BMA -102 MATHEMATICS –II
(I B.Tech, All Branches)
(Effective from Session 2017-18)

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OBJECTIVE: The objective of this course is to educate the students about:

- ordinary differential equations and their applications as mathematical models.
- series solutions of ordinary differential equations and special functions.
- Laplace transform, Fourier series, differential equations and boundary value problems.

Course Outcome

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

CO1	solve first and higher order ordinary differential equations.	Apply, Analyse Evaluate,
CO2	find series solutions of ordinary differential equations and learn Bessel's and Legendre's function and its applications.	Apply, Analyse Evaluate,
CO3	solve IVP_S and BVP_S using Laplace Transform.	Apply, Analyse Evaluate,
CO4	find Fourier series expansion of given function and solve partial differential equations.	Apply, Analyse Evaluate,
CO5	solve boundary value problems using variable separable method etc.	Apply, Analyse Evaluate,

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1	2	-	-	1	-	1	-	3
CO2	3	3	2	1	2	-	-	1	-	1	-	3
CO3	3	3	2	1	2	-	-	1	-	1	-	3
CO4	3	3	2	1	2	-	-	1	-	1	-	3
CO5	3	3	2	1	2	-	-	1	-	1	-	3
Average	3	3	2	1	2	-	-	1	-	1	-	3

1: Slight (Low) 2: Moderate (Medium) 3:Substantial (High) *If there is no correlation, put "-"*

Detailed Syllabus:

Unit- I: Ordinary Differential Equations:

First order ordinary differential equations, Existence and uniqueness of solutions of initial value problems, Solution of higher order linear differential equation with constant coefficients, Solution of second order differential equations by changing dependent and independent variables, Cauchy- Euler equations, Methods of diagonalization, undetermined coefficients and variation of parameters: Nonlinear equations, Linear and nonlinear models, Initial value and boundary value problems, Systems of equations. Application of differential equations as mathematical models, Models from population dynamics, Newton's Law of cooling, electric circuit, Oscillation of spring.

Unit-II: Series Solutions of Ordinary Differential Equations & Special Functions

Ordinary and singular points of an equation, Power series solutions, Frobenius method, Bessel's and Legendre's equations and their series solutions, Properties of Legendre's polynomials and Bessel's functions, Generating

functions, Fourier- Bessel series and Fourier-Legendre series expansions, sturm- Liouville Problem and related theorems.

Unit-III: Laplace Transform:

Laplace transform, Existence conditions and ROC, Inverse Laplace transform, Operational properties, Convolution, Unit step function, Dirac-Delta function, Periodic functions, Applications to solve IVP and BVP: Linear ordinary differential equations, Transfer function and control system analysis.

Unit-IV: Fourier Series and Partial Differential Equations:

Orthogonal functions, Fourier series, existence conditions, Fourier series of even and odd functions, convergence of Fourier series, Fourier half range series, Harmonic analysis, Complex Fourier series and frequency spectrum. Development of partial differential equations and Solutions, Solution of first order partial differential equations, Solutions of linear higher order partial differential equations with constant coefficients.

Unit-V: Boundary-Value Problems:

Classification of second order partial differential equations, Derivation of heat and wave equations, solutions in rectangular coordinates by separation variable method, solution of Laplace equation, D'Alemberts solution of wave equation, Non-homogeneous equations and boundary conditions, Orthogonal series expansions, Fourier series in two dimensions, Boundary value problems in polar, cylindrical and spherical coordinate systems and their solutions.

Books Recommended:

1. E.A. Coddington, An Introduction to Ordinary Differential Equations, Practice Hall, 1995.

2. I.N. Sneddon, Elements of Partial Differential equations, McGraw-Hill 1957.

3. Dennis G, Zill & Michael R. Cullen; Advanced Engineering Mathematics, Jones & Bartlett Publishers. 2nd Edition.

4. R.K. Jain & S.R.K. Iyengar; Advanced Engineering Mathematics, Narosa Publishing House, 2002.

5. Erwin Kreyszig; Advaced Engineering Mathematics, John Wiley & Sons 8th Edition.