CHE1010	PROCESS PLANT UTILITIES	L	T	P	J	C
		3	0	0	0	3
Pre-requisite	**NIL**	**Syllabus version**				
		1.0				

Course Objectives:

1. Equip the students with the basic understanding and effective utilization of utilities viz. water, steam, compressor, vacuum pumps, refrigeration and cooling units, insulator, inert gases in process industries and allied operations
2. Impart insights in relation to the different types of fuels and boilers used in process industries for the generation of steam, types of compressors and blowers for handling air and inert gases
3. Expose students to different methods of treatment of wastewater and drinking water

Course Outcomes (CO):

1. Explain the importance of water and various methods for water softening and purification
2. Classify the different types of fuels and boilers used in process industries for the generation of steam
3. Identify the different types of compressors and blowers for handling air and inert gases
4. Summarize the different types of equipment used for humidification, and dehumidification
5. Select a suitable refrigeration system for a typical application in process industries
6. Interpret the application of correct type of insulation system for control of heat losses and learn about proper utilization of inert gases on the process plants

Student Learning Outcomes (SLO):	**2, 4, 9**

2. Clear understanding of the subject related concepts and of contemporary issues
4. Sense-making skills of creating unique insights in what is being seen or observed (Higher level thinking skills which cannot be codified)
9. Problem solving ability - solving social issues and engineering problems

Module:1	**Water and Steam**	**7 hours**

Requisites of Industrial Water and its uses; Water treatment methods - ion exchange, demineralization, membranes technology, reverse osmosis. Water resources management.
Properties of steam, Boiler types and mountings, boiler accessories, Indian Boiler Act, 1923. Steam distribution and utilization, steam economy, waste heat utilization

Module:2	**Industrial fuels**	**6 hours**

Solid, liquid and gaseous fuels used in chemical process industries for power generation, Typical combustion calculations

Module:3	**Compressed Air**	**6 hours**

Types of fans, axial, reciprocating and centrifugal compressors, rotary blowers and vacuum pumps and their performance characteristics. Methods of vacuum development, ejectors and their limitations, materials handling under vacuum, piping systems.

Module:4	**Humidification and Dehumidification**	**5 hours**

Properties of Air–Water Vapors and use of Humidity Chart, Equipments used for Humidification, Dehumidification and Cooling Towers

Module:5	**Refrigeration & Ventilation**	**6 hours**
Principle of refrigeration, Refrigeration system like compression refrigeration, absorption refrigeration, and chilled water system; Types of refrigerants; Concept of cryogenics and cryogenics characteristics. Air blending, exhaust ventilation and flaring		
Module:6	**Industrial insulation and Inert Gases**	**8 hours**
Importance of insulation, insulation material and their effect on various materials of equipment piping, fitting and valves, insulation for high, intermediate, low and subzero temperatures including cryogenic insulation Introduction, properties of inert gases & their use, sources and methods of generation, general arrangement for inerting system; operational, maintenance and safety aspects		
Module:7	**Effluent treatment**	**5 hours**
Disposal of solid, liquid and gas wastes; pollution control measures – compliance to statutory norms; Effluent Treatment – Case studies like treatment of effluents from paper mills, Dye and Textile industries, petrochemical industries, plastic and rubber industries.		
Module:8	**Contemporary issues**	**2 hours**
Total Lecture hours		**45 hours**

Text Books	
1.	Broughton J., Process Utility Systems, 3rd ed., Institution of Chemical Engineers, U.K., 2004
Reference Books	
1.	Mujawar B.A., A Textbook of Plant Utilities, 3rd ed., Nirali Prakashan Publication, India, 2007.
2.	Poling B.E., Prausnitz J.M., O'Connell J., The Properties of Gases and Liquid, 5th ed., McGraw Hill, USA, 2008.
3.	Perry, R.H., Green, D. W., Perry's Chemical Engineers Handbook, 8th ed., McGraw Hill, USA, 2007.

Mode of evaluation: Continuous Assessment Test, Quizzes, Assignments, Final Assessment Test			
Recommended by Board of Studies	15-04-2019		
Approved by Academic Council	55th	Date	13-06-2019