AMITY UNIVERSITY

UTTAR PRADESH

L	T	P/S	SW/ FW	TOTAL CREDIT UNITS
3		-	-	03

Course Title: SIMULATION AND MODELING IN FOOD PROCESSING EQUIPMENT

Course Code:

Credit Units: 03

Course Objectives:

The objective is to enable the students to create computer simulation model of the physical processes occurring during the food processing using finite elements and also to impart knowledge in advanced modeling and simulation of food processing equipment.

Pre-requisites:

B.Tech, Basic knowledge of Statistics and Applied Mathematics required.

Student Learning Outcomes:

On completion of the course the student will be able to:

1. Identify methods and their suitability for various processes,
2. Interpret and analyze, types of processes and simulations relevant to Food processing, and
3. Write simple process modeling tools.

Pedagogy for Course Delivery:

The course pedagogy will include lectures, discussion on applications of the topics covered.

Course Contents/Syllabus:

	Weightage (%)
Module I: Introduction	**15%**
• Introduction, • A systematic approach to model building, • Classification of models, • Conservation principles.	
Module II Basic modeling processes and its application	**20%**
• Thermodynamic principles of process systems, • Models based on transport phenomena: principles and applications; • Population balance models and applications;	

• Empirical models; • Model parameters estimation.	
Module III Discrete Analysis and Modeling	**20%**
• Construction of geometry and discretion using Gambit-Fluent's manuals; Commercial CFD solvers; • Turbulence modeling; Implementation of boundary conditions; • Introduction to multiphase flow; • Customizing commercial CFD solver; • Unsteady state simulations	
Module IV Simulation and numerical modeling	**25%**
• Sequential modular, simultaneous modular and equation oriented approaches; • Partitioning and tearing; • Simulation examples of fluid flow processes; • Monte Carlo simulation. • Comparison of various numerical techniques for CFD.	
Module IV Finite element analysis	**20%**
• Review of finite difference and finite element methods; • Solution to discrete algebraic equation; • Finite-volume method for diffusion problems	

Assessment/ Examination Scheme:

Theory L/T (%)	Lab/Practical/Studio (%)	End Term Examination(%)
100	0	100

Assessment/ Examination Scheme:

	Continuous Assessment/ Internal Assessment				End Term Examination		Total
Theory Assessment	**CT**	**S/V/Q**	**HA**	**A**	**EE**		**TT**
Weightage (%)	10	08	07	05	70		100

Abbreviations: CT – Class Test, S- Seminar, V- Viva, Q- Quiz, HA- Home Assignment, TT- Total Theory

Text & References:

- K. M. Hangos and I. T. Cameron, "Process Modelling and Model Analysis", Academic Press, 2001.
- W.L. Luyben, "Process Modelling, Simulation and Control for Chemical Engineers", 2nd Edn., McGraw Hill Book Co., New York, 1990.
- W. F. Ramirez, "Computational Methods for Process Simulation", 2nd ed., Butterworths, 1997.
- Mark E. Davis, "Numerical Methods and Modelling for Chemical Engineers", John Wiley & Sons, 1984.
- Singiresu S. Rao, "Applied Numerical Methods for Engineers and Scientists" Prentice Hall, Upper Saddle River, NJ, 2001