VISVESVARAYA TECHNOLOGICAL UNIVERSITY, BELGAUM

SYLLABUS FOR 2015 -2019

ENGINEERING MATHEMATICS-IV
(Common to all Branches)

Course Title: Engineering Mathematics - IV | **Course Code : 15MAT41**
Credits: 04 | **L-T-P: 4-0-0**
Contact Hours/Week : 04 | **Total Hours: 50**
Exam. Marks : 80 | **IA Marks : 20**
Exam. Hours : 03

Course Objectives:
The purpose of this course is to make students well conversant with numerical methods to solve ordinary differential equations, complex analysis, sampling theory and joint probability distribution and stochastic processes arising in science and engineering.

MODULE	RBT Levels	No. of Hrs
MODULE-I **Numerical Methods**: Numerical solution of ordinary differential equations of first order and first degree, Taylor's series method, modified Euler's method, Runge - Kutta method of fourth order. Milne's and Adams-Bashforth predictor and corrector methods (No derivations of formulae).	**L1 & L2**	**10**
MODULE-II **Numerical Methods**: Numerical solution of second order ordinary differential equations, Runge-Kutta method and Milne's method. **Special Functions:** Series solution-Frobenious method. Series solution of Bessel's differential equation leading to $J_n(x)$-Bessel's function of first kind. Basic properties and orthogonality. Series solution of Legendre's differential equation leading to $P_n(x)$-Legendre polynomials. Rodrigue's formula, problems	**L3**	**10**
MODULE-III **Complex Variables:** Review of a function of a complex variable, limits, continuity, differentiability. Analytic functions-Cauchy-Riemann equations in cartesian and polar forms. Properties and construction of analytic functions. Complex line integrals-Cauchy's theorem and Cauchy's integral formula, Residue, poles, Cauchy's Residue theorem (without proof) and problems. **Transformations:** Conformal transformations, discussion of transformations: $w=z^2$, $w=e^z$, $w=z+(1/z)(z\neq 0)$ and bilinear transformations-problems.	**L1 & L3** **L3**	**10**
MODULE-IV **Probability Distributions:** Random variables (discrete and continuous), probability mass/density functions. Binomial distribution, Poisson distribution. Exponential and normal distributions, problems. **Joint probability distribution:** Joint Probability distribution for two discrete random variables, expectation, covariance, correlation coefficient.	**L3**	**10**

MODULE-V **Sampling Theory:** Sampling, Sampling distributions, standard error, test of hypothesis for means and proportions, confidence limits for means, student's t-distribution, Chi-square distribution as a test of goodness of fit. **Stochastic process:** Stochastic processes, probability vector, stochastic matrices, fixed points, regular stochastic matrices, Markov chains, higher transition probability-simple problems.	**L3** **L1**	**10**

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

1. Solve first and second order ordinary differential equations arising in flow problems using single step and multistep numerical methods.
2. Understand the analyticity, potential fields, residues and poles of complex potentials in field theory and electromagnetic theory.
3. Describe conformal and bilinear transformation arising in aerofoil theory, fluid flow visualization and image processing.
4. Solve problems of quantum mechanics, hydrodynamics and heat conduction by employing Bessel's function relating to cylindrical polar coordinate systems and Legendre's polynomials relating to spherical polar coordinate systems.
5. Solve problems on probability distributions relating to digital signal processing , information theory and optimization concepts of stability of design and structural engineering.
6. Draw the validity of the hypothesis proposed for the given sampling distribution in accepting or rejecting the hypothesis.
7. Determine joint probability distributions and stochastic matrix connected with the multivariable correlation problems for feasible random events.
8. Define transition probability matrix of a Markov chain and solve problems related to discrete parameter random process.

Question paper pattern:

- The question paper will have **ten** full questions carrying equal marks.
- Each full question consisting of **16** 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.

Graduate Attributes (as per NBA)

1. Engineering Knowledge
2. Problem Analysis
3. Life-Long Learning
4. Accomplishment of Complex Problems

Text Books:

1. *B.S. Grewal: Higher Engineering Mathematics, Khanna Publishers, 43rd Ed., 2015.*
2. *E. Kreyszig: Advanced Engineering Mathematics, John Wiley & Sons, 10th Ed., 2015.*

Reference books:

1. *N.P.Bali and Manish Goyal: A Text Book of Engineering Mathematics, Laxmi Publishers,7th Ed., 2010.*
2. *B.V.Ramana: "Higher Engineering M athematics" Tata McGraw-Hill, 2006.*
3. *H. K. Dass and Er. RajnishVerma: "Higher Engineerig Mathematics", S. Chand publishing, 1st edition, 2011.*

Web links and Video Lectures:

1. *http://nptel.ac.in/courses.php?disciplineID=111*
2. *http://wwww.khanacademy.org/*
3. *http://www.class-central.com/subject/math*