

GANPAT UNIVERSITY									
FACULTY OF ENGINEERING & TECHNOLOGY									
Programme		Master of Technology				Branch/Spec.	Chemical Engineering		
Semester		II				Version	1.0.0.0		
Effective from Academic Year			2026-27			Effective for the batch Admitted in			July 2026
Subject code		3CH2101	Subject Name			Process Optimization, Modelling, and Simulation			
Teaching scheme						Examination scheme (Marks)			
(Per week)	Lecture (DT)		Practical (Lab.)		Total		CE	SEE	Total
	L	TU	P	TW					
Credit	3	0	0	0	3	Theory	40	60	100
Hours	3	0	0	0	3	Practical	0	0	0
Pre-requisites:									
Process control on UG level									
Course Outcomes									
On successful completion of the course, the students will be able to:									
CO1	Classify the structure of modular and equation-oriented mode simulators								
CO2	Identify the partitions and tearing for the given flow diagram								
CO3	Build models for different unit operations in chemical engineering								
CO4	Apply various simulators for chemical processes and learn basics of process integration								
Theory syllabus									
Unit	Content								Hrs
1	Basic Concepts of Process Modeling: General Aspects of Modelling and Process Simulation, Process Synthesis and Process Analysis, Study and Applications of Fundamental Laws, Introduction to Regression Analysis, Basics of Various Numerical Methods.								09
2	Modeling of Chemical Engineering Systems: Basics of Mass Balance, Energy balance for Non-Reactive Systems, Energy Balance for Reactive Systems, Modelling of Various Unit Operations like Absorber, Isotherms Mixtures, Reactors etc., State Space Representation of the System of Equations, Linearization of Nonlinear Systems, Degree of freedom Analysis of Various Unit Operations.								12
3	Modular and Equation Solving Approaches: Modular Approach to Process Simulation, Equation-Solving Approach, Structure of Modular and Equation-Oriented Mode, Precedence-Ordering of Equation Set, Partitioning the Flowsheet, Tearing Algorithms, Algorithms Based on the Signal Flow Graph, Basic Tearing Algorithm, etc.								9
4	Process Simulators: Introduction to Mathematical Software, Introduction to Process Simulators and Their Usage in Process Engineering.								8
5	Process Integration: General aspects of process integration, the hierarchy of chemical process design and integration, approaches to chemical process design and integration								7
Text Books									
1	Luyben W. L., Process Modeling, Simulation and Control for Chemical Engineers, McGraw Hill Publication.								
2	Ramirez W. F., Computational Methods for Process Simulation, Butterworth Heinemann								
Reference Books									
1	Biegler L. T., Grossman I. E., Westerberg A. W., Systematic Methods of Chemical Process Design, Prentice Hall Publication.								
2	Babu B. V., Process Plant Simulation, Oxford Publication.								

ICT/MOOCs references

https://onlinecourses.nptel.ac.in/noc22_ch47/preview

Mapping of CO with PO and PSO:

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	PSO3
CO1	2	2	-	-	2	-	-	-	-	-	1	2	-	-
CO2	3	3	-	1	2	-	-	-	-	-	1	3	-	-
CO3	3	3	2	2	2	-	-	-	-	-	1	3	1	-
CO4	3	2	3	2	3	1	-	-	-	1	2	3	2	1