C. U. SHAH UNIVERSITY
Wadhwan City

FACULTY OF: - Technology & Engineering
DEPARTMENT OF: -Instrumentation & Control Engineering
SEMESTER: - IV
CODE: - 4TE04EMT1
NAME – Engineering Mathematics - 4

Teaching and Evaluation Scheme:-

Subject Code	Name of the Subject	Teaching Scheme (Hours)				Credits	Evaluation Scheme							
							Theory				Practical (Marks)			Total
		Th	Tu	Pr	Total		Sessional Exam		University Exam		Internal		University	
							Marks	Hrs	Marks	Hrs	Pr/Viva	TW	Pr	
4TE04EMT1	Engineering Mathematics - 4	4	0	0	4	4	30	1.5	70	3	---	---	---	**100**

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

Prerequisite:-

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 Content	Hours
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.	**06**
2	**Functions of Complex variables:** Reorientation, Analytic function, Cauchy – Riemann equation (Cartesian and Polar forms), Harmonic functions, Finding Harmonic Conjugate functions (Using C-R equations and Milne Thompson Method) Conformal mappings.	**08**
3	**Vector 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, Line, Surface and Volume integrals, Green's theorem, Gauss and Stoke's theorems (Without proof).	**12**
4	**Interpolation:** Finite differences, Relations between finite difference operators, Interpolation by polynomials,	**06**

	Newton's Forward and Backward Methods, Stirling's Method, Lagrange's interpolation Formula, Inverse Interpolation.	
5	**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.	**06**
6	**System of Linear Algebraic Equations:** Direct methods: Gauss elimination and Gauss Jordan method. Iterative methods: Gauss Jacobi's method and Gauss-Seidal method.	**05**
7	**Numerical solution of ordinary differential equations**: Picard's Method, Taylor's Method, Euler's Method, Runge-Kutta methods.	**05**

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. **E. Kreyszig**, Advanced engineering mathematics (8th Edition), John Wiley (1999).
2. Higher Engineering Mathematics – Vol. 3, **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. **B. S. Grewal**, Numerical Methods in Engineering & Science (7th Edition), Khanna Publishers(2007).
5. Vector Calculus and Linear Algebra, **RaviSingh & Mukul Bhatt**, Mc Graw Hill Publ.
6. Numerical Methods by **B.S.Grewal**, Khanna Publisher.
7. **S. D. Conte and Carl de Boor**, Elementary Numerical Analysis- An Algorithmic Approach (3rd Edition), McGraw-Hill, 1980.
8. **C. E. Froberg**, Introduction to Numerical Analysis (2nd Edition), Addison-Wesley, 1981.

E-Resourses:

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