Process Systems Engineering

prof. Davide Manca – Politecnico di Milano

Master course in Chemical Engineering – Ten Credits

Concise program

1. Introduction to the Process Systems Engineering. History of the Computer Aided Process Engineering. Design from scratch, revamping, and process intensification.

2. Steady state and dynamic simulation of industrial processes. Cost estimation. Economic assessment of the CAPEX and OPEX terms. Classical conceptual design of an industrial process and evaluation of the economic potential terms. The use of superstructures to optimize the plant layout. Mixed integer linear and non-linear programming for design purposes.

3. Dynamic conceptual design: time-series analysis of price/cost of commodities and utilities. Cost indexes for CAPEX terms. Discounted back approach to OPEX terms and dynamic simulation of future scenarios according to market demand, and price/cost fluctuations and uncertainties. Feasibility study under market fluctuations.

4. Economics: fixed capital investment and working capital. Evaluation of the capital investment. Short accounts on interest and investment, takes and insurance, depreciation, profitability, cash flow, breakeven point.

5. Data reconciliation. Gross error detection. Model identification. Coaptation.

6. Process optimization: design mode; on-line mode; management/supervision. Hierarchical approach. The objective function and the structure of multidimensional continuous/discontinuous problems. Short accounts on scheduling, planning, and supply chain management (for batch and continuous processes).

7. Operator Training Simulators: conventional and advanced. Virtual Environments, Virtual Reality and Augmented Virtual Reality. Integration of dynamic process simulation and dynamic accident simulation.

Labs

The labs are based on the design and simulation of a chemical plant with UNISIM Design™.

Note: the course is in English and all the material is in English as well.