| Course code | Course Name | L-T-P-Credits | Year of Introduction |
|---|---|---|---|
| CH482 | PROCESS UTILITIES AND PIPE LINE DESIGN | 3-0-0-3 | 2016 |

**Prerequisite : Nil**

**Course Objectives**

1. To impart the basic concepts of project engineering
2. To develop understanding about process auxiliaries and utilities in process industries

**Syllabus**

Process Auxiliaries. Piping design, Piping insulation, Piping fittings, Valves, Pumps, Process control and instrumentation diagram.
Process Utilities: Process Water, Steam, Compressors and Vacuum Pumps, Methods of vacuum development and their limitations, materials handling under vacuum. Refrigeration and Chilling systems, Oil heating systems, Nitrogen systems

**Expected Outcome**

After successful completion of the course the students will be able to

i. Acquire the overall knowledge about the process plant.
ii. Understand the importance of process auxiliaries and utilities in process industries.
iii. Learn the conceptual design of chemical process plant.
iv. Build a bridge between theoretical and practical concepts used for process auxiliaries and utilities in any process industry.

**References:**


1. F.C. Vibrandt and C.E. Dryden, "Chemical Engineering Plant Design", McGraw Hill, Fifth Edition.
2. Jack Broughton; Process utility systems; Institution of Chem. Engineers, U.K.
3. M.S. Peters and Timmerhaus, "Plant design and Economics for Chemical Engineers", Mc Graw Hill 3rd Edition.
4. Roger Hunt and Ed Bausbacher, "Process Plant layout and Piping Design" PTR Prentice-Hall Inc.,


**Course Plan**

| Module | Contents | Hours | Sem. Exam Marks |
|---|---|---|---|
| I | Process Auxiliaries: Basic considerations and flow diagrams in chemical engineering plant design. Piping design: Selection of material, pipe sizes, working pressure, Basic principles of piping design, piping drawings, pipe installations, overhead installations, Process steam piping, selection and determination of steam – pipe size, Piping insulation, application of piping insulation, weather proof and fire resisting pipe insulation jackets, piping fittings, pipe joints | 7 | 15 |
| II | Valves: Types of valves, selection criteria of valves for various systems. Pumps: Types of pumps, NPSH requirement, pump location, pump piping, pump piping support. Process control and instrumentation diagram, control system design for process auxiliaries. | 7 | 15 |

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| **FIRST INTERNAL EXAMINATION** | | | |
| III | Process Utilities: Process Water: Sources of water, hard and soft water, Requisites of industrial water and its uses, Methods of water treatment, Chemical softening, Demineralization, Resins used for water softening, Water for boiler use, cooling purposes, cooling towers, drinking and process water treatment, reuse and conservation of water, 27 50% water resources management, waste water treatment and disposal. | 7 | 15 |
| IV | Steam: Steam generation and its application in chemical process plants, distribution and utilization, boilers, design of efficient steam heating systems, steam economy, condensate utilization, steam traps, their characteristics, selection and application, waste heat utilization | 7 | 15 |
| **SECOND INTERNAL EXAMINATION** | | | |
| V | Compressors and Vacuum Pumps: Types of compressors and vacuum pumps and their performance characteristics, Methods of vacuum development and their limitations, materials handling under vacuum, lubrication and oil removal in compressors and pumps, instrument air. | 7 | 20 |
| VI | Refrigeration and Chilling systems. Oil heating systems, Nitrogen systems. | 7 | 20 |
| **END SEMESTEREXAMINATION** | | | |

**Question Paper Pattern:**

Maximum Marks: 100 Exam Duration: 3 Hours

**Part A:** There shall be **Three questions** uniformly covering Modules 1 and 2, each carrying 15 marks, of which the student has to answer any **Two questions**. At the most 4 subdivisions can be there in one main question with a total of 15 marks for all the subdivisions put together.
(2 x15= 30 Marks)

**Part B**: There shall be **Three questions** uniformly covering Modules 3 and 4, each carrying 15 marks, of which the student has to answer any **Two questions**. At the most 4 subdivisions can be there in one main question with a total of 15 marks for all the subdivisions put together.
(2 x15= 30 Marks)

**Part C**: There shall be **Three questions** uniformly covering Modules 5 and 6, each carrying 20 marks, of which the student has to answer any **Two questions**. At the most 4 subdivisions can be there in one main question with a total of 20 marks for all the subdivisions put together.
(2 x20= 40 Marks)