UTKALMANI GOPABANDHU INSTITUTE OF ENGINEERING, ROURKELA

LESSON PLAN

DEPARTMENT OF CHEMICAL ENGINEERING

LESSON PLAN

SUBJECT CODE : TH-4

NAME : Chemical Process Industry-I

BRANCH : CH

SEMESTER : Diploma-IV

CREDIT POINTS : 4

NUMBER OF MODULES : 4

CLASSES REQUIRED : 60

PRE-REQUISITE : TO UNDERSTAND RAW MATERIAL, CHEMISTRY INVOLVED, OUTLINES OF MANUFACTURING PROCESS AND MAJOR ENGINEERING PROBLEMS OF SOME IMPORTANT INORGANIC INDUSTRIAL CHEMICAL PRODUCT.

MODULE-I

CONCEPT OF UNIT OPERATION AND PROCESS: 1.General principles applied in studying an industry, types of flow sheet, 2. Economics in Chemical process, Choice of process technology, 3. Batch and continuous process

Objectives:

To understand the General principles applied in studying an industry, types of flow sheet**,** Choice of process technology and also to differentiate between Batch and continuous process.

Session no	Topics to be covered	PRIMARY REFERENCE (BOOKS/NOTES)
1	Concept of Unit operation with examples	T1, R1
2	Concept of Unit process with examples	T1
3	General principles applied in studying an industry	R1
4	Types of flow sheets	T1, R1
5	Economics in Chemical process	R1
6	Choice of process technology	T1
7	Batch Process and examples	T1, R1
8	Continuous process and examples	T1, R1

MODULE-II

INDUSTRIAL GASES: 1. Manufacturing process of Hydrogen from propane with a flow sheet, 2. Manufacturing of producer gas and water gas, 3. Manufacturing of Ammonia commercially,4. Manufacturing of carbon dioxide, 5. Manufacturing of Acetylene

Objectives:

To understand the manufacturing of Hydrogen from propane, producer gas, water gas, ammonia, carbon dioxide and acetylene commercially.

Session no	Topics to be covered	PRIMARY REFERENCE (BOOKS/NOTES)
9	Manufacturing process of Hydrogen from propane with a flow sheet	T1, R1
10	Manufacturing of producer gas with flow-sheet	T1, R1
11	Manufacturing of water gas with flow-sheet	T1
12	Manufacturing of Ammonia commercially	R1
13	Manufacturing of carbon dioxide	R1, T1
14	Flow-sheet of manufacturing of Acetylene	T1, R1
15	Process description of manufacturing of Acetylene	R1

MODULE-III

ACIDS: 1. Manufacture of sulfuric acid by contact (DCDA) process, 2. Manufacture of Nitric acid by Ammonia Oxidation or Ostwald's process.

Objectives:

To understand the manufacturing of sulfuric acid by contact (DCDA) process, nitric acid by ammonia oxidation process.

Session no	Topics to be covered	PRIMARY REFERENCE (BOOKS/NOTES)
16	Flow sheet of manufacturing of sulfuric acid by	T1, R1

	contact (DCDA) process	
17	Process description of manufacturing of sulfuric acid by contact (DCDA) process	T1
18	Flow sheet of manufacturing of Nitric acid by Ammonia Oxidation	R1
19	Process Description of manufacturing of Nitric acid by Ammonia Oxidation	T1, R1
20	Flow sheet of manufacturing of Nitric acid by Ostwald's process	R1
21	Process Description of manufacturing of Nitric acid by Ostwald's process	T1
22	Revision and Quiz	T1,R1

MODULE-IV

CHLORO–ALKALI INDUSTRY: 1. Manufacture of soda ash by Solvay's process, 2. Manufacture of caustic soda by electrolysis of brine, 3. Different types of electrolytic cells with their advantages & disadvantages

Objectives:

To understand the manufacturing of soda ash by Solvay's process, caustic soda and to study the different types of electrolytic cells with their advantages & disadvantages.

Session no	Topics to be covered	PRIMARY REFERENCE (BOOKS/NOTES)
23	Chemical reaction and mechanism of manufacturing of soda ash by Solvay's process	T1, R1
24	Flow sheet of manufacturing of soda ash by Solvay's process	T1
25	Process description of manufacturing of soda ash by Solvay's process	T1, R1
26	Flow-sheet of manufacturing of caustic soda by electrolysis of brine	T1
27	Process description of manufacturing of caustic soda by electrolysis of brine	R1
28	Definition and types of electrolytic cells	T1,R 1
29	Advantages and disadvantages of electrolytic cells	R1

MODULE-V

PULP & PAPER INDUSTRY: 1. Manufacture of pulp by sulphate & sulphite process, 2. Manufacture of paper by wet process, 3. Recovery of chemicals from black liquor, by product utilisation, 4. Different type of paper products, 5. Additives used in paper production and their application.

Objectives:

To understand the manufacturing of pulp by sulphate and sulphite process, manufacturing of paper. To study different types of products, Additives used in paper production and their application.

Session no	Topics to be covered	PRIMARY REFERENCE (BOOKS/NOTES)
30	Manufacture of pulp by sulphate process	T1, R1
31	Manufacture of pulp by sulphite process	T1

32	Manufacture of paper by wet process	T1
33	Recovery of chemicals from black liquor, by product utilization	R1
34	Different type of paper products	R1, T1
35	Additives used in paper production and their application	R1,T1

MODULE-VI

CEMENT INDUSTRIES: 1. Different types of cement, 2. Constituents of cement and their characteristics, lime stone beneficiation, 3. Manufacture of portland cement by wet & dry process, 4. Additives used in cement industries, 5. Factors affecting cement industry, 6. Importance of mini cement plant

Objectives:

To understand different types of cement, Constituents of cement and their characteristics, lime stone beneficiation, Manufacturing of portland cement by wet & dry process, Additives used in cement industries, Factors affecting cement industry

Session no	Topics to be covered	PRIMARY REFERENCE (BOOKS/NOTES)
36	Different types of cement	T1, R1
37	Constituents of cement and their characteristics, lime stone beneficiation	T1
38	Manufacture of portland cement by wet & dry process	T1
39	Additives used in cement industries, Factors affecting cement industry	T1, R1
40	Importance of mini cement plant	R1

MODULE-VII

METALLURGICAL INDUSTRIES: 1. Methods of manufacturing cast iron, 2. Properties of cast iron, 3. Manufacturing of sponge iron, wrought iron, 4. Different methods of steel manufacturing, 5. Manufacturing of alumina from bauxite by Bayer's process, 6. Extraction of aluminum from alumina by Hope's process 7. Manufacture of rare earth elements like titanium, thorium, uranium & Zirconium and their application.

Objectives:

To understand manufacturing cast iron, sponge iron, wrought iron, steel, alumina from bauxite by Bayer's process, extraction of aluminum from alumina by Hope's process, manufacturing of rare earth elements like titanium, thorium, uranium & Zirconium and their application

Session no	Topics to be covered	PRIMARY REFERENCE (BOOKS/NOTES)
41	Methods of manufacturing cast iron	T1, R1
42	Properties of cast iron	T1
43	Manufacturing of sponge iron with flow-sheet	T1, R1
44	Manufacturing of wrought iron with flow-sheet	T1, R1
45	Different methods of steel manufacturing	T1
46	Flow sheet for Manufacturing of alumina from bauxite by Bayer's process	R1
47	Process description of Manufacturing of alumina from bauxite by Bayer's process	T1, R1

48	Extraction of aluminum from alumina by Hope's process	T1
49	Manufacturing of rare earth elements titanium and thorium and their application	T1
50	Manufacture of rare earth elements uranium & Zirconium and their application.	T1,R1

MODULE-VIII

FERTILIZERS : 1. Classification of fertilizers, 2. Manufacture of urea, calcium ammonium nitrate, super phosphate and ammonium phosphate, nitrophosphate, sodium phosphate, 3. Mixed fertilizer 4. Additives used in fertilizers.

Objectives:

To understand the classification of fertilizers, manufacturing of urea, calcium ammonium nitrate, super phosphate and ammonium phosphate, nitrophosphate, sodium phosphate, mixed fertilizer, Additives used in fertilizers

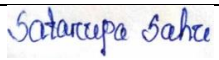
Session no	**Topics to be covered**	**PRIMARY REFERENCE (BOOKS/NOTES)**
51	Classification of fertilizers	T1, R1
52	Manufacturing of urea with flow sheet	T1
53	Manufacturing of calcium ammonium nitrate with flow sheet	T1
54	Manufacturing of super phosphate with flow sheet	T1, R1
55	Manufacturing of ammonium phosphate with flow sheet	T1
56	Manufacturing of nitrophosphate with flow sheet	R1
57	Manufacturing of sodium phosphate with flow sheet	T1, R1
58	Mixed fertilizer	T1, R1
59	Additives used in fertilizers	R1
60	Revision and Quiz	T1

Course Delivery Plan

Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
MODULE	1	1	2	2 & 3	3	3& 4	4	4& 5	5&6	6	7	7	7&8	8	8

BOOKS FOR REFERENCE:
TEXT BOOKS

T1: Chemical Technology by C Dryden, Tata Mc Grawhill Publication
REFERENCE
R1: Chemical Process Industries by N Shreeve, Tata Mc Grawhill Publication

	Prepared by	**Approved by**
Signature		
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