Semester	**:**	**IV**		
Course No.	**:**	**AE-MATH-243**	**Credit Hrs.** **:**	**3(3+0)**
Course Title	**:**	**Engineering Mathematics-II**		

SYLLABUS

Objectives : To make the students acquainted with the application of various advanced mathematics such as vector calculus, Fourier series and Laplace transform and applications of numerical methods in engineering.

THEORY

Vector calculus: Scalar and vector point functions, vector differential operator Del, gradient of scalar point function, divergent and curl of vector point function and their physical interpretations, line, surface and volume integrals, Green's, Stock's and Divergence theorem (without proofs)

Functions of a complex variable: limit, continuity and analytic function, Cauchy-Riemann equations, harmonic functions.

Fourier series: Periodic functions, Euler's formulae, functions having arbitrary period, even and odd functions, half range series expansion, series expansion of functions with finite discontinuity.

Laplace Transform: Rules for Laplace transform and inverse Laplace transform applications to find solutions of ordinary and simultaneous differential equations.

Numerical Methods: Finite difference operators and their relationship, factorial notation. Newton's forward and backward interpolation formula, Newton's divide difference interpolation and Lagrange's interpolation formula, numerical differentiation and integration rule, numerical solutions of ODE by Taylor's series, Euler's method modified Euler's method, Runge-Kutta method of order four.

TEACHING SCHEDULE

THEORY [AE-MATH-243]

Lecture No.	Topic	Sub-topics/ Key Points	Weightage (%)
1 - 7	**Vector Calculus**	Scalar and vector point functions	15
		Vector differential operator Del	
		Gradient of scalar point function	
		Divergent and curl of vector point function and their physical interpretations	
		Line, surface and volume integrals	
		Green's, Stock's and Divergence theorem	
8 - 12	**Functions of a Complex Variable**	Limit, Continuity, Derivative	10
		Analytic function	
		Cauchy-Riemann equations	
		Harmonic functions	
13 - 19	**Fourier Series**	Periodic functions	15
		Euler's formulae	
		Functions having arbitrary period	
		Series expansion of functions with finite discontinuity	
		Even and odd functions	
		Half range series expansion	
20 - 31	**Laplace Transform**	Laplace Transform of elementary functions	25
		Properties of Laplace Transforms: Linearity, Shifting and Change of Scale Property	
		Laplace Transform of derivatives	
		Laplace Transform of an integral	
		Laplace Transform of function multiplied by t^n	
		Laplace Transform of function divided by t	
		Inverse Laplace Transform	
		Applications to find solutions of ordinary and simultaneous differential equations with constant coefficients	

Continued….

32 - 43	**Numerical Methods**	Finite difference operators and their relationship	25
		Newton's forward and backward interpolation formula	
		Newton's divide difference interpolation	
		Factorial notation	
		Lagrange's interpolation formula	
		Numerical differentiation	
		Numerical integration rule	
44 - 48	**Numerical solutions of Ordinary Differential Equations by**	Taylor's series method,	10
		Euler's method and modified Euler's method	
		Runge-Kutta method of order four	
		Total =	**100**

Suggested Readings [AE-MATH-243]:

1. Grewal B.S., 2015. Higher Engineering Mathematics. Khanna Publishers, Delhi. (43rd Edition)
2. Narayan, S. 2016. A Text Book of Vector. S. Chand and Co. Ltd., New Delhi.
3. Narayan, S. 2016. Differential Calculus. S. Chand and Co. Ltd., New Delhi.
4. Narayan, S. 2016. Integral Calculus. S. Chand and Co. Ltd., New Delhi.
5. Raman, B.V.2008. Engineering Mathematics. Tata McGraw Hill, New Delhi.