**COURSE OUTLINE**

**Course Code: CSE 218**

**Course Title: Numerical Methods**

**Level/Term: 2/I Section: A/B**

**Academic Session: January, 2019**

**Course Teacher:**

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**Course Outline:**

*Introduction; Solution of Non-linear Equations: Fixed Point Iteration, Bi-Section method, False Position method, Newton-Raphson method, Bairstow’s Method; Solution of Linear equations: Triangular systems and back substitution, Gauss-Jordan elimination method, Pivoting, LU-factorization, Cholesky’s method, Dolittle and Crout factorization; Interpolation and Approximation: Taylor’s Series, Lagrangian interpolation, Divided differences formula, Newton’s forward and backward interpolation, Spline interpolation; Differentiation: Numerical differentiation, Richardson’s extrapolation; Integration: Newton’s-Cote integration, Trapezoidal rule, Simpson’s rule, Romberg’s integration; Ordinary Differential Equations: Euler’s method, Picard’s method, Milne’s method, Taylor’s series method, Runge-Kutta method; Curve Fitting: Least squares lines, Least square polynomials, Non-linear curve fitting; Numerical Optimization: Golden Ratio search, Newton’s search, Powell’s method, Gradient search.*

**Learning Outcomes/Objectives:**

After undergoing this course, students should be able to:

* Understanding the basic concepts and theory of numerical methods.
* Perform detailed analysis of different algorithms of numerical methods.
* Apply the knowledge acquired in the course to solve real life problem.

**Assessment**

Offline: 35-40%

Online: 20-25%

Attendance: 10%

Quiz: 25-35%

**Learning Resources:**

1. Numerical Methods for Engineers: Steven C. Chapra and Raymond P.Canale.

**Weekly schedule:**

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| **Week** | **Topics** |
| Week 1 | Introduction to Numerical methods, Introduction to Python |
| Week 2 | Advanced Python, graphical tools for python, numpy, pandas |
| Week 3 | Approximation and Round-off error, Truncation error and Taylor Series, Roots of equation (Bracketing method & Open Methods)  Declaration of offline |
| Week 4 | Offline submission + online |
| Week 5 | Introduction to Linear System |
| Week 6 | Optimization and Remaining part of Linear System  Declaration of offline on Linear Systems |
| Week 7 | Offline submission |
| Week 8 | Curve fitting + quiz  Declaration of offline on curve fitting |
| Week 9 | Offline submission + online |
| Week 10 | Numerical Differentiation and Integration  Declaration of offline on Numerical Differentiation and Integration |
| Week 11 | Offline submission + online |
| Week 12 | Ordinary and partial differential equation  Declaration of offline on differential equation |
| Week 13 | Offline submission |
| Week 14 | Quiz |