

# GUJARAT TECHNOLOGICAL UNIVERSITY

## B.E. SEMESTER : VIII

### BIOTECHNOLOGY

Subject Name: **MODELING AND SIMULATIONS OF BIOPROCESSES**

Sr. No.	Course Contents	Total Hrs
1.	Concepts of optimization, single variable optimization, Linear and Non Linear Programming Methods with Numericals, Specialized Optimization techniques-GA, ANN etc. Few Applications.	14
2.	Concept of modeling, Unstructured and structured modeling, meaning and interpretation through Deterministic and stochastic models, Segregated and unsegregated models, Shu's segregated models for Lactic acid fermentation.	6
3.	Details of Structured kinetic models: Compartmental models, Product formation, Unstructured and structured models, Genetically structured models.	8
4.	Stochastic model for thermal sterilization of the medium, Modelling for activated sludge process, Model for anaerobic digestion, Models for lactic acid fermentation and antibiotic production, other case studies	12
5.	Process simulation techniques, Equation oriented approach, Equation oriented simulators ( SPEED UP, ASCEND, FLOWSIM, QUASILIN, DYN SIM), simulation programs based on Euler's methods, Newton – Raphsen methods, Runga – Kutta methods, Simulation of biochemical system models.	8

#### Textbooks:

1. J.E. Bailey and D.F. Ollis, Biochemical Engg Fundamentals, 1986, McGraw Hill Book Company

#### Reference books:

1) G. Francis, Modelling and Simulation

2) A. Haerder and J. A. Roels “ Application of simple structured I Bioengineering, and P55 in Advances In Biochemical engineering Vol21, A. Fiechts (ed) Spring –Verlag , Berlin, 1982.

3) Edgar,Himmelblau,Lasdon, Optimization of Chemical Processes, Second Edition,McGraw Hill.

#### Tutorials:

From each unit above, there must be minimum 2 tutorial based for skill testing students gained for the concerned topics.