AND STATISTICAL METHODS**  
(Common to all programmes)

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

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

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

**Curve Fitting:** Curve fitting by the method of least squares- fitting the curves of the form-  $y = ax + b$ ,  $y = ax^b$  and  $y = ax^2 + bx + c$ .

**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:

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

- 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.

| Sl. No.  | Title of the Book                          | Name of the Author/s            | Name of the Publisher   | Edition and Year               |
|--|--|---------------------------------|-------------------------|--------------------------------|
| <b>Textbooks</b>   |  |                                 |                         |                                |
| 1  | Advanced Engineering Mathematics           | E. Kreyszig                     | John Wiley & Sons       | 10 <sup>th</sup> Edition, 2016 |
| 2  | Higher Engineering Mathematics             | B. S. Grewal                    | Khanna Publishers       | 44 <sup>th</sup> Edition, 2017 |
| 3  | Engineering Mathematics                    | Srimanta Pal et al              | Oxford University Press | 3 <sup>rd</sup> Edition, 2016  |
| <b>Reference Books</b>   |  |                                 |                         |                                |
| 1  | Advanced Engineering Mathematics           | C. Ray Wylie, Louis C. Barrett  | McGraw-Hill             | 6 <sup>th</sup> Edition 1995   |
| 2  | Introductory Methods of Numerical Analysis | S.S. Sastry                     | Prentice Hall of India  | 4 <sup>th</sup> Edition 2010   |
| 3  | Higher Engineering Mathematics             | B. V. Ramana                    | McGraw-Hill             | 11 <sup>th</sup> Edition, 2010 |
| 4  | A Text Book of Engineering Mathematics     | N. P. Bali and Manish Goyal     | Laxmi Publications      | 2014                           |
| 5  | Advanced Engineering Mathematics           | Chandrika Prasad and Reena Garg | Khanna Publishing,      | 2018                           |
| <b>Web links and Video Lectures:</b>   |  |                                 |                         |                                |
| 1. <a href="http://nptel.ac.in/courses.php?disciplineID=111">http://nptel.ac.in/courses.php?disciplineID=111</a>   |  |                                 |                         |                                |
| 2. <a href="http://www.class-central.com/subject/math(MOOCs)">http://www.class-central.com/subject/math(MOOCs)</a> |  |                                 |                         |                                |
| 3. <a href="http://academicearth.org/">http://academicearth.org/</a>   |  |                                 |                         |                                |
| 4. VTU EDUSAT PROGRAMME - 20   |  |                                 |                         |                                |

*Handwritten signature*

H.O.D.

Dept. Of Information Technology & Engineering  
Alva's Institute of Engineering & Technology  
Mijar, MOODBIDRI - 574 225