Course Code	**EM 215**
Course Title	**Numerical Methods**
No. of Credits	**3**
Pre-requisites	**-**
Compulsory/Optional	**Compulsory for Computer Engineering specialization**

Aim(s): To apply and analyze numerical methods for modeling and simulation.

Intended Learning Outcomes:

On successful completion of the course, the students should be able to;

- Demonstrate the limitationsand identifythe need of approximation, of numerical methods.
- Apply and derive numerical methods to solve nonlinear equations and solve systemsof linear equations.
- Derive and apply interpolation and integration methods and their errors.
- Solve ordinary differential equations and partial differential equations numerically.

Time Allocation (Hours): Lectures 30   Tutorials 05Practical   Assignments 20

Course content/Course description:

- **Introduction to numerical methods:**Taylor series,error Analysis, rate of convergence**.**
- **Solutions to nonlinear equations:** Bisection method, Newton-Raphson method, fixed point iteration, systems of nonlinear equations.
- **Solutions to systemsof linear equations**: Gaussian elimination, LU   factorization, Iterative methods with relaxation.
- **Approximation and curve fitting:** least squares approximation,Fourier approximation.
- **Interpolation:**Lagrange and Newton Interpolations, piecewise and spline interpolations.
- **Numerical calculus:**differentiation and integration(Newton-Cotes methods, Gaussian integration methods).
- **Numerical solutions to ordinarydifferential equations:**single step methods (Taylor method, Runge-Kutta method), adaptive step size mechanisms.
- **Numerical solutions to partial differential equations:**explicit and implicit finite difference methods.
- **Computational labs:** covering selected topics & appropriate problems from the respective fields.

Recommended Texts :

- S. S. Sastry, Introductory Methods of Numerical analysis, (2012), PHILearning Pvt. Ltd.
- Steven Chapra and Raymond Canale,Numerical Methods for Engineers, 6th edition, (2009), McGraw-HillScience/Engineering/Math.(2009).
- M.K.Jain, Numerical Methods forScientific and Engineering Computations, (2003), New Age International.
- Eugene Isaacson and Herbert Bishop Keller, Analysis of Numerical Methods Reprint edition,(1994),Dover Publications.

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