SRI VENKATESWARA COLLEGE OF ENGINEERING

COURSE DELIVERY PLAN - THEORY

Department of Chemical Engineering	LP: CH18020
~~B.E/B.Tech/M.E/M.Tech~~ : Chemical Engineering Regulation:2018	Rev. No: 00
PG Specialisation : NA	Date: 18.01.21
Sub. Code / Sub. Name : CH18020 / PROCESS PLANT UTILITIES	
Unit : I	

Unit Syllabus: **IMPORTANCE OF UTILITIES**

Hard and Soft water, Requisites of industrial water and its uses. Methods of water Treatment such as Chemical Softening and Demineralization, Resins used for Water Softening and Reverse Osmosis. Effects of impure Boiler Feed Water.

Objective: To understand the properties of different types of water and to apply concepts of softening in purification processes

Session No *	Topics to be covered	Ref	Teaching Aids
1	Explain role of Utilities in Chemical Plant, List various utilities in chemical plant & uses	Tb2:140-160	Online class/PPT
2	List sources of Water, Types of water- Hard water and Soft water	Tb3:61-76	Online class/PPT
3	Methods of water Softening Processes	Tb3:30-36	Online class/PPT
4	Chemical Softening	Tb1:631-632	Online class/PPT
5	Demineralization	Ref 2:40-60	Online class/PPT
6	Process of Purification of water	Tb2:239-240	Online class/PPT
7	Resins used for Water Softening and Reverse Osmosis	Tb2:241-250	Online class/PPT
8	Effects of impure Boiler Feed Water	Tb3:20.28-29	Online class/PPT
9	Boiler Feed water and demineralized water	Tb3:30-32	Online class/PPT

Content beyond syllabus covered (if any): Methods of Purification of Water

* Session duration: 50 minutes

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Sub. Code / Sub. Name: **CH18020** / PROCESS PLANT UTILITIES

Unit : II

Unit Syllabus: **STEAM AND STEAM GENERATION**

Steam, problems based on Steam, Types of Steam Generator such as Solid Fuel Fired Boiler, Waste Gas Fired Boiler and Fluidized Bed Boiler. Scaling and Trouble Shooting, Steam Traps and Accessories.

Objective: Comprehensive understanding of steam as a utility and analyze conditions in different types of steam boilers

Session No *	Topics to be covered	Ref	Teaching Aids
10	Use of Steam, Air & Inert Gases as utilities	Tb3:17-31	Online class/PPT
11	Properties of steam- Enthalpy, Wet steam, Saturated steam, Superheated steam, Specific volume of steam	Tb2:15-48	Online class/PPT
12	Problems on Steam	Tb2:133-139	Online class/PPT
13	Steam Generator: Classification, comparison, components	Tb3:61-74	Online class/PPT
14	Factors affecting selection of Boiler	Tb2:75-85	Online class/PPT
15	Types of Steam Generator- Solid Fuel Fired Boiler	Tb3:86-91	Online class/PPT
16	Waste Gas Fired Boiler	Tb2:92-95	Online class/PPT
17	Fluidized Bed Boiler	Tb2:95-102	Online class/PPT
18	Scaling and Trouble Shooting, Steam Traps and Accessories	Tb3:187-194	Online class/PPT

Content beyond syllabus covered (if any): Methods to increase Energy efficiency in steam equipment

* Session duration: 50 mins

Sub. Code / Sub. Name: **CH18020** / PROCESS PLANT UTILITIES

Unit : III

Unit Syllabus: **REFRIGERATION**

Refrigeration Cycles, Methods of Refrigeration used in Industry and Different Types of Refrigerants such as Monochlorodifluro Methane, Chlorofluro Carbons and Brins. Refrigerating Effects and Liquefaction Processes.

Objective: To understand the different principles of refrigeration and analyze different types of refrigerants used in industries

Session No *	Topics to be covered	Ref	Teaching Aids
19	Concept of refrigeration	Ref1:2 -27	Online class/PPT
20	Refrigeration Cycles	Tb3:16 .8-9	Online class/PPT
21	Methods of Refrigeration used in Industry	Tb3:16 .8-9	Online class/PPT
22	Ice Refrigeration, Evaporative Refrigeration	Ref1:3 38	Online class/PPT
23	Vapor Refrigeration System	Ref1:4 8-52	Online class/PPT
24	Different Types of Refrigerants- primary and secondary refrigerants	Ref2:1 78-180	Online class/PPT
25	Primary refrigerants	Ref2:1 78-180	Online class/PPT
26	Secondary refrigerants	Ref2:1 78-180	Online class/PPT
27	Refrigerating Effects and Liquefaction Processes.	Ref1:2 50-268	Online class/PPT

Content beyond syllabus covered (if any): Cryogenic processes and their applications

* Session duration: 50 mins

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Sub. Code / Sub. Name: **CH18020**/ PROCESS PLANT UTILITIES

Unit : IV

Unit Syllabus: **COMPRESSED AIR**

Classification of Compressor, Reciprocating Compressor, Single Stage and Two Stage Compressor, Velocity Diagram for Centrifugal Compressor, Slip Factor, Impeller Blade Shape. Properties of Air –Water Vapors and use of Humidity Chart. Equipment used for Humidification, Dehumidification and Cooling Towers

Objective: To analyze the behaviour of air and water vapour in compressors, and cooling towers.

Session No *	Topics to be covered	Ref	Teaching Aids
28	Utility air-Compressed air, blower air, fan air, instruments	Ref2:124-127	Online class/PPT
29	Classification of Compressor, Reciprocating Compressor	Tb3:6.20-6.23	Online class/PPT
30	Single Stage and Two Stage Compressor	Tb3:6.24-6.28	Online class/PPT
31	Velocity Diagram for Centrifugal Compressor, Slip Factor	Tb3:20.19 - 20.20	Online class/PPT
32	Impeller Blade Shape	Ref20.23-20.24:	Online class/PPT
33	Properties of Air –Water Vapors and use of Humidity Chart	Tb3:12.10 - 12.13	Online class/PPT
34	Equipment used for Humidification	Tb3:153-161	Online class/PPT
35	Dehumidification	Tb3:163-167	Online class/PPT
36	Cooling Towers	Tb3:12.13 - 12.20	Online class/PPT

Content beyond syllabus covered (if any): Characteristics of vacuum pumps

* Session duration: 50 mins

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Sub. Code / Sub. Name: **CH18020** / PROCESS PLANT UTILITIES

Unit : V

Unit Syllabus: **FUEL AND WASTE DISPOSAL:**

Types of Fuel used in Chemical Process Industries for Power Generation such as Natural Gas, Liquid Petroleum Fuels, Coal and Coke. Internal Combustion Engine, Petrol and Diesel Engine. Waste Disposal

Objective: To identify different types of fuels and analyze the working of different types of engines

Session No *	Topics to be covered	Ref	Teaching Aids
37	Introduction to fuels	TB3:6.1-6.12	Online class/PPT
38	Types of fuels used in chemical process industries	TB3:14.7-14.85	Online class/PPT
39	Natural Gas, Liquid Petroleum fuels	TB3:20.5 – 20.6	Online class/PPT
40	Coal and Coke	TB3:14.6-14.95	Online class/PPT
41	Internal Combustion Engine	TB3:20.14-20.17	Online class/PPT
42	Petrol Engine	TB3:9.50	Online class/PPT
43	Diesel Engine	TB3:9.51	Online class/PPT
44	Waste Disposal	TB3:10-16	Online class/PPT
45	Waste Management	TB3:450-465	Online class/PPT

Content beyond syllabus covered (if any): Zero waste disposal and pinch technology

* Session duration: 50 mins

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TEXT BOOKS:

1. Eckenfelder, W. W, Jr. "Industrial Water Pollution Control" McGraw-Hill: New York, 3rd Edition 1999.
2. P.L. Ballaney, 'Thermal Engineering', Khanna Publisher, New Delhi, 1986.
3. Perry R. H., Green D. W. ,"Perry's Chemical Engineer's Handbook" ,McGraw Hill, New York, 2007
4. Jack Broughton; Process utility systems;Institution of Chem. Engineers U.K,1994 Edition.
5. Fuel Furnaces and Refractories, O.P. Gupta, Khanna Publishers.

REFERENCES:

1. Chemical Plant Utilities, LAP LAMBERT Academic Publishing (2016-10-26).
2. Chemistry of Engineering Materials by Jain & Jain. (Dhanpatrai Publishing Co.).

	Prepared by	Approved by
Signature		
Name	Mrs. G.Sudha	Dr. N. Meyyappan
Designation	Associate Professor	Professor and Head
Date	18.01.2021	18.01.2021
Remarks *:		
Remarks *:		

* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD		
SIGNATURE		
NAME	Dr. G. SUDHA	Dr. N. MEYYAPPAN
Designation	Associate Professor	Prof & Head
Date	19.01.2023	19.01.2023

If the same lesson plan is followed in the subsequent sem/year it should be mentioned and signed by the Faculty & the Hod

Signature	M Sri	N Mayyappan
Name	Dr. M. Srivalhya	Dr. N. Meyyappan
Designation	Asst. Professor	Prof & Head
Date	28/12/23	28/12/23