Course Code **Course Title** **No. of Credits** **Pre-requisites** **Compulsory/Optional**	**EM 203** **Numerical Methods in Chemical & Process Engineering** **3** **-** **Compulsory for Chemical & Process Engineering specialization**

Aim(s):

Intended Learning Outcomes:

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

- Use of modern computational and mathematical techniques in chemical and process engineering.
- Acquiring the knowledge, understanding and skills required for the use of pertinent software and appropriate programming language.
- Ability to solve sets of linear and nonlinear algebraic equations, ordinary differential equations, and differential-algebraic (DAE) systems in chemical and process engineering.
- Ability to solve partial differential equations obtained from transport phenomena in chemical and process engineering.

Time Allocation (Hours): Lectures 32 Tutorials Practical Assignments 13

Course content/Course description:

- **Introduction to computing software**
- **Introduction to numerical methods:** Error analysis.
- **Numerical solutions to systems of linear equations:** Gaussian elimination, Iterative methods, Relaxation methods
- **Numerical solutions to non-linear equations:** Fixed point iteration, Newton-Raphson method, System of non-linear equations
- **Numerical calculus:** Differentiation, Interpolation method, Finite difference integration, Newton-Cotes methods, Gaussian integration methods.
- **Numerical solutions to ordinary differential equations:**Initial value problems: Euler method, Runge-Kutta methods. Boundary value problems: Finite difference Method. Solving system of ordinary differential equations and higher order differential equations. Adaptive step size mechanisms
- **Numerical solutions to partial differential equations:**Explicit and implicit finite difference methods; Basics of finite element methods
- **Assignments / Projects in chemical & process engineering(** Assignments / Projects component must be coordinated and examined by the Department of C&PEng. since this components deal with examples from chemical and process engineering)

Recommended Texts :

- Steven C Chapra, Raymond P Canale. Numerical Methods for Engineers, 6th edition (2010)ISBN : 0073401064

Assessment	**Percentage Mark**
In-course Assignments / Projects Mid Semester Examination	 40 20
End-semester	40