

B.Sc. DEGREE PROGRAMME
MATHEMATICS (CORE COURSE)

SIXTH SEMESTER

MM6B11 : DIFFERENTIAL EQUATIONS

5 hours/week

4 credits

30 weightage

Text Book : W.E. Boyce & R.C. Dippima, Elementary Differential Equations and Boundary Value Problems. John Wiley & Sons, 7th Edn.

Module I (24 hrs)

(a) Introduction

- 1.1 Some Basic Mathematical Models; Direction Fields
- 1.2 Solutions of some Differential equations
- 1.3 Classification of Differential Equations
- 1.4 Historical Remarks

(Chapter 1, Sec. 1.1.1.2, 1.3, 1.4)

(b) First order differential equations

- 2.1 Linear equations with variable coefficients
- 2.2 Separable equations
- 2.3 Modeling with first order equations
- 2.4 Differences between linear and non linear equations
- 2.6 Exact equations and integrating factors
- 2.8 The existence and uniqueness theorem (proof omitted)

(Chapter 2 – Sec. 2.1, 2.2, 2.3, 2.4, 2.6, 2.8)

Module II (29 hrs)

(a) Second Order Linear Differential Equations

- 3.1 Homogeneous equation with constant coefficients
- 3.2 Fundamental solutions of Linear Homogeneous equations
- 3.3 Linear independence and Wronskian
- 3.4 Complex roots of characteristic equations
- 3.5 Repeated roots; Reduction of order
- 3.6 Non homogeneous equations; Method of Undetermined coefficients
- 3.7 Variation of parameters

3.8 Mechanical and Electrical vibrations (upto and including e.g. 1)

(Chapter 3 – Sec. 3.1 to 3.8)

(b) Systems of First Order Linear equations

7.1 Introduction

7.4 Basic theory of systems of first order Linear Equations

(Chapter 7 – Sec. 7.1, 7.4)

Module III : Laplace Transforms (17 hrs)

6.1 Definition of Laplace Transforms

6.2 Solution of Initial Value Problem

6.3 Step functions

6.5 Impulse functions

6.6 The Convolution Integral

(Chapter 6 – Sec. 6.1, 6.2, 6.3, 6.5, 6.6)

Module IV : Partial Differential Equations and Fourier Series (20 hrs)

10.1 Two point Boundary value problems

10.2 Fourier Series

10.3 The Fourier Convergence Theorem

10.4 Even and odd functions

10.5 Separation of variables; Heat conduction in a rod

10.7 The Wave equation: Vibrations of an elastic string

(Chapter 10 – Sec. 10.1, 10.2, 10.3, 10.4, 10.5, 10.7)

References

1. S.L. Ross : Differential Equations, 3rd ed., Wiley.
2. A.H. Siddiqi & P. Manchanda : A First Course in Differential Equation with Applications, Macmillan, 2006.
3. E.A. Coddington : An Introduction to Ordinary Differential Equation, PHI.
4. G.F. Simmons : Differential Equation with Application and Historical Notes, Second ed.
5. M. Braun : Differential Equations and their Applications, Springer.