

Module Code: MATH-312  
Module Title: **Ordinary Differential Equations**  
Module Rating: 3 Cr. Hours

### **First and Second Order Differential Equations**

- Review of ordinary differential equations
- Techniques of solving second and higher differential equations

### **Sturm Liouville Systems**

- Some properties of Sturm-Liouville equations
- Regular, periodic and singular Sturm-Liouville systems and its applications

### **Series Solutions of Second Order Linear Differential Equations**


- Review of power series
- Series solution near an ordinary point
- Series solution near regular singular points.

### **Series Solution of Some Special Differential Equations**

- Hypergeometric function  $F(a, b, c; x)$  and its evaluation
- Series solution of Bessel equation
- Expression for  $J_n(X)$  when  $n$  is half odd integer, Recurrence formulas for  $J_n(X)$
- Series solution of Legendre equation
- Rodrigues formula for polynomial  $P_n(X)$
- Generating function for  $P_n(X)$
- Recurrence relations, orthogonal polynomials
- Orthogonality of Bessel functions
- Expansions of polynomials
- The three term recurrence relation

### **Recommended Books**

1. E. D. Rainville, *Special Functions* (Macmillan and Company, 1971)
2. G. E. Andrews, R. Askey and R. Roy, *Special Functions* (Cambridge University Press, 2000)
3. D. G. Zill, *Advanced Engineering Mathematics* (Jones and Bartlett Publishers, 2005)
4. W. E. Boyce and R. C. DiPrima, *Elementary Differential Equations and Boundary Value Problems* (John Wiley and Sons, 2005)
5. N. M. Temme, *Special Functions, An Introduction to the Classical Functions of Mathematical Physics* (John Wiley and Sons, 1996)
6. E. T. Whittaker, and G. N. Watson, *A Course of Modern Analysis* (Cambridge University Press, 1958)

  
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