GUJARAT TECHNOLOGICAL UNIVERSITY

B. E. SEMESTER: VI

Chemical Engineering

Subject Name: **Process Equipment Design – I**
Subject Code: **160503**

Teaching Scheme				Evaluation Scheme		
Theory	**Tutorial**	**Practical**	**Total**	**University Exam (Theory) (E)**	**Mid Sem Exam (Theory) (M)**	**Practical (I)**
4	0	3	7	70	30	50

Sr. No	Course Content	Total Hrs.
1.	**Process design of piping, Fluid moving devices and Flow meters**: Introduction, Process design of piping,NPSHA &NPSHR,Power required by pump, evaluation of Centrifugal pump performance when handling viscous liquids, Power required in Fan, Blower and adiabatic compressor, flow meters, Process design of Orifice meter, Rotameter etc.	10
2.	**Process design of Heat exchangers**: Shell & Tube heat exchangers, Funcion of various parts of shell & Tube Heat exchaner, General design method of shell & tube heat exchanger, Criteria of selection among Fixed Tubesheet,U Tube & Floating Head heatexchanger,Process design of without phase change heatexchanger,Process design of condenser, Horizontal and vertical condenser, Condensation with non-condensable, Multi-component condensation, Process design of Kettle type &Thermosyphon Reboilers and vaporizes, Tinker's flow model, Air cooled heat exchangers and air heaters, plate heat exchangers, etc.	20
3.	**Process design of Distillation Column:** Introduction, Criteria of selection, Selection of equipment for distillation, Distillation column design, Selection of key components for multicomponent distillation,Determination of operating pressure for distillaion column,Advantages & disadvantages of vacuum distillation, Determination of nos. of theoretical stages for binary distillation by MeCabe Thiele method & Ponchon-Savarit method, Determination of nos. of theoretical stages for multicomponent distillation by Fenskey-Underwood-Gilliland's method,Selection of trays,Calculations for tower diameter & pressure drop of sieve tray tower, Cheking of conditions for weeping,downcomer flooding,liquid entrainment,etc, tray efficiency,Jet Flooding & downcomer Flooding,Different types of weirs & downcomers of tray tower, their selection criteria,Process design of Batch distillation,simple batch distillation & batch distillaion with rectification.	18

4.	**Process design of Absorbers**: Introduction, Criteria for selection among different types of absorption equipment, Process Design of packed tower type absorber: Determination of actual amount of solvet, Selection of packing, Determination of tower diameter & pressure drop, Detrmiation of *NtoG*, *HtoG* & height of packing, Process design & selection criteria of liquid distributors,redisributors & packing support, Process design of Spray chamber or spray tower type absorber, Venturi Scrubber, Process design of falling film absorber.	12
5.	**Process design of Extactor**: Indutrial applications of liquid-liquid extraction,choice of solvent,Process design of counter current multistage extractor, Selection criteria among different types of extactor, Process design of mixer-settler type extractor & packed tower type extractor, Guidelines for the design of other types of extractors	12

Text Book:

1. "Introduction to Process Engineering and Design" by S B Thakore and B I Bhatt, Tata McGraw Hill, 1st Edition, 2007.

Reference Books:

1. Coulson & Richardson's Chemical Engineering - Vol. 6 by R.K.Sinnott,Asian Book Pvt. Ltd. (publisher)
2. Applied Process Design for Chemical and Petrochemical plants,Vol. 1to 3 by E.E.Ludwig, Gulf Publishing Company