

**COURSE CODE: MATH 3426**

**COURSE NAME: Numerical Solution of Ordinary Differential Equations**

(3 Credits) (Level 3) (Semester 2)

**Pre-requisites:**

MATH2401 - Element of Mathematical Analysis **AND**

MATH2410 - A First Course in Linear Algebra.

**Course Content:**

- **Essential concepts:** Review of Calculus, finite differences, existence and uniqueness theorem, initial value problems (IVPs), boundary value problems (BVPs), boundary eigen value problems (BEVPs).
- **Error Analysis:** Roundoff error, truncation error, error propagation, stability and convergence of a numerical scheme.
- **Solution of IVPs:** Euler's method, Runge-Kutta method, Predictor-Corrector methods, stability analysis.
- **System of linear equations and higher order ODEs.**
- **Stiff differential equations.**
- **Solution of BVPs:** Solution of linear and nonlinear BVPs by shooting, finite difference methods and collocation method.
- **Solution of BEVPs:** Finite difference and shooting methods.
- **Practical implementation** in the computer laboratory.

**Evaluation:**

- |                                |     |
|--------------------------------|-----|
| • Final Examination (2 hours)  | 60% |
| • Course Work:                 | 40% |
| One in-course Test (1 hour)    | 20% |
| Two Lab assignments (10% each) | 20% |