NATIONAL INSTITUTE OF TECHNOLOGY, TIRUCHIRAPPALLI

DEPARTMENT OF CHEMICAL ENGINEERING

Course Plan for CLPC 20 Mass Transfer II-July 2022 session

COURSE PLAN – PART I			
Programme	**B.Tech. Chemical Engineering**		
Course Title	**Mass Transfer II**		
Course Code	**CLPC 20**	**No. of Credits**	**4**
Course Code of Pre-requisite subject(s)	**CLPC 18 Mass Transfer I**		
Session	**July 2022**	**Section**	**V Semester**
Name of Faculty	**Dr.K.M.Meera S.Begum**	**Department**	**Chemical Engg.**
Email	**meera@nitt.edu**	**Telephone No.**	**0431-2503109**
Name of other Coordinator(s) (if, applicable)	**--**		
E-mail	**--**	**Telephone No.**	**--**
Course Type	**Core course**		

Syllabus (approved in BoS)

Syllabus approved in BOS for students admitted from 2019-20 onwards.

COURSE OBJECTIVES

(i) To impart the basic concept of conventional mass transfer unit operations.
(ii) To learn the equilibrium characteristics of two-phase mass transfer processes.
(iii) To understand the hydrodynamics and modes of operations in mass transfer equipments.
(iv) To develop the skill in the design and analysis of mass transfer equipments in process industries.

COURSE OUTCOMES (CO)

Course Outcomes (CO)	**Aligned Programme Outcomes (PO)**
Upon completing the course, the student will be able to	
1 Acquire sufficient knowledge in the concepts of mass transfer operations in Chemical Process industries.	**PO1, PO8, PO10, PO12**
2. Analyze the two-phase mass transfer processes and apply in Process industries.	**PO1, PO2, PO3, PO4, PO5, PO8, PO10 and PO12**
3. Develop equilibrium characteristics for the design of transfer operations.	**PO1, PO2 and PO11**
4. Apply mathematical skills in the process design of equipments for the separation of components in Chemical Engineering Practice.	**PO1, PO2, PO3, PO9 and PO11**

COURSE PLAN – PART II

COURSE OVERVIEW

This course gives an insight into concepts of diffusional and unit operations of industrial applications. Outcome of this course will enable a student to apply the methodologies for various industrial chemical processing, biochemical processing and down streaming applications.

COURSE TEACHING AND LEARNING ACTIVITIES

S.No.	Week/ Contact Hours	Topic	Mode of Delivery
1.	Week 1	Introduction to Two phase mass transfer operations	Chalk & Talk/PPT
2.	Week 1	Fundamental laws to compute VLE data	
3.	Week 1	VLE phase diagrams-Effect of pressure and temperature	
4.	Week 1	Minimum and Maximum Boiling Mixtures-Phase diagrams	
5.	Week 2	Types of Distillation – Features	
6.	Week 2	Theory and design of Flash distillation	
7.	Week 2	Derivation of Rayleigh's expression-SD	
8.	Week 2	Problems solving in Flash and Simple distillations	
9.	Week 3	Tutorial Problems	
10.	Week 3	Theory and Calculation-Steam distillation	
11.	Week 3	Low Pressure Distillation-Theory and applications	
12.	Week 3	Concept and Illustration of Azeotropic and Extractive Distillations	
13.	Week 4	Description and concept of Continuous fractionation	
14.	Week 4	Theory and design methodology for continuous fractionators	
15.	Week 4	Ponchon Savarit Design methodology	
16.	Week 4	Reflux and its significance on design	
17.	Week 5	Tutorial Problems to find minimum Reflux ratio	
18.	Week 5	Tutorial Problems solving to find design factors by Ponchon Savarit method	
19.	Week 5	Mc-Cabe Thiele design for continuous Fractionator	
20.	Week 5	Fenske's relation at Total Reflux condition	Chalk & Talk/PPT
		Assessment I	
21.	Week 6	Design principle of Open steam distillation	
22.	Week 6	Tutorial Problems – McCabe Thiele method	
23.	Week 6	Packed bed tower design	
24.	Week 6	Exercise Problems to calculate Packed bed tower height	
25.	Week 7	Introduction to LLE - Theory and phase diagrams	
26.	Week 7	Various representations of LLE diagrams on systems	
27.	Week 7	Design of Single stage extraction	
28.	Week 7	Multistage crosscurrent mode Partially miscible systems	

29.	Week 8	Multistage crosscurrent mode - immiscible systems	
30.	Week 8	Design of countercurrent operation-Miscible systems	
31.	Week 8	Design of countercurrent - immiscible systems	
32.	Week 8	Exercise problems in crosscurrent and countercurrent mode	
33.	Week 9	Tutorial problems to find design factors	
34.	Week 9	Packed bed Extractor Design- LLE equipments-Types and Applications	
35.	Week 9	Introduction to Leaching Operation-Theory	
		Assessment II	
36.	Week 9	Solid liquid equilibria –Effect of temperature	
37.	Week 10	Various operative leaching methods	
38.	Week 10	Design methodology for countercurrent leaching	
39.	Week 10	Applications of leaching-Equipments	
40.	Week 10	Exercise Problems in leaching	
41.	Week 11	Introduction to Adsorption theory, Adsorbents and Applications	
42.	Week 11	Isotherms-Types and significance	
43.	Week 11	Adsorption hysteresis and Factors	
44.	Week 11	Design of single stage Adsorber	
		Compensation Assessment	
45.	Week 12	Multistage adsorber design- Cocurrent mode	
46.	Week 12	Multistage adsorber design-Countercurrent mode	
47.	Week 12	Problems solving for Practice	
48.	Week 12	Tutorials	**Chalk & Talk**
		Final Assessment	

COURSE ASSESSMENT METHODS (shall range from 4 to 6)

S.No.	Mode of Assessment	Week/Date	Duration	% Weightage
1	Assesssment I (written test)	After 5th week	1 hour	20%
2	Assessment II (written test)	After 9th week	1 hour	20%
3	Assessment III – (Assignment)	During the Course	-	20 %
	CPA Compensation Assessment*	After 11th week	1 hour	20%
4	Final Assessment**	At the end of course	2½ hours	40%

***Will be taken up by only absentees in any I and II assessments due to genuiene medical grounds on provision of medical certificate and with the decision of course faculty.**
****Mandatory; on Academic guidelines.**

ESSENTIAL READINGS : Textbooks, reference books Website addresses, journals, etc

Text Books:

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", Printice Hall of India Pvt. Ltd., New Delhi, 2013.
3. A.S. Foust, "Principles of Unit Operations",2nd Edn., Wiley & Sons, New York, 1980.

Reference Books:

1. M. Coulson and J. F. Richardson, "Chemical Engineering.", Vol - II, 5th Edn., Pergamon Press, New York, 2002.
2. C. J. Geankopolis, "Transport Processes in Chemical Operations", 4th Edn., Prentice Hall of India, New Delhi, 2004.
3. W. L. Mccabe, J. C. Smith and P. Harriot, "Unit Operations in Chemical Engg.",7th Edn. McGraw Hill Book Co., New York, 2004.

COURSE EXIT SURVEY (mention the ways in which the feedback about the course shall be assessed)

1) Feedback will be collected during the class committee meetings and one at the end of course completion.
2) Suitable mapping of COs with POs will be made and attainment will be calculated.

COURSE POLICY (preferred mode of correspondence with students, policy on attendance, compensation assessment, academic honesty and plagiarism etc.)

MODE OF CORRESPONDENCE (email/ phone etc)

Email: meera@nitt.edu

ATTENDANCE POLICY (A uniform attendance policy as specified below shall be followed)

- 75% attendance in course is mandatory.
- Students with less than 65% attendance shall be prevented from writing the final assessment and shall be awarded 'V' grade.

COMPENSATION ASSESSMENT

One Compensation assessment will be conducted only for absentees in Assessment I or Assessment II under genuine Medical issues.

ACADEMIC DISHONESTY & PLAGIARISM

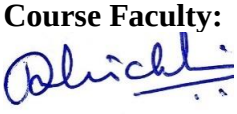
- Possessing a mobile phone, carrying bits of paper, talking to other students, copying from others during an assessment will be treated as punishable dishonesty.
- Zero mark to be awarded for the offenders. For copying from another student, both students get the same penalty of zero mark.
- The departmental disciplinary committee including the course faculty member, PAC chairperson and the HoD, as members shall verify the facts of the malpractice and award the punishment if the student is found guilty. The report shall be submitted to the Academic office.

ADDITIONAL INFORMATION

NIL

FOR APPROVAL

Course Faculty: Dr.K.M.Meera S. Begum **CC-Chairperson: Dr.T.Sivasankar**



HOD: Dr.P. Kalaichelvi **(Approved by CC Chairman and HOD)**