

NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

COURSE OUTLINE TEMPLATE			
Course Title	Mass Transfer		
Course Code	CLPC20	No. of Credits	3
Department	Chemical Engineering	Faculty	Dr.T.Sivasankar
Pre-requisites Course Code	CLPC15 - Process Calculations		
Course Coordinator(s) (if, applicable)	-		
Other Course Teacher(s)/Tutor(s) E-mail	ssankar@nitt.edu	Telephone No.	0431-2503131
Course Type	<input checked="" type="checkbox"/> Core course	<input type="checkbox"/> Elective course	
COURSE OVERVIEW			
<p>This course will provide the required basics of molecular mass transfer that will be happening in most of the chemical engineering unit operations. Diffusion is the basic phenomena lying in this process. The basic theories behind these diffusion and the analogies between heat, momentum and mass transfer would be dealt with. The mass transfer that occurs in gas/liquid/solid-gas/liquid systems would be elaborated. The design of major columns like adsorption, humidification, drying and crystallization based on the mass transfer concepts would be elaborated.</p>			
COURSE OBJECTIVES			
<ol style="list-style-type: none"> 1. To learn the concept of diffusion in gas, liquid & solid. 2. To understand the basics of interphase mass transfer. 3. To learn application of gas-liquid operation and simultaneous heat and mass transfer operations. 			
COURSE OUTCOMES (CO)			
Course Outcomes	Aligned Programme Outcomes (PO)		
<ol style="list-style-type: none"> 1. Will be familiar with the basic phenomenon of mass transfer involving phases. 2. Will be able to apply the mathematical and design concepts of mass transfer in gas-liquid systems like absorption, humidification, drying and crystallization. 3. Will be gaining good knowledge of required optimum condition for a gas-liquid system. 	<p align="center">PO2, PO3, PO5, PO11, PO12</p>		

COURSE TEACHING AND LEARNING ACTIVITIES			
Si.No.	Week	Topic	Mode of Delivery
1.	Week 1	Basics of Mass Transfer (MT), Various MT operations & their application in chemical engineering.	Chalk and Talk / PPT
2.	Week 2	Equilibrium basis in MT, Molecular Diffusion, Interphase MT.	Chalk and Talk / PPT
3.	Week 3	Fick's Law of diffusion, Binary, Eddy, Steady state, Pseudo molecular diffusion for gases, Multicomponent diffusion	Chalk and Talk / PPT
4.	Week 4	Diffusion in liquids & solids, diffusion predictions, Unsteady state diffusion	Chalk and Talk / PPT
5.	Week 5	MT coefficients, Theories of MT	Chalk and Talk / PPT
6.	Week 6	Dimensional analysis, Analogies between heat, momentum & heat transfer	Chalk and Talk / PPT
7.	Week 7	G-L phase controlled systems, Individual & overall MT coefficients	Chalk and Talk / PPT
8.	Week 8	Gas Absorption: Columns-Types, factors affecting the operation, Equilibrium	Chalk and Talk / PPT
9.	Week 9	Operating line (OL) for counter current/co-current absorber & stripper plate column, L/G ratios, No. of columns and Height	Chalk and Talk / PPT
10.	Week 10	OL for counter current/co-current absorber & stripper packed column, L/G ratios, HETP	Chalk and Talk / PPT
11.	Week 11	Humidification: Basics definitions, wet bulb theory	Chalk and Talk / PPT
12.	Week 12	Cooling towers: Types, OL & Height of the humidifiers and dehumidifiers	Chalk and Talk / PPT
13.	Week 13	Drying: Equilibrium, Hysteresis, types of dryers, drying behavior.	Chalk and Talk / PPT
14.	Week 14	Falling rate & constant rate period. Crystallization: Crystal growth, solubility curves, equilibrium, HT & MT	Chalk and Talk / PPT
15.	Week 15	Nucleation, crystallization equipment, MSMR crystallization model	Chalk and Talk / PPT

COURSE ASSESSMENT METHODS				
Si.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Assessment – 1 (written)	Week 6	1 hr	20
2	Assessment – 2 (written)	Week 12	1 hr	20
3	Assessment – 3 (Assignment/Miniproject)	Week 10	--	10
4	Assessment – 4 (written)	Week 16	3 hrs	50
ESSENTIAL READINGS : Textbooks, reference books Website addresses, journals, etc.				
<ol style="list-style-type: none"> 1. R.E. Treybal, "Mass Transfer Operations", 3rd Edn., McGraw Hill Book Co., New York, 1981. 2. N. Anantharaman and K.M.Meera Sheriffa Begum, "Mass Transfer Theory and Practice", Prentice Hall of India Pvt. Ltd., New Delhi, 2013. 3. A.S.Foust, "Principles of Unit Operations", 2nd Edition, Wiley & Sons, New York, 1980. 4. J. M. Coulson and J. F. Richardson, "Chemical Engineering", 5th Edition Vol. II, P Butterworth Heinemann, New, 2002. 5. C.J.Geankoplis, "Transport Processes and Separation Process Principles," IV edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2004. 6. W.L. McCabe, J.C. Smith and P. Harriot, "Unit Operations of Chemical Engineering", 7th Edn., McGraw Hill Book Co., New York, 2004. 				

COURSE EXIT SURVEY (mention the ways in which the feedback about the course is assessed and indicate the attainment also)
Course Exit survey will be collected at the end of the semester before the start of semester examination through online. Students can log in their MIS account to give the feedback. Mid semester feedback will also be obtained for the effective teaching learning process.
COURSE POLICY (including plagiarism, academic honesty, attendance, etc.)
<ul style="list-style-type: none"> • Attending classes regularly and continuously is required for the students to understand the concepts. Students should maintain 75% attendance. • If the student misses (due to valid reason) either Assessment-1 or Assessment-2, he/she will be given a option to appear for Reassessment which covers the portion of the two assessment. • Participation in the discussions is mandatory during the tutorial classes. • Strict academic disciplines have to be maintained inside the class room.
ADDITIONAL COURSE INFORMATION
The Course Coordinator is available for consultation at times that are displayed on the coordinator's office notice board. Queries may also be emailed to the Course Coordinator directly at ssankar@nitt.edu
FOR SENATE'S CONSIDERATION
<p>Course Faculty _____ CC-Chairperson _____ HOD _____</p>