COMPUTATIONAL MATHEMATICS AND INTEGRAL CALCULUS

II Semester:AE / CE / ME

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AHS003	Foundation	3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes:15	Practical Classes: Nil				Total Classes: 60		

I. COURSE OVERVIEW:

The course focuses on more advanced Engineering Mathematics topics which provide with the relevant mathematical tools required in the analysis of problems in engineering and scientific professions. The course includes Types of Interpolation, Curve fitting, Numerical solutions of Ordinary Differential Equations, Multiple Integrals, Vector Calculus and Special functions. The mathematical skills derived from this course form a necessary base to analytical and design concepts encountered in the program.

II. OBJECTIVES:

The course should enable the students to:

I. Enrich the knowledge of solving algebraic, transcendental and differential equation by numerical methods.
II. Apply multiple integration to evaluate mass, area and volume of the plane.
III. Analyze gradient, divergence and curl to evaluate the integration over a vector field.
IV. Understand the Bessel's equation to solve them under special conditions with the help of series solutions.

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:

CO 1	**Apply** numerical methods for solving algebric ,transcendental equations and interpolating the data	Apply
CO 2	**Make use of** least squares methods for fitting straight lines, the second degree, exponential and power curves.	Apply
CO 3	**Utilize** numerical methods for solving linear differential equations with initial conditions	Apply
CO 4	**Identify** the limits of definite integrals for calculating the area ofsolids.	Understand
CO 5	**Extend** vector operations and theorems for finding line, surface andvolume integrals.	Apply
CO 6	**Determine** characteristics of special functions for solving proper and improper integrals	Understand

IV. SYLLABUS:

UNIT-I	ROOT FINDING TECHNIQUES AND INTERPOLATION	Classes: 09

Root finding techniques: Solving algebraic and transcendental equations by bisection method, method of false position, Newton-Raphson method; Interpolation: Finite differences, forward differences, backward differences and central differences; Symbolic relations; Newton's forward interpolation, Newton's backward interpolation; Gauss forward central difference formula, Gauss backward central difference formula; Interpolation of unequal intervals: Lagrange's interpolation.

UNIT-II	CURVE FITTING AND NUMERICAL SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS	Classes: 08

Fitting a straight line; Second degree curves; Exponential curve, power curve by method of least squares; Taylor's series method; Step by step methods: Euler's method, modified Euler's method and Runge-Kutta method for first order differential equations.

UNIT-III	MULTIPLE INTEGRALS	Classes: 10
Double and triple integrals; Change of order of integration. Transformation of coordinate system; Finding the area of a region using double integration and volume of a region using triple integration.		
UNIT-IV	**VECTOR CALCULUS**	**Classes: 08**
Scalar and vector point functions; Gradient, divergence, curl and their related properties; Solenoidal and irrotational vector point functions; Scalar potential function; Laplacian operator; Line integral, surface integral and volume integral; Vector integral theorems: Green's theorem in a plane, Stoke's theoremand Gauss divergence theorem without proofs.		
UNIT-V	**SPECIAL FUNCTIONS**	**Classes: 10**
Gamma function, properties of gamma function; Ordinary point and regular singular point of differential equations; Series solutions to differential equations around zero, Frobeniusmethod about zero; Bessel's differential equation: Bessel functions properties, recurrence relations, orthogonality, generating function, trigonometric expansions involving Bessel functions.		

Text Books:

1. Kreyszig, "AdvancedEngineeringMathematics", JohnWiley&SonsPublishers, 9th Edition, 2014.
2. B. S.Grewal, "HigherEngineeringMathematics", KhannaPublishers, 42nd Edition, 2012.

Reference Books:

1. R K Jain, S R K Iyengar, "AdvancedEngineeringMathematics", Narosa Publishers, 5th Edition, 2016.
2. S. S. Sastry, "Introduction Methods of Numerical Analysis", Prentice-Hall of India Private Limited, 5th Edition, 2012.

Web References:

1. http://www.efunda.com/math/math_home/math.cfm
2. http://www.ocw.mit.edu/resources/#Mathematics
3. http://www.sosmath.com/
4. http://www.mathworld.wolfram.com

E-Text Books:

1. http://www.keralatechnologicaluniversity.blogspot.in/2015/06/erwin-kreyszig-advanced-engineering-mathematics-ktu-ebook-download.html
2. http://www.faadooengineers.com/threads/13449-Engineering-Maths-II-eBooks

Course Home Page: