Kerala Technological university KTU First year B.tech Syllabus
for **MA102Differential Equations**

Course No. : MA102

Course Name: Differential Equations
L-T-P-Credits: 2-1-0-3

Year of Introduction: 2015
Course Objectives:

Students will be able to understand the fundamental concepts, theories and methods in Differential Equations and will be able to apply the concepts and methods described in the syllabus in various engineering and technological applications.

Syllabus:

First order ordinary differential equations, second order ordinary differential equations, higher order linear differential equations, Fourier series, partial differential equations, applications of partial differential equations.
Expected outcome:

Students must understand the fundamental concepts, theories and methods in differential equations and will be able to apply the concepts and methods described in the syllabus through class room teaching, text books, assignments and practice using software.

Text Book:

1. Erwin Kreyszig: Advanced Engineering Mathematics, Wiley
2. A C Srivastava, P K Srivasthava, Engineering Mathematics Vol 2. Phi Learning Private Ltd

References:

1. S. L. Ross. Differential Equations, Wiley
2. Mathematical Methods For Science And Engineering. Datta, Cengage Learing,
3. B. S. Grewal. Higher Engineering Mathematics, Khanna Publishers, New Delhi.
4. N. P. Bali, Manish Goyal. Engineering Mathematics, Lakshmy Publications
5. D. W. Jordan, P Smith. Mathematical Techniques, Oxford University Press
6. C. Henry Edwards, David. E. Penney. Differential Equations And Boundary Value Problems.Computing And Modeling, Pearson

Module 1 Contents

FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS (Book 1. Sections: 1.1, 1.3, 1.4, 1.5, 1.6) Introduction –Basic Concepts, Modelling. Separable ODEs, Modelling- Exact ODEs, Integrating Factors-Linear ODEs, Bernoulli Equation, Population Dynamics-Orthogonal Trajectories. (Theorems need not be proved. Sketching, plotting and interpretation of solutions of differential equations using suitable software)

Module 2 Contents

SECOND ORDER LINEAR ORDINARY DIFFERENTIAL EQUATIONS (Book 1. Sections: 2.1, 2.2, 2.4, 2.7, 2.8, 2.10) Homogeneous Linear ODEs of Second Order -- Homogeneous Linear ODEs with Constant Coefficients-Modelling of free oscillations of a Mass Spring system –Non-Homogeneous ODEs-Modelling: Forced Oscillations, Resonance – Solution by Variation of Parameters. (Theorems need not be proved. Sketching, plotting and interpretation of solutions of differential equations using suitable software)

Module 3 Contents

HIGHER ORDER LINEAR ORDINARY DIFFERENTIAL EQUATIONS (Book 1. Section: 3.1, 3.2, 3,2) Homogeneous linear ODEs- Initial value problem-Existence, uniqueness (without proof)- Homogeneous linear ODEs with constant coefficients- Non-Homogeneous linear ODEs-Method of variation of Parameters-Bending of elastic beam under a load. (Theorems need not be proved)

Module 4 Contents

FOURIER SERIES (Book 2. Section: 4.1, 4.2, 4.3, 4.4) Periodic Functions-Orthogonality of Sin and Cosine functions- Euler's formula-Fourier series for even and odd functions-Half range expansions- half range Fourier cosine series - Half range Fourier sine series. (Use of soft ware's to understand the convergence of Fourier series, sketching of partial sums)

Module 5 Contents

PARTIAL DIFFERENTIAL EQUATION (Book 2. Section: 5.1.1, 5.1.2, 5.1.3, 5.1.4, 5.1.5, 5.1.9, 5.1.10, 5.2.6, 5.2.7, 5.2.8, 5.2.9, 5.2.10) Formation of PDEs-solutions of a first order PDE- General integral from complete solution-Method for solving first order PDE-Lagrange's Method-Linear PDE with Constant Coefficients-Solution of Linear Homogeneous PDE with Constant Coefficient.

Module 6 Contents

APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS (Book 2. Section: 6.1, 6.2, 6.3, 6.4, 6.7, 6. 8, 6. 9, 6.9.1, 6.9.2) Method of Separation of Variables- Wave equation-Vibrations of a Stretched sting, Solution of one dimensional equation-The equation of Heat conduction – One dimensional Heat equation- Solution of one dimensional Heat equation –A long insulated rod with ends at zero temperatures- A long insulated rod with ends at non-zero temperatures.