

COURSE MODULES OF THE SUBJECT TAUGHT FOR THE SESSION SEP-JAN 2027

Course Syllabi with CO's

Faculty Name :			Academic Year: 2026-2027 (ODD SEMESTER)				
Department: Mathematics							
Course Code	Course Title	Core/ Elective	Prerequisite	Contact Hours			Total Hrs/ Sessions
				L	T	P	
1BMATEE301	Complex Analysis, Transform Techniques and Optimization	Core	Differentiation, Integration, Partial Fraction, Differential Equation	3	2	-	-
Objectives	- To provide an insight into applications of complex variables arising in potential theory, quantum mechanics, heat conduction and field theory. - Learn to use the Fourier series to represent periodical physical phenomena in engineering analysis. - To enable the students to study Fourier Transforms and concepts of infinite Fourier Sine and Cosine transforms and to learn the method of solving difference equations by the z-transform method. - To develop probability distribution of discrete, continuous random variables occurring in digital signal processing, design engineering and microwave engineering. - Analyze and solve linear programming models of real-life situations.						
Topics Covered as per Syllabus							
Module-1: Complex Analysis Review of a function of a complex variable, limits, continuity and differentiability. Analytic functions-Cauchy-Riemann equations in Cartesian and polar forms. Construction of analytic functions by Milne-Thomson method, Problems on electric flux. Complex integration: Line integral of a complex function, Cauchy's theorem and Cauchy's integral formula (statement only) and problems.							
Module-2: Fourier Series Periodic functions, Euler's Formula, Conditions for Fourier series expansion (Dirichlet's condition), Fourier series of functions -having points of discontinuity, with period 2π , with change of interval (arbitrary period) and, Even and odd functions. Half range Fourier series. Practical harmonic analysis.							
Module-3: Fourier transforms and Z-transforms Infinite Fourier transforms: Definition, Fourier transforms, Fourier sine, and cosine transforms. Inverse Fourier Transforms, inverse Fourier sine and cosine transforms. Problems. Z-transforms: Definition, Standard Z-transforms, Damping, and shifting rules, Statements of initial value theorem and Final Value Theorem (statements only). Inverse Z-transform and applications to solve difference equations.							

Module-4: Probability distributions and Sampling theory

Probability Distributions: Review of basic probability theory, Random variables-discrete and continuous. Probability distribution function, cumulative distribution function, Mathematical Expectation-mean and variance. Repeated Trials- Binomial, Poisson, Normal and exponential distribution (without proofs for mean and SD). Sampling Theory: Introduction to sampling distributions, standard error, Type-I and Type-II errors. Test of hypothesis for single means, single proportions. Student's t-distribution, Chi-square distribution as a test of goodness of fit.

Module-5: Linear Programming Problems

Linear Programming Problems: Introduction to optimization techniques, formulation of the problems. Introduction to Linear programming, graphical solution, solution by simplex and Big M method.

Title of the Book Name of the Author/s Name of the Publisher Edition and Year

Textbooks

- (i) Higher Engineering Mathematics, B.S. Grewal, 45th Edition, Khanna Publishers.
- (ii) Operations Research: An Introduction, Hamdy A. Taha, Pearson Education.
- (iii) Higher Engineering Mathematics, H.K. Dass and Er. Rajnish Verma, S. Chand Publications.

List of Reference Books

- (i) Complex Variables and Applications by James Ward Brown and Ruel V. Churchill, McGraw-Hill Education.
- (ii) Advanced Engineering Mathematics, Erwin Kreyszig, 10th Edition, Wiley India.
- (iii) Fourier Series and Boundary Value Problems by Ruel V. Churchill and James Ward Brown.
- (iv) Probability and Statistics for Engineers and Scientists by Ronald E. Walpole et al., Pearson Education.
- (v) Operations Research by Hamdy A. Taha, Pearson Education. (vi) Schaum's Outline of Complex Variables, McGraw-Hill.

List of URLs, Text Books, Notes, Multimedia Content, etc

- NPTEL Courses on Engineering Mathematics
- MIT Open Course Ware Mathematics
- SWAYAM Online Courses

Course Outcomes

On completion of this course, students are able to:

- CO1:** Apply the concepts of analytic functions, Cauchy-Riemann equations, complex integration, Cauchy's theorem, and Cauchy's integral formula to solve engineering and mathematical problems involving complex variables.
- CO2:** Develop Fourier series representations of periodic functions and perform harmonic analysis for functions with different periodicities, discontinuities, and symmetry properties.
- CO3:** Utilize Fourier transforms and Z-transforms, including their inverse transforms and properties, to analyze signals and solve difference equations arising in engineering applications.
- CO4:** Apply probability distributions, sampling theory, and statistical hypothesis testing techniques for analyzing uncertainty and making data-driven decisions.
- CO5:** Formulate and solve linear programming problems using graphical, simplex, and Big-M methods to obtain optimal solutions in engineering and



	management applications.
Internal Assessment Marks: 50 (A minimum of two Internal Assessment Tests(IA)shall be conducted, carrying a total of 25 marks. In addition, Continuous Comprehensive Assessment (CCA) shall be conducted for a total of 25 marks.).	

The Correlation of Course Outcomes (CO's) and Program Outcomes (PO's)

Subject Code:	1BMATEE301	TITLE: Complex Analysis, Transform Techniques and Optimization						Faculty Name:			
List of Course Outcomes	Program Outcomes										
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO-1	2	2	-	-	2	-	-	3	-	-	2
CO-2	3	2	-	-	2	-	-	3	-	-	2
CO-3	2	2	-	-	2	-	-	3	-	-	2
CO-4	2	2	-	-	2	-	-	3	-	-	2
CO-5	2	3	-	-	2	-	-	3	-	-	2

Note: 3 = Strong Contribution 2 = Average Contribution 1 = Weak Contribution