ENGINEERING MATHEMATICS-IV

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

(Effective from the academic year 2016 -2017)

SEMESTER – IV

Subject Code	15MAT41	IA Marks	20
Number of Lecture Hours/Week	04	Exam Marks	80
Total Number of Lecture Hours	50	Exam Hours	03

CREDITS – 04

Course objectives: This course will enable students to

- Formulate, solve and analyze engineering problems.
- Apply numerical methods to solve ordinary differential equations.
- Apply finite difference method to solve partial differential equations.
- Perform complex analysis.
- Interpret use of sampling theory.
- Apply joint probability distribution and stochastic process.

Module 1	Teaching Hours
Numerical Methods: Numerical solution of ordinary differential equations of first order and first degree, Picard's method, 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). Numerical solution of simultaneous first order ordinary differential equations, Picard's method, Runge-Kutta method of fourth order	10 Hours

Module 2	
Numerical Methods: Numerical solution of second order ordinary differential equations, Picard's method, Runge-Kutta method and Milne's method. **Special Functions:** Bessel's functions- basic properties, recurrence relations, orthogonality and generating functions. Legendre's functions - Legendre's polynomial, Rodrigue's formula, problems.	10 Hours

Module 3	
Complex Variables: 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 with proof and problems. **Transformations:** Conformal transformations, discussion of transformations: $=$, $=$, $= +(/)$ and bilinear transformations.	10 Hours

Module 4	
Probability Distributions: Random variables (discrete and continuous), probability functions. Poisson distributions, geometric distribution, uniform distribution, exponential and normal distributions, Problems. **Joint probability distribution:** Joint Probability distribution for two variables, expectation, covariance, correlation coefficient.	10 Hours

Module 5	
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 process, probability vector, stochastic matrices, fixed points, regular stochastic matrices, Markov chains, higher transition probability.	10 Hours

Course Outcomes: After studying this course, students will be able to:
- Use appropriate numerical methods to solve first and second order ordinary differential equations.   - Use Bessel's and Legendre's function which often arises when a problem possesses axial and spherical symmetry, such as in quantum mechanics, electromagnetic theory, hydrodynamics and heat conduction.   - State and prove Cauchy's theorem and its consequences including Cauchy's integral formula.   - Compute residues and apply the residue theorem to evaluate integrals.   - Analyze, interpret, and evaluate scientific hypotheses and theories using rigorous statistical methods.
Graduate Attributes
- Engineering Knowledge   - Problem Analysis   - Life-Long Learning   - Conduct Investigations of Complex Problems
Question paper pattern:
The question paper will have ten questions.   There will be 2 questions from each module.   Each question will have questions covering all the topics under a module.   The students will have to answer 5 full questions, selecting one full question from each module.
Text Books:
1. B.V.Ramana "Higher Engineering Mathematics" Tata McGraw-Hill, 2006.   2. B. S. Grewal," Higher Engineering Mathematics", Khanna publishers, 42nd edition, 2013.
Reference Books:
1. N P Bali and Manish Goyal, "A text book of Engineering mathematics" , Laxmi publications, latest edition.   2. Kreyszig, "Advanced Engineering Mathematics " - 9th edition, Wiley, 2013.   3. H. K Dass and Er. RajnishVerma, "Higher Engineering Mathematics", S. Chand, 1st ed, 2011.

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