

5 <sup>th</sup> Semester	REI5D003	Process Simulation & Modelling	L-T-P 3-0-0	3 CREDITS
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## Process Simulation & Modelling

### **Module-I:**

**(12 hours)**

Introduction to process control, control objectives and benefits, Dynamic behavior of process control systems: First and Second order systems, series and parallel structures of simple systems, Recycle structures, staged processes.

Concepts of system modeling: Definition, principles & modeling procedure, need of modeling with respect to engineering and non-engineering systems, Classification of modeling, fundamentals of chemical process dynamics, continuity equation, equation of motion, transport equation, equation of state, equilibrium, chemical kinetics, Input-output model and its transfer function, Dynamic modeling of tank reactor system. Vaporizer flashes drum, batch reactor, Binary distillation column and boiler.

### **Module-II:**

**(10 hours)**

Computational methods for solving algebraic & differential equations: Solution of algebraic equation: Interval Halving, Newton Raphson method, Solution of differential equation: Runge-Kutta method, Euler method,

Intelligent controllers: Adaptive control system (Self tuning regulator & Model reference adaptive controller), inferential control systems

### **Module-III:**

**(8 hours)**

**Optimization:** Optimization techniques and application, Single and multivariable optimization, line programming, Sequential quadratic programming & reduced gradient optimization technique & application

**Simulation:** Basic principles of simulation, Use of system simulation tools for modeling & simulation, Types of system simulation.

### **Books:**

- [1] Process modeling, simulation and control for chemical Engineers, WilliamL.Luyben, MC-GrawHill Private Ltd.
- [2] Process Control: ThomasE.Marlin, McGrawHill Publication.
- [3] Process control principle and Application- SurekhaBhanot, 1st Edition, Oxford
- [4] Simulation modelling & analysis–Law Kelton(MN)
- [5] System simulation with digital computer–NarsingDeo