Course code	Course Name	L-T-P-Credits	Year of Introduction
CH472	PROCESS INTEGRATION	3-0-0-3	2016

Prerequisite : NIL

Course Objectives

1. To impart the knowledge of systematic methods for the material and energy integration of chemical process industries.
2. To enable students to apply various techniques for process integration in order to conserve material and energy requirement in chemical process industries.

Syllabus

Process Integration and its Building Blocks, Heat Exchanger Networking, Targeting of Heat Exchanger Network, Integration of Reactor systems, Integration of Distillation systems, Mass Exchanger Network Synthesis

Expected Outcome

- The students will be able to apply various techniques for process integration in order to conserve material and energy requirement in chemical process industries

References:

1. James M. Douglas, Conceptual Design of Chemical Process, McGraw Hill, New York, 1988.
2. Kemp I.C, Pinch Analysis and Process Integration - A user guide on process integration for efficient use of energy, , 2nd Edition, Butterworth – Heinneman, 2006.
3. Linnhoff, B. Townsend D.W., Boland D., Hewitt G.F., Thomas, B.E.A., Guy, A. R. and Marsland, R. H., "A User's guide on process integration for the efficient use of energy", Inst. of Chemical Engineers, London (1982).
4. Mahmoud. M., El – Hawalgi, Process Integration -, Elsevier, 2006.
5. Robin Smith, Chemical Process Design and Integration, John Wiley and Sons. Ltd., New Delhi, 2005.
6. Uday. V. Shenoy, Heat Exchanger Network Synthesis, , Gulf Publishing Co, USA, 1995
7. Warren D. Seider, J. D. Seader and Daniel R. Lewin, Product & Process Design Principles, Wiley Publication.

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	**Process Integration and its Building Blocks** Definition of Process Integration, Areas of application and techniques available for Process Integration, Role of thermodynamic laws.	7	15%
II	**Heat Exchanger Networking** Heat Exchanger Networking, Composite curve method, Problem table algorithm, Grand composite curve	7	15%

FIRST INTERNAL EXAMINATION			
III	**Targeting of Heat Exchanger Network** Energy targeting, Area targeting, Number of units targeting, Shell targeting, cost targeting.	7	15%
IV	**Integration of Reactor systems** Choice of Idealized reactor model and reactor performance. Reactor configurations: Temperature Control, Choice of Reactors. Heat Integration characteristics of reactors	7	15%
SECOND INTERNAL EXAMINATION			
V	**Integration of Distillation systems** Distillation sequencing, Heat Integration characteristics of Distillation column, appropriate placement of distillation column, various configurations for heat integration of distillation column.	**7**	20%
VI	**Mass Exchanger Network Synthesis** Mass Exchanger Network, Minimum Mass Separating Agents (MSA), Mass exchange networks for minimum external MSA. Minimum Number of Mass Exchangers	**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)