TEMPLATEFORCOURSESPECIFICATION (mass Transfer)

HIGHER EDUCATIONPERFORMANCEREVIEW:PROGRAMMEREVIEW

COURSE SPECIFICATION

ThisCourseSpecificationprovidesaconcisesummary ofthemainfeaturesofthe course and the learning outcomes that a typical student might reasonably be expected toachieve and demonstrateif he/she takesfulladvantage of thelearning opportunities thatare provided.It shouldbe cross-referencedwith theprogrammerspecification.

1. TeachingInstitution	University Of Technology
2. UniversityDepartment/Centre	Chemical Engineering
3.Course title/code	Mass Transfer / CE342
4.Programmer(s) towhichitcontributes	CE342
5.Modesof Attendance offered	Fall
6.Semester/Year	2semester/year
7. Number ofhourstuition(total)	3 hrs.
8. Dateof production/revision of this Specification	6/6/2016
9. Aimsof the Course	
1. The course aims to provide deeper knowledge, a wide scope and improved understanding of the mechanics in mass transfer as well as a better insight into analytical and empirical methods applied in analysis and synthesis of mass transfer	
2. The student should gain knowledge to apply the theories to relevant engineering.	
3. Ability to lead a team allocates tasks and assembles results.	

10·LearningOutcomes, Teaching,LearningandAssessmentMethod

A-Knowledge andUnderstanding

A1.Basic information, conceptsand terminology of the general principles of mass transfer processes of diffusion in gas, liquid and solid, convective mass transfer, absorption, distillation and boundary layer.

A2. Demonstrating a broad and integrated knowledge and a deep understanding of issues related to separation processes in a chemical process and important role it plays in the success of the process both economically and environmentally.

A3. Ability to design separation units for the effective solution of intended problem.

B.Subject-specific skills

B1.The economic, management and statutory requirements involved in the practice of separation processes in chemical engineering.

B2. Gain and/or improve their ability to synthesize, integrate and utilize process information in solving separations and analogy problems.

B3. Analyze and interpret data and, when necessary, design experiments to gain new data.

B4. Give an awareness and understanding of professional responsibilities concerned mainly with nature of the separation processes that take place in industrial units, and, in particular, with determining the factors that influence the rate of transfer of material.

B5.Use laboratory, engineering and measuring equipment to provide data in support of theoretical understanding

TeachingandLearningMethods

Lectures, Tutorials , Example Classes , Informal and formal teamwork , Weekly homework problems

Assessmentmethods

Midterm exams ,Final exam ,Quizzes, Weekly homework, Team and homework problems , partial test (Oral questions :- multiple choice ,alternative response), Open questions that have a definite answer , or do not have a definite answer

C. ThinkingSkills

C1.An ability to apply effective, creative and innovative solutions, both independently and cooperatively, to current and future problems in mass transfer, absorption and distillation.

C2. Apply course concepts in solving interdisciplinary problems, solve the problems through logic and improve their ability to work effectively in a group of peers.

C3.Present and evaluate information and ideas in the handling of mass transfer issues.

C4.Analyze and solve engineering problems often on the basis of limited and contradictory information

TeachingandLearningMethods

Lectures, Tutorials , Example Classes , Informal and formal teamwork , Weekly homework problems , Analysis of cases linked to the work environment , Practical Applications

Assessmentmethods

Midterm exams ,Final exam ,Quizzes, Weekly homework, Team and homework problems , partial test (Oral questions :- multiple choice ,alternative response), Open questions that have a definite answer , or do not have a definite answer

D. **GeneralandTransferable Skills(otherskillsrelevanttoemployabilityand personaldevelopment).**

D1.Work together in same-discipline teams to solve engineering problems.
D2.Becreative, particularly and analytical in the formulation and solution of problems.
D3. Speed intuitive, predictability and evaluate information and ideas in the handling of separation processes and transport phenomena issues.

11.Course Structure

Week	Hours	ILOs	Unit/Moduleor TopicTitle	Teaching Method	Assessment Method
1st semester					
1		Introduction to chemical engineering and mass transfer, generally.		Lectures , Example Classes , Applications	Open questions that have a definite answer ,
2		Diffusion in binary mixtures of gases.	Calculation of rate of mass transfer and flux in gases.	Lectures , Example Classes , Practical Applications	Exams , Weekly homework, Team and homework problems , Open questions that have a definite answer ,
3		Maxwell Theory	Diffusion in binary and multi component system	Lectures , Example Classes , Applications	homework, Team and homework problems , Open questions that have a definite answer ,
4		Diffusion in binary liquid mixtures.	Calculation of rate of mass transfer and flux in liquids.	Lectures , Example Classes , Applications	Exams , Weekly homework, Team and homework solve problems , Open
5		Diffusion in multi – component liquid mixtures .diffusivity calculating.	Diffusion rate and empirical correlations to find diffusivity.	Lectures, Tutorials , Example Classes , Informal and formal teamwork , Weekly homework problems	Exams , Weekly homework, Team and homework solve problems , Open questions that have a definite answer , or do not have a definite answer,partial test (Oral questions)

6		Convective mass transfer. Mass transfer coefficients.	Correlating the flux in terms of mass transfer coefficients.	Lectures, Tutorials , Example Classes , Informal and formal teamwork , Weekly homework problems	Exams , Weekly homework, Team and homework solve problems , Open questions that have a definite answer , or do not have a definite answer,partial test (Oral questions
7		Diffusion theories.	Film theory, and two film theory		
8		Equilibrium curves and over all mass transfer coefficients.	Relation between mass transfer rate and reaching equilibrium state.	Lectures, Tutorials , Example Classes , Informal and formal teamwork , Weekly homework problems	Exams , Weekly homework, Team and homework solve problems , Open questions that have a definite answer , or do not have a definite answer,partial test (Oral questions
9		Single and multi-stage Absorption columns.	How to make the overall and individual mass balance over the absorption column to calculate the unknown stream flow rate and composition.	Lectures, Tutorials , Example Classes , Informal and formal teamwork , Weekly homework problems	Exams , Weekly homework, Team and homework solve problems , Open questions that have a definite answer , or do not have a definite answer,partial test (Oral questions
10		Finding No. of stages theoretically and graphically.	calculating the required number of trays to obtain the degree of removing or recovering	Lectures, Tutorials , Example Classes , Informal and formal teamwork , Weekly homework problems	Exams , Weekly homework, Team and homework solve problems , Open questions that have a definite answer , or do not have a definite answer,partial test (Oral questions
11		Types of absorption columns. (Tray and Packed).	-the difference between using plate tower or packed bed column for a certain separation process	Lectures, Tutorials , Example Classes , Informal and formal teamwork , Weekly homework problems	Exams , Weekly homework, Team and homework solve problems , Open questions that have a definite answer , or do not have a definite answer,partial test (Oral questions

12		Design equation for dilute solutions.	Finding the design equation when solute concentration less than 10%	Lectures, Tutorials , Example Classes , Informal and formal teamwork , Weekly homework problems	Exams , Weekly homework, Team and homework solve problems , Open questions that have a definite answer , or do not have a definite answer,partial test (Oral questions
13		Finding HTU and NTU.	For a packed column ,column height is a function of HTU and NTU.	Lectures, Tutorials , Example Classes , Informal and formal teamwork , Weekly homework problems	Exams , Weekly homework, Team and homework solve problems , Open questions that have a definite answer , or do not have a definite answer,partial test (Oral questions
14		Column efficiency.	Point eff. Murdree eff. Overall eff.	Lectures, Tutorials , Example Classes , Informal and formal teamwork , Weekly homework problems	Exams , Weekly homework, Team and homework solve problems , Open questions that have a definite answer , or do not have a definite answer,partial test (Oral questions
15		Constant and variable Mass transfer area.	The effect of area with different shapes in diffusion rate	Lectures, Tutorials , Example Classes , Informal and formal teamwork , Weekly homework problems	Exams , Weekly homework, Team and homework solve problems , Open questions that have a definite answer , or do not have a definite answer,partial test (Oral questions
2nd semester					
16		Introduction to Distillation columns.	Simple introduction to distillation columns . How to find NO. of columns required to separate multi-component s feed. Degree of freedom.	Lectures, Tutorials , Example Classes , Informal and formal teamwork , Weekly homework problems	Exams , Weekly homework, Team and homework solve problems , Open questions that have a definite answer , or do not have a definite answer,partial test (Oral questions

17		Boiling point diagram.	Most effective diagram in distillation columns to find the vapor liquid equilibrium	Lectures, Tutorials , Example Classes , Informal and formal teamwork , Weekly homework	Exams , Weekly homework, Team and homework solve problems , Open questions that have a definite answer , or do not have a definite
18		Vapor liquid equilibrium.	Standard shape for VLE and the deviation from standard one, how to design such columns.	Lectures, Tutorials , Example Classes , Informal and formal teamwork , Weekly homework problems	Exams , Weekly homework, Team and homework solve problems , Open questions that have a definite answer , or do not have a definite answer,partial test (Oral questions
19		Batch Distillation.	Finding the design equation for batch columns with and without reflux ratio.	Lectures, Tutorials , Example Classes , Informal and formal teamwork , Weekly homework problems	Exams , Weekly homework, Team and homework solve problems , Open questions that have a definite answer , or do not have a definite answer,partial test (Oral questions
20		Flash Distillation	How flash columns operate and when it can be used . Find the design equation.	Lectures, Tutorials , Example Classes , Informal and formal teamwork , Weekly homework problems	Exams , Weekly homework, Team and homework solve problems , Open questions that have a definite answer , or do not have a definite answer,partial test (Oral questions
21		Continuous multi stage fractionator.	Finding the mass balance equations ,heat balance equations and enthalpy equation	Lectures, Tutorials , Example Classes , Informal and formal teamwork , Weekly homework problems	Exams , Weekly homework, Team and homework solve problems , Open questions that have a definite answer , or do not have a definite answer,partial test (Oral questions
22		Feed line equation .No. of ideal traysCold, sat.liquid, mixed, sat.vapor and super.	Drawing the feed line according to feed condition heated.	Lectures, Tutorials , Example Classes , Informal and formal teamwork , Weekly homework problems	Exams , Weekly homework, Team and homework solve problems , Open questions that have a definite answer , or do not have a definite answer,partial test (Oral questions

23		Fensk's equation , Minimum No. of reflux ratio.	How to find the minimum reflux ratio graphically and analytically	Lectures, Tutorials , Example Classes , Informal and formal teamwork , Weekly homework problems	Exams , Weekly homework, Team and homework solve problems , Open questions that have a definite answer , or do not have a definite answer,partial test (Oral questions
24		Multi component Distillation.	Find the amount and flow rates for each component	Lectures, Tutorials , Example Classes , Informal and formal teamwork , Weekly homework problems	Exams , Weekly homework, Team and homework solve problems , Open questions that have a definite answer , or do not have a definite answer,partial test (Oral questions
25		FUG method.	Fensk's ,underwood and Gilliland method to find minimum reflux ratio ,minimum no. of trays and feed tray location	Lectures, Tutorials , Example Classes , Informal and formal teamwork , Weekly homework problems	Exams , Weekly homework, Team and homework solve problems , Open questions that have a definite answer , or do not have a definite answer,partial test (Oral questions
26		Underwood equation.	Analytically how to calculate minimum reflux ratio	Lectures, Tutorials , Example Classes , Informal and formal teamwork , Weekly homework problems	Exams , Weekly homework, Team and homework solve problems , Open questions that have a definite answer , or do not have a definite answer,partial test (Oral questions
27		Gilliland equation.	Finding the actual no. of trays and feed tray location	Lectures, Tutorials , Example Classes , Informal and formal teamwork , Weekly homework problems	Exams , Weekly homework, Team and homework solve problems , Open questions that have a definite answer , or do not have a definite answer,partial test (Oral questions

28		Multi feed and side stream.	How the design equation can be changed if more than one feed is introduced to the column or a side stream is with drawn.	Lectures, Tutorials , Example Classes , Informal and formal teamwork , Weekly homework problems	Exams , Weekly homework, Team and homework solve problems , Open questions that have a definite answer , or do not have a definite answer,partial test (Oral questions
29		Introduction to boundary layer.	Physical meaning for B.L and how it can affect the flow of streams .	Lectures, Tutorials , Example Classes , Informal and formal teamwork , Weekly homework problems	Exams , Weekly homework, Team and homework solve problems , Open questions that have a definite answer , or do not have a definite answer,partial test (Oral questions
30		Stream line and Turbulent Boundary layer.	Types of streams occurs if a fluid is moving over a flat surface or through a pipe	Lectures, Tutorials , Example Classes , Informal and formal teamwork , Weekly homework problems	Exams , Weekly homework, Team and homework solve problems , Open questions that have a definite answer , or do not have a definite answer,partial test (Oral questions

12.Infrastructure	
Requiredreading: ·CORETEXTS ·COURSEMATERIALS ·OTHER	o Lecturers o Book -References Coulson ,J.M and Richardson J.F. "Chemical Engineering , volume 1", 3ed edition ,Robert Maxwell.M.C. Colulsson ,J.M and Richardson J.F. "Chemical Engineering , volume 2", 3ed edition, Robert Maxwell.M.C. Colulsson ,J.M and Richardson J.F. "Chemical Engineering , volume 6", 3ed edition, Robert Maxwell.M.C. Other support books :- Perry,J.H," chemical engineering handbook ",Mc-Graw – Hill Book com.1975. Binay.K.Dutta "mass transfer and separation process "2007. Trebal Robert E.,"mass transfer operation"2ed edition, Mc-
Specialrequirements(include for example workshops,periodicals, ITsoftware, websites)	Websites , Laboratory

Community-based facilities (include forexample,guest Lectures, internship,field studies)	field trips

13. Admissions		
Pre-requisites	Before undertaking this module the student should have undertaken t of chemical engineering I and II , chemistry , mathematics I and II simultaneous courses:- Thermodynamics , and applied mathematics	
Minimumnumber ofstudents	Central Admission	
Maximumnumber ofstudents	Central Admission	