C. U. SHAH UNIVERSITY
Wadhwancity

FACULTY OF:- Technology and Engineering
DEPARTMENT OF: - EC/MECH/EEE/AUTO/IC/EE/CIVIL
SEMESTER: - IV
CODE: - 4TE04EMT2
NAME: – Engineering Mathematics - 4

Teaching and Evaluation Scheme:-

Subject code	Subject name	Teaching Scheme(Hours)				Credits	Evaluation Scheme							
							Theory				Practical/Tutorial			
							Sessional Exam		University Exam		Internal		Total	Total
		Th	Tu	Pr	Total		Marks	Hours	Marks	Hours	Pr/Viva	Tw		
4TE04EMT2	Engineering Mathematics - 4	3	2	0	5	4	30	1.5	70	3	30	20	50	150

Objectives:-

- To have knowledge of Fourier integral & Fourier transform.
- To know analytic function, conformal transformations
- To learn basic concepts of vector calculus (grad, divergence, curl, line integral, surface integrals) and have knowledge of irrotational, solenoidal & conservative vector fields.
- Basic knowledge of widely used numerical techniques and their applications

Prerequisites:-

Students should have a firm grasp elementary engineering mathematics offered in first and second semesters. The basic concept of vector algebra and calculus must be clear.

Course Outline:-

Sr. No.	Course contents
1	**Fourier integral & Transform:** Fourier integral theorem (only statement), Fourier Sine and Cosine integrals, Complex form of Fourier integral, Fourier Sine and Cosine transforms, solution of boundary value problems using Fourier transforms
2	**Functions of complex variables:** Analytic function, Cauchy – Riemann equation (Cartesian and Polar forms), Harmonic functions, Finding Harmonic Conjugate functions (Using C-R equations and Milne Thompson Method), Standard Conformal transformation, Complex integration, Cauchy integral formula
3	**Vector Differential Calculus:** Reorientation, Differentiation of Vectors, Scalars and vector fields, Gradient of a scalar function, Directional derivative, Divergence and Curl of a vector function, Irrotational, Solenoidal and conservative vector fields
4	**Vector Integral Calculus:** Line, Surface and Volume integrals, Green's theorem(Without

	proof), Gauss and Stokes's theorems (Without proof)
5	**Interpolation:** Finite differences, Relations between finite difference, Interpolation by polynomials, Newton's Forward and Backward Methods, Stirling's Method, Lagrange's interpolation Formula, Divided differences, Newton's divided differences, Error of the interpolating polynomial
6	**Numerical Differentiation & Integration:** Numerical differentiation using forward difference and backward difference, Numerical Integration by using Newton-cotes quadrature formula, Trapezoidal rule, Simpson's $\frac{1}{3}$ rule, Simpson's $\frac{3}{8}$ rule
7	**System of Linear Algebraic Equations:** Direct methods: Gauss elimination and Gauss Jordan method. Iterative methods: Gauss Jacobi's method and Gauss-Seidal method.
8	**Numerical solution of ordinary differential equations**: Picard's Method, Taylor's Method, Euler's Method, Runge-Kutta methods

Learning Outcomes:-

After the successful completion of the course, students will be able to

- Apply knowledge of Fourier integral and Fourier transform to solve differential equations
- Calculate gradient, divergence & curl in Cartesian and other simple coordinate systems
- Evaluate line, surface and volume integrals in simple coordinate systems
- Solve algebraic and transcendental equations, system of linear equations and differential equations by Numerical methods

Teaching & Learning Methodology:

- Lecture method using standard teaching aids.
- Solving term assignments in tutorials
- Quiz/Seminar/Expert lectures

Books Recommended:-

1. Advanced Engineering Mathematics (8th Edition), **E. Kreyszig**, Wiley-India (1999)
2. Higher Engineering Mathematics – Vol. 1, **Dr. K. R. Kachot**, Mahajan Publ. House
3. Complex variables and application, **R. V. Churchill and J. W. Brown**, (7th Edition), McGraw-Hill (2003)
4. Numerical Methods in Engineering & Science (7th Edition), **B. S. Grewal**, Khanna Publishers(2007).
5. Complex analysis, **J. M. Howie**, Springer-Verlag (2004)
6. Elementary Numerical Analysis- An Algorithmic Approach (3rd Edition), **S. D. Conte and Carl de Boor**, McGraw-Hill, 1980.
7. Introduction to Numerical Analysis (2nd Edition), **C. E. Froberg**, Addison-Wesley, 1981

E-Recourses:-

1. http://www.wiley.com/college/mat/kreyszig154962/
2. http://en.wikipedia.org