CVM UNIVERSITY
Aegis: Charutar Vidya Mandal (Estd.1945)

FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2022-23

Programme: **Bachelor of Technology (Food Processing Technology)**

Semester: **VIII**

Course Code: **202070805**

Course Title: **Modeling, Simulation and plant layout of Food Processes**

Course Group: **Professional Elective Course -VI**

Course Objectives: A model represents construction and working of some system of interest. A model is similar system it represents but it is simpler than the system. The purpose of a model is to allow the analyst to predict the effect of changes to the system. Simulation is used before an existing system is altered or a new system built, to meet specifications, to prevent under or over-utilization of resources, to reduce the chances of failure, to eliminate bottlenecks and to optimize system performance**.**

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
				Theory		J/V/P*		Total
Lecture	Tutorial	Practical		Internal	External	Internal	External	
3	2	0	4	50/18	50/17	25/9	25/9	150/53

* **J**: Jury; **V**: Viva; **P**: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	**Introduction:** Introduction to mathematical modeling, Model building; Classification and uses of mathematical models; Formulation of mathematical model and fundamental laws.	10
2	**Batch processes in food industry:** Introduction; Equilibria in batch processes; Steady state flow processes like Two Heated Tanks, Single-Component Vaporizer, Multicomponent Flash Drum, Batch Reactor, Reactor With Mass Transfer, Ideal Binary Distillation Column, Multicomponent Nonideal Distillation Column, Batch Distillation With Holdup, simultaneous heat and mass transfer in packed tower, pH Systems	12
3	**Numerical methods:** Computer Programming, Iterative Convergence Methods, Interval Halving , Newton-Raphson Method , False Position , Explicit Convergence Methods, Wegstein , Muller Method, Numerical Integration of Ordinary Differential Equations, Explicit Numerical Integration Algorithms, Implicit Methods	12

4	**Basic concepts of plant layout and design:** Introduction, Preparation of flow sheets for material movement and utility consumption in food plants, Layout and designing aspects of pilot and semi-commercial food processing plants; Scale-up; Application of Program Evaluation and Review Technique (PERT) and Critical Path Method (CPM) in project planning and monitoring.	**11**
	Total	**45**

List of Practicals / Tutorials:

1	MATLAB's power of computational mathematics
2	Basic commands, syntaxes and variables in MATLAB
3	Generating and running script file
4	Data types and operators of MATLAB
5	Introduction to HYSYS
6	Modeling of multi component distillation column
7	Modeling of variable pressure distillation a) Approximate variable pressure model Rigorous variable pressure model
8	Modeling of gravity flow tank
9	Simulation of the numerical method using MATLAB
10	Simulating Heat exchanger and separation column using HYSYS
11	Simulation of process involving recycle using HYSYS

Reference Books:

1	Process modeling, simulation and control: William L Luyben, TMH
2	Process analysis & simulation : Himmelblau, Kenneth & Birchoff, John Wills
3	Chemical process modeling and computer simulation : Amiya K Jana, PHI learning Pvt Ltd
4	Process Plant Simulation: B V Babu, Oxford University Press

Supplementary learning Material:	
1	https://fdocuments.in/document/process-plant-simulation-babu.html
2	https://www.tutorialspoint.com/matlab/index.htm
3	https://sites.ualberta.ca/CMENG/che312/F06ChE416/HysysDocs/AspenHYSYSOperationsGuide.pdf

Pedagogy:

- Direct classroom teaching
- Audio Visual presentations/demonstrations
- Assignments/Quiz
- Continuous assessment
- Interactive methods
- Industrial/ Field visits
- Course Projects

Internal Evaluation:

The internal evaluation comprised of written exam (40% weightage) along with combination of various components such as Certification courses, Assignments, Mini Project, Simulation, Model making, Case study, Group activity, Seminar, Poster Presentation, Unit test, Quiz, Class Participation, Attendance, Achievements etc. where individual component weightage should not exceed 20%.

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						**R**: Remembering; **U**: Understanding; **A**: Applying; **N**: Analyzing; **E**: Evaluating; **C**: Creating
R	**U**	**A**	**N**	**E**	**C**	
15%	30%	30%	15%	10%	0%	

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	Understand the process	**10**
CO-2	Analyse physical and chemical phenomena involved in various process	**20**
CO-3	Develop mathematical models for various chemical processes	**30**
CO-4	Use various simulation approaches	**20**
CO-5	Simulate a process using process simulators	**20**

Curriculum Revision:	
Version:	2
Drafted on (Month-Year):	June-2022
Last Reviewed on (Month-Year):	
Next Review on (Month-Year):	June-2025