Annexure 2

APPLIED MATHEMATICS – II
(ORDINARY & PARTIAL DIFFERENTIAL EQUATIONS AND TRANSFORM)

Course Code: MAT 201 **Credit Units: 04**

Total Hours: 40

Course Objective:

The objective of this course is to familiarize the prospective engineers with techniques in ordinary and partial differential equations, transforms and complex analysis. It aims to equip the students to deal with advanced level of mathematics and applications that would be essential for their disciplines.

Course Contents:

Module I: Ordinary differential equations: (9 Hours)

Equation of first order and first degree, Exact, linear and Bernoulli's equations, Equations of first order and higher degree: equations solvable for p, equations solvable for y, equations solvable for x and Clairaut's type. Higher order linear differential equations with constant coefficients, Second order linear differential equations with variable coefficients, method of variation of parameters, Solution by series method.

Module II: Partial Differential Equations: (8 Hours)

Formation of Partial Differential Equations, First order partial differential equations, solutions of first order linear PDEs; Solution to homogenous and non-homogenous linear partial differential equations of second order by complimentary function and particular integral method with constant coefficients. Non linear partial differential equation of first order, Charpit's method.,Separation of variable method for the solution of wave and heat equations.

Module III: Laplace Transform and Fourier series: (9 Hours)

Laplace Transform: Introduction of Laplace Transform, Laplace Transform of elementary functions, properties of Laplace Transform, change of scale property, second shifting property. Laplace transform of the derivative, inverse Laplace transform and its properties. Convolution theorem. Applications of Laplace Transform to solve the ODEs. Introduction of Fourier series, Fourier series for discontinuous functions, Fourier series for even and odd function, Half range series.

Module IV: Complex Variable – Differentiation: (7 Hours)

Function of complex variable, differentiation, analytic functions, Cauchy-Riemann equations, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties; conformal mappings, Mobius transformations and their properties.

Module V: Complex Variable – Integration: (7 Hours)

Contour integrals, Cauchy-Goursat theorem (without proof), Cauchy Integral formula (without proof), Liouville's theorem and Maximum-Modulus theorem (without proof); Taylor's series, zeros of analytic functions, singularities, Laurent's series; Residues, Cauchy Residue theorem (without proof), Evaluation of definite integral involving sine and cosine, Evaluation of certain improper integrals.

Course Outcomes:

- Upon completion of this course, students will be able to solve field problems in engineering involving ODEs, PDEs.
- The effective mathematical tools for the solutions of differential equations that model physical processes.
- The students will be able to use Laplace transform to solve differential equations.
- The student will be able to solve PDEs by using the concept of Fourier series.
- The concept of functions of complex variables with respect to differentiation and integration.
- The computation of some special real integrations using complex integration.

Examination Scheme:

Components	A	CT	S/V/Q/HA	EE
Weightage (%)	5	15	10	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination; A: Attendance

Suggested Text/Reference Books:

- G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
- Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
- W. E. Boyce and R. C. Di Prima, Elementary Differential Equations and Boundary Value Problems, 9th Edition., Wiley India, 2009.
- S. L. Ross, Differential Equations, 3rd Edition, Wiley India, 1984.
- E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall of India, 1995.
- E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
- N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
- B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.