MANGALORE UNIVERSITY

DEPARTMENT OF MATHEMATICS

MSC MATHEMATICS

MTS 456	**Ordinary Differential Equations**	**4 Credits (48 hours)**

Prerequisite: Knowledge of syllabi prescribed for the courses MTH 402 (Linear Algebra -I) and MTH 403 (Real Analysis- I).

Course Outcome: Students will have the knowledge and skills of solving ordinary differential equations, boundary value problems, finding power series solutions of ordinary differential equations.

Course Specific Outcome: At the end of the course Students will have the knowledge and skills to**e**xplain Demonstrate accurate and efficient use of the following advanced topics in various situations –

- Notion of Linear dependence and the Wronskian
- The Basic theory for linear equations
- Solving differential equations using Power Series method
- The Legendre polynomials, Bessel's functions
- Solving Systems of first order equations
- Existence and uniqueness theorem.
- The fundamental matrix, Non-homogeneous linear systems, Linear systems with periodic coefficients.

Unit I - Linear Differential Equations of Higher Order:

Linear dependence and the Wronskian, Basic theory for linear equations, Method of variation of parameters, Reduction of n^{th} order linear homogeneous equation, Homogeneous andnon-homogeneous equations with constant coefficients.

(12 Hours)

Unit II - Solutions in Power Series:

Second order linear equations with ordinary points, Legendre equation and Legendre polynomials, Second order equations with regular singular points, Bessel equation.

(18 Hours)

Unit III - Systems of Linear Differential Equations:

Systems of first order equations, Existence and uniqueness theorem. The fundamental matrix, Non-homogeneous linear systems, Linear systems with periodic coefficients.

(10 Hours)

Unit IV - Existence and Uniqueness of solutions :

Equations of the form $x' = f(t, x)$, Method of successive approximation, Lipschitz condition, Picard's theorem, Non uniqueness of solutions, Continuation of solutions.

(8 Hours)

References

[1] S. G. Deo and V. Raghavendra, *Ordinary Differential Equations and Stability Theory*, Tata McGraw Hill, 1980.

[2] A. Coddington,*An Introduction to Ordinary Differential Equations*, Prentice Hall of India, 2013.

[3] A. Coddington and N. Levinson, *Theory of Ordinary Differential Equations*, Krieger, 1984.

[4] M. W. Hirsh and S. Smale, *Differential Equations, Dynamical Systems and Linear Algebra*, Academic Press, New York, 1974. 5. V. I. Arnold, Ordinary Differential Equations, MIT Press, Cambridge, 1981.

[5] Shepley L. Ross, *Differential Equations*, Wiley, 2004.