Course Type	Course Code	Name of the Course	L	T	P	Credits
DC	CHC303	Process Design and Economics	3	0	0	9

Course Objective

This course aims to furnish the engineering principles involved in the development of chemical process design and the role of software in process design. This course also provides basic understanding of the concepts of chemical process economics including cost and asset accounting, interest and investment costs, cost estimation, taxes and insurance, depreciation, profitability analysis of investments. Inventory control tools and optimum design strategies will also be briefed.

Learning Outcomes

After the completion of the course, the student would be acquainted with the engineering principles involved in the flowsheet synthesis along with the optimum design strategies. The student would also be able to perform various calculations on interest, depreciation and pay back periods etc. related to chemical process plants.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
01	**Introduction:** Introduction to process design, general design considerations	**03**	Identify the goal of process design. and understand the factors involved in choosing a plant site, preparing plant layout, etc.
02	**Process Design Development:** Introduction, development of design database, process creation, types of process design, process flow diagrams, piping and instrumentation diagrams, scale-up of equipment in design	**05**	Learn the principles involved in the process design development and understand the scale-up methods.
03	**Flowsheet Synthesis:** Introduction, process information, functions diagram, operations diagram, analysis and evaluation of flowsheets, criteria for evaluating designs, role of software in process design, software selection	**06**	Synthesize and evaluate process flowsheets & realize the use of software in process design.
04	**Optimum Economic Design:** Strategy for optimum production rates in plant operation, cyclic operations, and economic pipe diameter	**02**	Understand the application of optimization methods for optimum design
05	**Process Economics:** Introduction, basics of accounting procedure, interest types and their calculations, present worth and discount, perpetuities and capitalized costs, total capital, fixed capital and working capital investment, methods of estimation of investment, types of taxes, types of insurance	**06**	Carry out basic calculations on interests, annuities and investments. Incorporate taxes in order to calculate the gross and net profits.

06	**Cost Estimation:** Cash flow, factors involved in project cost estimation, cost index and scaling for equipment cost, estimation of total product cost	**06**	Perform economic analysis of production costs for chemical process plants.
07	**Depreciation:** Types and methods of determination of depreciation	**06**	Apply different methods to compute depreciation
08	**Profitability:** Profitability evaluation methods, practical factors in alternative investments and replacement studies	**08**	Assess the profitability through different methods and payback period.

Textbooks:

1. Peters, M. S., and Timmerhaus, K. D. (1991). Plant Design and Economics for Chemical Engineers, 4th Ed., McGraw Hill Inc.

References Books:

1. Couper, J. R. (2003). Process Engineering Economics, Marcel Dekker Inc.
2. Silla, H. (2003). Chemical Process Engineering Design and Economics, Marcel Dekker Inc.