MIT MUZAFFARPUR

COURSE FILEOF

Chemical Engineering-III

(0711614)

Faculty Name:

MITHILESH KUMAR RAI

ASSISTANT PROFESSOR,DEPARTMENT OF LEATHER TECHNOLOGY

विज्ञान एवं प्रावैधिकी विभाग
Department of Science and Technology
Government of Bihar

Content

VISION STATEMENT

- To emerge as a national leader in graduate level studies in all sub areas of leather field and to make significant contribution to the development of the society, industry, nation and the world.

MISSION STATEMENT

- Educate leather technology students to produce quality engineers who serve leading firms and different sectors of the industry and can work in multi-disciplinary environment to anticipate and address evolving challenges of the 21st century in tanning and footwear industry.
- Impart high performance knowledge in leather and footwear sector that are economic and environment friendly.
- To establish national leadership and provide technological support to the Indian leather industry.
- Improve fundamental knowledge of inter relationship between the built environment and natural systems.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs):

After successful completion of program, graduates will be able to

PEO1: Work in the leather, chemical and footwear industries.

PEO2: Pursue higher studies.

PEO3: Contribute in teaching, research and other developmental activities of Leather technology and its allied fields.

PEO4: Work in the multicultural and multidisciplinary groups for the sustainable development and growth of leather industry projects and profession.

PROGRAMME OUTCOMES (PO)

Students who complete the B.E. degree in leather technology will be able to:

1. An ability to apply knowledge of mathematics, science, and engineering,
2. The ability to conduct laboratory experiments and to critically analyze and interpret experimental data.
3. The ability to perform design of leather products by means of design experiences integrated throughout the professional component of the curriculum.

4. An ability to function on teams, that must integrate contributions from different areas of leather technology towards the solution of multi-disciplinary projects.
5. An ability to identify, formulate, and solve Leather technology problems.
6. An understanding of professional practice issues in leather technology including professional and ethical responsibility.
7. An ability to write and speak effectively.
8. The broad education necessary to understand the impact of leather technology solutions in a global and societal context.
9. A recognition of the need for, and an ability to engage in life-long learning,
10. An ability to use the techniques, skills, and modern tools necessary for leather technology practices.
11. Possess a thorough understanding of techniques that are appropriate to environment and country.
12. Possess ability to estimate costs, estimate quantities and evaluate materials for leather manufacturing.

COURSE OBJECTIVE AND COURSE OUTCOMES:

Institute / College Name :	MUZAFFARPUR INSTITUTE OF TECHNOLOGY		
Program Name	**B. Tech.Leather Technology**		
COURSE CODE	071614		
COURSE NAME	**Chemical Engg-3**		
Lecture / Tutorial / Practical (per week):	3 – 0- 0	**Course Credits**	3
Course Coordinator Name	MITHILESH KUMAR RAI		

Course objective:

The objective of this course is to provide the fundamental concepts associated with the mass transfer operation like distillation, filtration, drying and extraction. To introduce the manufacturing process of different chemical like bleaching powder, basic chromium sulfate. To give knowledge about drying process. To give knowledge

Course outcomes (CO):

CO1: Became familiar with Distillation process which can be used in leather industry.

CO2: Learn the Basic concept of filtration process and application of it in leather industry.

CO3: Understand the mechanism of drying and extraction operation in chemical as well as leather technology field.

CO4: Became able to know various types of extractors which will be used in leather industry and chemical industry.

MAPPING OF COs AND POs

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	✓	✓	✓									
CO2		✓		✓								
CO3	✓		✓		✓							
CO4	✓	✓		✓								

Correlation level: 1- slight (Low) 2- moderate (Medium) 3-substantial (High)

COURSE SYLLABUS:

Topics	Number of Lectures	Weightage (%)
Distillation :- Vapour-liquid, Equilibra, Theory of distillation of Binary liquid mixture, Fraction, Design and operation of distillation column for separation of binary mixture by Mc. Cebe thiel method	12	27
Filtration :- Theory and Mechanism of filtration, continuous and batch type filtration equipment	10	22
Drying :- Drying characteristics of material, Theory and Mechanism of drying, estimation of drying rate. Type of dryers	8	18

Extraction:- Extraction, Types of extraction, liquid-liquid extraction liquid-solid extraction, operation of stagewise and differential contact extractors.	7	15
Chemical Process :- Manufacture of Bleaching powder, Alkali Industries Sodium sulfide, Sodium dichromate Basic Chromium sulphate	7	15

MUZAFFARPUR INSTITUTE OF TECHNOLOGY

B.Tech. 6th Semester (2016 Batch) PROVISIONAL TIME TABLE WITH EFFECT FROM 09.02.2018

6th SEMESTER Leather technology					ROOM NO. LB-2			
	10:00 - 10:50	10:50 - 11:40	11:40 - 12:30	12:30 – 1: 20	1:20 – 1:50	1:50- 2:40	2:40 - 3:30	3:30 – 4:20
MON					R			
TUES					E			
WED		CH ENGG-III(MKR)			C			
THUR				CH ENGG-III(MKR)	E			
FRI				CH ENGG-III(MKR)	S			
SAT					S			

FACULTY NAME:MKR: MITHILESH KUMAR RAI

STUDENT LIST:

SL. NO.	ROLL NO.	AKU REG. NO.	NAME
1	15LT11	15106107243	ARVIND KUMAR
2	15LT01	15107107268	MANJAY KUMAR
3	15LT02	15107107269	ANSHU PRIYA
4	15LT03	15107107270	MD AQIB JAVED
5	15LT04	15107107271	DIVYANSHU
6	15LT06	15107107272	ANKIT KUMAR
7	15LT07	15107107273	VIKASH KUMAR
8	15LT08	15107107274	PRASHANT KUMAR
9	15LT09	15107107275	CHANDRAKANT PRASAD
10	15LT10	15107107276	SARIKAKUMARI
11	15LT05	15107107279	SAMRIDDHI

Text Books:

TB1: Mass transfer operation by Robert E. Trebal

TB2: Principle of Mass Transfer & Separation Process by B.k Dutta

TB3: Mass transfer operation by K.A Gavani

TB4: Unit operation of chemical Engineering by Mc cabe and Smith

TB5: Unit operation-1 Fluid flow and mechanical operation by K.A Gavani

Reference Books:

RB1: Introduction to Computational Mass Transfer: With Applications to Chemical by Xigang Yuan

COURSE PLAN

Topic No.	Topic	**No. of Lecture/ lecture no.**	**Text book**
1.	**Distillation**	**12**	**TB1,TB2**
	Vapour-liquid, Equilibra, , Fraction,	1-3	
	Theory of distillation of Binary liquid mixture	4-7	
	Design and operation of distillation column for separation of binary mixture by Mc. Cebe thiel method	8-12	
2.	**Filtration**	**10**	**TB4, TB5**
	Theory and Mechanism of filtration,	13-15	
	continuous and batch type filtration equipment	16-20	
3.	**Drying**	8	**TB1,TB2**
	Drying characteristics of material	21-22	
	Theory and Mechanism of drying	23-24	
	Estimation of drying rate	25-27	
	Type of dryers	28	

4.	**Extraction**	7	**TB1,TB2**
	Extraction, Types of extraction,	29-30	
	liquid-liquid extraction, liquid-solid extraction	31-33	
	operation of stagewise and differential contact extractors	34-35	
5.	**Chemical Process** , ,	7	
	Manufacture of Bleaching powder	36-38	
	Alkali Industries Sodium sulfide	39-40	
	Sodium dichromate	41	
	Basic Chromium sulphate	42	
Total Number of Lecture		42	

DETAILS OF ASSIGNMENTS:

S.No.	Assignment	Topic No.
1	Assignment 1	1
2	Assignment 2	2
3	Assignment 3	3
4	Assignment 4	4,5

Chemical Engineering -3 (0711614)

Assignment -1

Q.1 Explain the mechanism of distillation process.

Q.2 Explain flash distillation and continuous distillation with diagram.

Q.3 Describe the method to find out the number of plates for separation of binary mixture by Mc. Cebe thiel method.

Chemical Engineering -3 (0711614)

Assignment -2

Q.1 Write down the theory and Mechanism of filtration.

Q.2 Explain the working of Plate and frame filtration equipment with diagram.

Q.3 Derive the formula to calculate filtration time in continuous filtration.

Q.4 Write short not note on filter aids.

Chemical Engineering -3 (0711614)

Assignment -3

Q.1 Describe the working principal of rotary dryer with diagram.

Q.2 Explain the drying curve in detail.

Q.3 Explain the mechanism of drying and derive the formula tocalculate the drying rate.

Chemical Engineering -4 (0711614)

Assignment -4

Q.1Describe the process for making bleaching powder with flow sheet.

Q.2 Explain the manufacturing process of basic chromium sulfate.

Q.3 What do you mean by extraction? Explain any one extraction equipment with digram.

Muzaffarpur Institute of Technology , Muzaffarpur
B.Tech (Leather Technology) VI semester
Mid semester examination-2018

Subject: Chemical Engineering - III **Code: LT-071614**

Max .mark:20 **Time** :2Hours

Note: Attempt any four question. All question have equal marks. Assume any missing data.

Q.1 Describe the Flash distillation or equilibrium distillation of binary mixture with proper diagram

Q.2 Explain liquid extraction and one extraction equipment with proper diagram.

Q.3 Describe the method to find out the number of theoretical plate of distillation column for separation of binary mixture by Mc. Cebe thiel method.

Q.4 Explain principle of drying. Drive the formula to find out the drying time of solids with diagram.

Q.5 Write down The following term in short-

(a) Relative Volatility

(b) Raoult's Law

Q.6 Describe the differential or simple distillation of binary mixture with proper diagram.

Question bank;

Code : 071614

B.Tech(Leather Technology) 6th Semester Examination, 2017

Chemical Engineering-III

Time : 3 hours *Full Marks : 70*

Instructions :

(i) There are Nine Questions in this Paper.

(ii) Attempt Five questions in all.

(iii) Question No. 1 is Compulsory.

(iv) The marks are indicated in the right-hand margin.

1. Answer in short any seven of the following: 7×2=14

(a) Gas absorption.

(b) Adsorption.

(c) Leaching.

(d) Crystallization.

(e) Drying.

(f) Concentration.

(g) Dehumidification.

(h) Liquid extraction.

(i) Equilibria.

(j) Vapour.

2. Describe a Typical Distillation Equipment and principle of stage processes. 14

3. What is Flash Distillation and Continuous Distillation ? 14

4. Discuss Design and operating characteristics of plate columns. 14

5. Explain Theory and Mechanism of filtration, continuous and Batch type filtration equipment. 14

6. What do you understand by drying of solids? Classify Dryers. Explain Principles of Drying. 14

7. Explain liquid extraction and extraction equipment. Discuss principles of extraction. 14

8. How will you manufacture Bleaching powder? Give its properties and uses. 14

9. Describe the process to manufacture Sodium Dichromate, its uses, properties and safety considerations. 14

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B.Tech Leather Technology 6th Semester Exam., 2016

CHEMICAL ENGINEERING—III

Time : 3 hours *Full Marks* : 70

Instructions :

(i) The marks are indicated in the right-hand margin.

(ii) There are ***NINE*** *questions in this paper.*

(iii) Attempt ***FIVE*** *questions in all.*

(iv) Question No. ***1*** *is compulsory.*

1. Answer any *seven* of the following : 2×7=14

   (a) What is distillation?

   (b) What is filtration?

   (c) Write a short note on free moisture content.

   (d) What is minimum reflux ratio?

   (e) Define equilibrium moisture content.

   (f) Explain about chemical process.

   (g) What is extraction?

   (h) Define leaching.

   (i) Define azeotrope.

   (j) Define the characteristics of filter medium.

2. *(a) Explain McCabe-Thiele method.* 7

   (b) Write the difference between distillation and extraction. 7

3. *(a) Explain briefly the continuous filtration.* 7

   (b) Draw a neat sketch of rotary drum filter and write its construction. 7

4. *(a) What is optimum reflux ratio?* 4

   (b) A mixture containing benzene and toluene with 40% benzene and 60% toluene is to be separated in a fractionating column to give product containing 96% benzene and bottom product containing 95% toluene. Feed is a mixture of two-third vapour and one-third liquid. Find out the number of theoretical stages required if reflux ratio of 1·5 times the minimum is used. 10

5. *(a) Explain briefly the laboratory batch sedimentation test.* 7

(b) A wet solid is to be dried from 35% to 10% moisture under constant drying conditions in 5 hours. If the equilibrium moisture content is 4% and the critical moisture content is 14%, how long will it take to dry the solids to 6% moisture under the same condition? 7

5. (a) Write short notes on the following : 7

   (i) Constant rate period

   (ii) Falling rate period of drying

   (b) Explain spray dryer with advantages and disadvantages. 7

7. *(a)* Explain about liquid-liquid extraction. 7

   (b) Write a short note on solid-liquid extraction. 7

8. Describe the manufacturing process of—

   (a) bleaching powder;

   (b) basic chromium sulphate. 7+7=14

9. *(a)* Write the factors affecting selection of extractors. 7

   (b) Write the manufacturing process of sodium sulfide. 7

Result of the students

Roll No	Name	Marks of attendance	Class test	End semester exam	Total
15LT11	ARVIND KUMAR	5	5	11	21
15LT01	MANJAY KUMAR	5	5	11	21
15LT02	ANSHU PRIYA	5	5	19	29
15LT03	MD AQIB JAVED	5	5	9	19
15LT04	DIVYANSHU	5	5	18	28
15LT06	ANKIT KUMAR	5	5	10	20
15LT07	VIKASH KUMAR	5	5	14	24
15LT08	PRASHANT KUMAR	5	5	13	23
15LT09	CHANDRAKANT PRASAD	5	5	14	24
15LT10	SARIKAKUMARI	5	5	19	29
15LT05	SAMRIDDHI	5	5	13	23

RESULT ANALYSIS