Type	Course Code	Name of Course	L	T	P	Credit
DP	NCHC510	Advanced Processes Lab	0	0	3	1.5

Course Objective
This laboratory course aims to acquaint postgraduate students with various critical aspects and important tools of decision-making for chemical engineering processes.
Learning Outcomes
Hands-on experience on • performing techno-economic analysis and life cycle assessment for typical chemical processes, • applying the different methods of design of experiments for optimizing process conditions, • using the standard available optimization toolbox capabilities for performing optimization and parameter estimation studies, • practical control strategies in Multi-input Multi-output chemical engineering systems.

Unit No.	Topics to be covered	Lecture Hours	Learning Outcomes
1.	**Techno-economic Analysis&Life Cycle Assessment** Selection of a specific process design/sequence among multiple alternatives based on techno-economic analysis Life Cycle Assessment for process flowsheets	12	• Performing techno-economic analysis and life cycle assessment for typical chemical processes
2.	**Design of Experiments** Applying the concepts of different factors analysis, information criterion etc. on various chemical engineering problems	9	• Applying the different methods of design of experiments for optimizing process conditions
3.	**Process Optimization** Handling Unconstrained and Constrained optimization problems using standard toolboxes –essential for process design Parameter estimation using optimization toolbox for applications in Chemical Engineering problems – constrained & unconstrained nonlinear function Minimization	12	• Using the standard available optimization toolbox capabilities for performing optimization and parameter estimation studies
4.	**Process Control** Demonstration/experiment with Multi-input Multi-output (MIMO) systems such as distillation columns, absorption columns etc.	9	• Knowing about practical control strategies in MIMO chemical engineering systems
	Total Contact hours:	**42**	

Text Books:

1. Klöpffer, W and Grahl B. Life Cycle Assessment (LCA): A Guide to Best Practice. Wiley.

Reference Books:

1. Lazic, ZR. Design of Experiments in Chemical Engineering: A Practical Guide. Wiley.
2. Edgar, TF and Himmelblau, DM. Optimization of Chemical Processes. McGraw Hill.