

**Department Of Computer Science and Engineering**  
**Kathmandu University**  
**Dhulikhel, Kavre**



**Differential Equations and Complex Variables**  
**207**

**Course: MATH**

**Level: B.E./B.Sc 2<sup>nd</sup> Year 2<sup>nd</sup> Semester**

**Credit Hours: 4**

**Contents:**

**A. Differential Equations**

**1. First Order Differential Equations**

- 1.1 Introduction
- 1.2 Separable Equations
- 1.3 Exact Differential Equations
- 1.4 Integrating Factors and Bernoulli's Equations
- 1.5 Linear First Order Differential Equations with Some Physical Applications

**2. Linear Second Order Differential Equations**

- 2.1 Introduction
- 2.2 The fundamental Theorem
- 2.3 Wronskians and General Solution
- 2.4 Homogeneous Second Order Linear Equations with Constant Coefficients
- 2.5 Damped and Undamped Motions
- 2.6 Non-homogeneous Second Order Equations.

**3. Series Solutions of Differential Equations**

- 3.1 Introduction
- 3.2 Power Series Solution of Differential Equations
- 3.3 Legendre's Equation Legendre's Polynomials and Functions
- 3.4 Bessel's Equations and Functions.

**4. Partial Differential Equations**

- 4.1 Introduction
- 4.2 Derivation of the Wave and Heat Equations
- 4.3 Fourier Series Solutions
- 4.4 Laplace's Equation
- 4.5 Gravitational Potential
- 4.6 The D'Alembert Solutions
- 4.7 Separation of Variables
- 4.8 Fourier Series Solution of Boundary Value Problems
- 4.9 Fourier- Bessel and Fourier - Legendre Solution of Boundary Value Problems
- 4.10 Laplace Transform and Fourier Transform Solution of Boundary Value Problems.

## **5. Laplace Transforms**

- 5.1 Introduction
- 5.2 Definitions of Laplace Transform
- 5.3 Laplace Transform of Derivatives and Integrals
- 5.4 Derivatives and Integral of Laplace Transforms
- 5.5 Inverse Laplace Transforms
- 5.6 Laplace Transform of Periodic Functions
- 5.7 Partial Fractions
- 5.8 Convolutions
- 5.9 Laplace Transform Solutions of Differential Equations with Polynomial Coefficients.

## **B. Complex Variables**

### **6. Complex Variables**

- 6.1 Complex Numbers,
- 6.2 Complex Functions
- 6.3 Polar Forms
- 6.4 Analytic Functions
- 6.5 Complex Integration
- 6.6 Green's Theorem
- 6.7 Cauchy's Integral Formulae
- 6.8 Taylor Series
- 6.9 Laurent Series
- 6.10 Singularities
- 6.11 Residues
- 6.12 Conformal mapping.

### **Recommended Text Books**

1. E.Kreyszig: *Advanced Engineering Mathematics*, Wisley Eastern Ltd.
2. M. C. Potter and J Goldberg: *Mathematical Methods*, 2nd Edition, TMH