Course Code	**EM 315**
Course Title	**Numerical Methods for Civil Engineers**
No. of Credits	**2**
Pre-requisites	**-**
Compulsory/Optional	**Compulsory**

Aim(s): To introduce numerical methods for solving mathematical models of Civil Engineering problems.

Intended Learning Outcomes:
On successful completion of the course, the students should be able to;

- Explain, apply and analyze numerical methods for finding roots of equations, interpolation and curve fitting.
- Explain, apply and analyze numerical methods for solving ordinary and partial differential equations.
- Select suitable algorithms and apply for solving partial differential equations related to Civil Engineering problems

Time Allocation (Hours): Lectures 26 Tutorials 04 Practical Assignments

Course content/Course description:

- **Error analysis**
- **Solutions to nonlinear equations:** bisection method; method of false position; fixed-point iteration; Newton-Raphson's method; secant method.
- **Numerical solutions to systems of linear equations:**
  Gaussian elimination; Jacobi method; Gauss Seidel method
- **Interpolation:** Newton interpolating polynomial; Lagrange interpolating polynomial; Spline interpolation.
- **Approximation and curve fitting:** Linear regression; polynomial regression;
- **Numerical Quadrature**: Gaussian Quadrature
- **Numerical solutions to ordinary differential equations:**
  Initial value problems: Euler method, Runge - Kutta methods;
  Boundary value problem: Finite difference method
- **Numerical solutions for partial differential equations:**
  Finite difference method: Elliptic equations:1D and multi-dimensional problems; parabolic problems;
  Integral Equation Methods: Collocation method, Galerkin method and Weighted Residual method ;

Recommended Texts :

- C. Chapra and R.P.Canale, (2010). *Numerical Methods for Engineers*, 6th edition, McGraw-Hill.

Assessment	Percentage Mark
In-course Tutorials/Quizzes Mid Semester Examination	 20 30
End-Semester	50