GUJARAT TECHNOLOGICAL UNIVERSITY B.Pharm SEMESTER: IV

Subject Name: Unit Operations-II Subject Code: 2240001

Teaching Scheme				Evaluation Scheme			
Theory	Tutorial	Practical	Total	Theory		Pra	ctical
				External	Internal	External	Internal
3	0	3	6	80	20	80	20

Theory

Sr No	Course Contents	Total Hrs
1	Filtration:	8
	Theory and mechanism of filtration process, Types of filtration,	
	factors influencing filtration, filter aids, filter media, industrial filter	
	including filter press, filter leaf, rotary filter, edge filter, cartridge	
	filters, membrane filters, mathematical problems on filtration,	
	optimum cleaning cycle in batch filters, applications in pharmacy.	
2	Centrifugation:	4
	Principle and theory of centrifugation, industrial centrifuges	
	including perforated basket centrifuge, sedimentation type	
	centrifuge, continuous centrifuges, etc., applications in pharmacy.	
3	Drying:	9
	Theory and mechanism of drying, moisture content, loss on drying,	
	rate of drying & time of drying calculations, classification of	
	dryers, factors affecting selection of dryers, dryers used in	
	pharmaceutical including drum dryer, spray dryer, fluidised bed	
	dryer, tray dryer, tunnel dryer, rotary dryer vacuum dryer,	
	Microwave, Radiant heat dryer (Infra Red), Mathematical problems	
	on drying, applications in pharmacy.	
4	Distillation:	8
	Raoult's law and its limitation, Henry's Law, Phase diagram,	
	volatility & relative volatility, General parts of distillator, simple	
	steam and flash distillation, batch and continuous distillation,	
	rectification distillation columns and their efficiency, McCabe	
	Thiele method for calculation of number of theoretical plates,	
	azeotropic, molecular & steam distillation, mathematical problems,	
	applications in pharmacy.	
5	Evaporation:	8
	Basic concept of phase equilibria, factors affecting evaporation,	
	heat transfer in evaporators, Duhring's Rule and Raoult's law,	
	evaporators including natural circulation, forced circulation & film	

	evaporators, single effect and multiple effect evaporators,	
	mathematical problems, applications in pharmacy.	
6	Humidity, Ventilation and Air Conditioning Systems (HVAC):	8
	Basic concepts & definitions, measurement of humidity, psychometric charts, theory and calculations of humidification processes, humidity control, applications of humidity, equipment for humidification and dehumidification operations. Types of refrigeration cycles, air conditioning, applications in pharmacy. Design of HVAC systems.	

Practical – 22400P1

1	Study of filtration process and various factors affecting it.
2	Demonstration of centrifuge.
3	Study of rate of drying curve and various parameters related to it.
4	Demonstration of various dryers.
5	Study of various distillation processes.
6	Comparison of efficiency of different columns used in distillation process.
7	Study of evaporation process and various factors affecting it.
8	Determination of humidity and related parameters using DBT/WBT and dew point
	method.
9	Demonstration of sling psychrometer, dial type and digital humidity measuring
	instruments.

Note: Any other practical related to theory topic can be carried out.

References Books:

- 1. Elementary Chemical Engineering Max S. Peters, Published by McGraw Hill Book Company, New York, 1954
- 2. Perry's Chemical Engineer's Handbook Robert H Perry, Green D.W., Maloney J.O.7th Edition, 1998, McGraw Hill Inc., New York.
- 3. Tutorial Pharmacy by Cooper & Gunn, ed. S.J.Carter, CBS Publishers & Distributors, Delhi, 6th Edition, 2000.
- 4. Unit Operations of Chemical Engineering, 5th edition McCabe, Smith & Harriott, McGraw Hill Inc., New York.
- 5. Pharmaceutical Engineering K.Sambamurthy, 2002 NAI (P) Ltd., Delhi.
- 6. Pharmaceutics: The Science of Dosage Form Design M.E. Aulton.
- 7. The Theory & Practice of Industrial Pharmacy Lachman L.,Lieberman H.A. & Kanjig J.L., 3rd edition, 1990 Varghese Publishing House, Bombay.
- 8. Alfonso G. Remington: The Science & Practice of Pharmacy. Vol.I & II. Lippincott, Williams & Wilkins Philadelphia.
- 9. Introduction to Chemical Engineering by Walter L. Badger & Julius T. Banchero, Mcgraw Hill International edition, New Delhi, 1955.
- 10. Pharmaceutical Engineering (Principles and Practices) by C.V.S. Subrahmanyam, Vallabh prakashan, Delhi 110034.