GUJARAT TECHNOLOGICAL UNIVERSITY

B.Pharm

SEMESTER: III

Subject Name: Pharmaceutical Engineering
Subject Code: 2230002

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

Theory

Sr No	Course Contents	Total Hrs
1	**Introduction:** Pharma engineering and its significance, unit operations and unit processes. Unit systems, SI unit, CgS unit, gas constant and conversion of units. Physical quantities, dimensions and units, dimensional equations, dimensional analysis and dimensionless groups. Different types of graphical representation.	2
2	**Stoichiometry:** General principles, material balance-tie substances, chemical reactions and molal units, rate process, steady, unsteady and equilibrium state, laws of combining weights, applications of gas laws, energy balance, fuels and combustion,etc.,Mathematical problems.	9
3	**Fluid flow:** Types of steady flow, Reynold number & its significance, types of pressure, viscosity, concept of boundary layers, total energy balance and total mechanical energy balance, losses in mechanical energy of fluids, basic equations of fluid flow, valves, flow meters, manometers. Mathematical problems.	10
4	**Material handling systems:** Solid handling- storage, conveyers, vacuum & pneumatic conveying. Liquid handling- storage, pumps Gases- Fans, blowers and compressors. Colour coding of Pipelines, use of forklifts and pallets, store design in pharmaceutical industries.	8
5	**Heat transfer:** Modes of heat transfer. Conduction- Fourier's law, resistances in series and parallel, use of mean area and mean temperature difference. Convection-Concept of film, overall coefficient, heat transfer by forced convection in laminar and turbulent flow, condensing vapours, evaluation of individual film coefficients. Radiation-Black body, absorptivity & emmisivity. Heating of fluids, steam as heating medium, properties and uses of steam, steam traps, study of steam table. Heat exchange equipments-Heat exchangers, condensers, boilers, extended surface scraped and surface equipments etc. applications of heat transfer in industrial processes. Mathematical problems.	10

6	**Mass Transfer:** Principle, streams in mass-transfer operations, solid/fluid and fluid/fluid mass transfer, influence of mass transfer on unit operations.	3
7	**Materials of Pharmaceutical Plant Construction:** General study of composition, corrosion resistance, properties, factors affecting the selection of material of pharmaceutical plant construction with special reference to stainless steel and glass. Corrosion-types, causes, theories of corrosion and its prevention.	3

Practical – 22300P2

1.	To demonstrate unit systems and conversion of units.
2.	To demonstrate stoichiometry and tie substances in chemical reactions
3.	To measure pressure of gas and other fluids using different manometers (U-tube manometer, inclined manometer etc)
4.	Study of various flow meters (orifice meter, venturi meter, rotameter) and ejector pump.
5.	Experiment on Reynolds number
6.	Determination of overall heat transfer coefficient.
7.	Demonstration of corrosion resistance of various materials.
8.	Practical related to topics in pharmaceutical engineering theory should be carried out.
9	Introduction to engineering drawing – Demonstration of orthographic and isometric projections, preparation of sheets based on orthographic projections.

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. Pharmaceutics I (Pharmaceutical Engineering), Jani G. K., B. S. Shah Prakashan, Ahmedabad.
10. Pharmaceutical Engineering : Principles and Practice, Subramanyam C.V.S., Thimma J, Suresh S.S. et. al., 2002, Vallabh Prakashan, Delhi.
11. A Textbook of Engineering Drawing Vol. I and II, P.J.Shah,6th Edition, 2003, Ahmedabad
12. Engineering Drawing, 34th edition, N.D.Bhatt Charutar Publishing House, 1994

13. Engineering Drawing & Graphic Technology, 13th edition by Thomas E. French, Charles J. Vierch, Rebot J. Foster, McGraw Hill International Edition, New Delhi, 1972
14. Introduction to Chemical Engineering by Walter L. Badger & Julius T. Banchero, Mc graw Hill International edition, New Delhi, 1955