MODELLING AND SIMULATION OF PROCESS

Introduction to modeling, a systematic approach to model building, classification of models. Conservation principles, thermodynamic principles of process systems.

Development of steady state and dynamic lumped and distributed parameter models based on first principles. Analysis of ill-conditioned systems.

Development of grey box models. Empirical model building. Statistical model calibration and validation. Population balance models. Examples.

Introduction to cement manufacturing-Operation of cement mill and cement kiln. Modeling and simulation of unit operation and processes involved in cement production.

Solution strategies for lumped parameter models. Stiff differential equations. Solution methods for initial value and boundary value problems. Euler's method. R-K method, shooting method, finite difference methods. Solution strategies for distributed parameter models. Solving parabolic, elliptic and hyperbolic partial differential equations. Finite element and finite volume methods. Solving the problems using *MATLAB/SCILAB*.

TEXT BOOKS:

1. K.M.Hangos and I. T. Cameron, "*Process Modeling and Model Analysis*", Academic Press, 2001.
2. W.L.Luyben, "*Process Modeling, Simulation and Control for Chemical Engineers*", 2nd Edn., McGraw Hill Book Co., New York, 1990.
3. W. F. Ramirez, "*Computational Methods for Process Simulation*", 2nd ed., Butterworths, 1997.
4. Kurt E. Peray, "*Cement Manufacuter's Handbook*" Chemical Publishing Co.Inc.,NewYork,N.Y.,1979.

REFERENCES:

1. Mark E. Davis, "*Numerical Methods and Modelling for Chemical Engineers*", John Wiley & Sons, 1984.
2. Singiresu S. Rao, "*Applied Numerical Methods for Engineers and Scientists*" Prentice Hall, Upper Saddle River, NJ, 2001.