ADVANCED MATHEMATICS IN AEROSPACE ENGINEERING

I Semester: AE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
BAEB01	**Core**	3	-	-	3	30	70	100

Contact Classes: 45	Tutorial Classes: Nil	Practical Classes: Nil	Total Classes: 45

I. COURSE OVERVIEW:

The course focuses on more advanced Engineering Mathematics topics which provide the relevant mathematical tools required in the analysis of problems in engineering and scientific professions. The course includes root-finding techniques, Interpolation, and its applications, parabolic equations, Hyperbolic equations, Elliptic equations with applications. The mathematical skills derived from this course form a necessary base for analytical and design concepts encountered in the program.

II. COURSE OBJECTIVES:

The course should enable the students to:

I. Develop a basic understanding of a range of mathematics tools with emphasis on engineering applications.
II. Solve problems with techniques from advanced linear algebra, ordinary differential equations and multivariable differentiation.
III. Develop skills to think quantitatively and analyze problems critically

III. COURSE OUTCOMES:

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

CO 1	**Calculate** the unknown values of given equal and unequal spaced data by using Numerical methods.	**Apply**
CO 2	**Make use of** Lagrange's method and method of separation of variables for solving linear and nonlinear partial differential equations.	**Apply**
CO 3	**Interpret** the boundary conditions for functions of Parabolic equations by using partial derivatives.	**Apply**
CO 4	**Solve** the Parabolic equations by using Crank-Nicholson implicit method.	**Apply**
CO 5	**Compute** the numerical solution of the Hyperbolic Equations by using method of characteristics.	**Apply**
CO 6	**Apply** the properties of Elliptic Equations for curved boundary analysis by the five-point approximation to Polman's equation.	**Apply**

IV. SYLLABUS:

UNIT-I	PROBABILITY THEORY AND DISTRIBUTIONS	Classes: 09

Theory Probability Theory and Sampling Distributions. Basic probability theory along with examples. Standard discrete and continuous distributions like Binomial, Poisson, Normal, Exponential etc. Central Limit Theorem and its significance. Some sampling techniques like chi-square, t, F distributions.

UNIT-II	TESTING OF STATISTICAL HYPOTHESIS	Classes: 09

Testing a statistical hypothesis, tests on single sample and two samples concerning means and variances. ANOVA: One – way, Two – way with / without interactions.

UNIT-III	ORDINARY DIFFERENTIAL EQUATIONS	Classes: 09

Ordinary linear differential equations solvable by direct solution methods.

Non linear ordinary differential equations, solvable by direct solution methods.

UNIT-IV	PARTIAL DIFFERENTIAL EQUATIONS AND CONCEPTS IN SOLUTION TO BOUNDARY VALUE PROBLEMS	Classes: 09

First and second order partial differential equations; canonical forms

UNIT-V	NUMERIC'S FOR ORDINARY DIFFERENTIAL EQUATIONS AND PARTIAL DIFFERENTIAL EQUATIONS	Classes: 09

Methods for first order ordinary differential equations, multistep methods, methods for systems and higher order ordinary differential equations, methods for elliptic partial differential equations, Neumann and mixed problems, irregular boundary, methods for parabolic and hyperbolic partial differential equations.

Text Books:

1. J. B. Doshi, "Differential Equations for Scientists and Engineers", Narosa, New Delhi.
2. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, 43rd Edition, Delhi.

Reference Books:

1. S. P. Gupta, "Statistical Methods", S. Chand & Sons, 37th Revised Edition.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley India, 9th Edition 2014.

Web References:

1. http://www.efunda.com/math/math_home/math.cfm
2. http://www.ocw.mit.edu/resourcs/#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