

TRIBHUVAN UNIVERSITY
INSTITUTE OF SCIENCE AND TECHNOLOGY
SCHOOL OF MATHEMATICAL SCIENCES
Bachelor in Mathematical Sciences (B.Math.Sc.)

Course of Study

Code No.: MSMT 202

Paper: **Differential Equations**

Nature: Theory

Full Mark: 75

Pass Mark: 30

Credit: 3

Course Description:

This course is designed for third semester of B.Math.Sc. program. The main aim of this course is to provide knowledge of Differential Equations.

Objectives

The objective of this course is to acquaint students with the basic concepts of differential equation like first order linear and nonlinear differential equations, second order differential equations and higher order linear equations as well as partial differential equation. It aims at enabling students to build good knowledgebase in the subject of ordinary differential equations and partial differential equation.

Mode of Delivery:

The course will be taught by lecture (48 hrs), and problem solving and class discussion (24 hrs). The use of computers/laptops for problem solving will be encouraged as far as possible..

Contents:

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| Unit 1 Applications of integration | 8 hrs |
| Definition and classification of differential equations, Solutions of differential equations, Some mathematical models and direction fields. | |
| Unit 2 First Order Linear and Nonlinear Differential Equations | 10 hrs |
| Integrating factors, Separable equations, Modeling with first order equations, Difference between the linear and nonlinear equations, Autonomous equations and population dynamics, Exact equations and integrating factors, Numerical approximations, Euler's method, Existence and uniqueness theorem, First order difference equations. | |
| Unit 3 Second Order Linear Equations | 10 hrs |
| Homogeneous equations with constant coefficients, Solutions of linear homogeneous equation, The Wronskian, Complex roots of the characteristic equation, Repeated roots, Reduction of order, Nonhomogeneous equations, Method of undetermined coefficients, Variation of parameters, Mechanical and electric vibrations, Forced vibrations. | |
| Unit 4 Higher Order Linear Equations | 10 hrs |
| General theory of nth order linear equations, Homogeneous equations with constant coefficients, Method of undetermined coefficients, Method of variation of parameters. | |
| Unit 5 System of First Order Linear Equations | 10 hrs |
| Introduction, Review of matrices, Linear algebraic equations; Linear independence, Eigenvalues, Eigenvectors, Basic theory of first order linear equations. | |

Text Book:

1. Boyce, W. and DiPrima, R.; *Elementary Differential Equations and Boundary Value Problems*, 9th Ed., Wiley India.

Reference Books:

1. James C. Robinson; *An Introduction to Ordinary Differential Equations*, Cambridge University Press
2. *Differential Equations*, Third Edition, Shepley L. Rose, James Wiley India, 2010.

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