Course Type	Course Code	Name of the Course	L	T	P	Credits
DC	NCHC525	Unit Operations for Pharmaceutics	3	1	0	4

Course Objective

- To provide fundamental knowledge of important chemical/pharmaceutical engineering unit operations ensuring a thorough understanding of the principles of unit operations and the appropriate theory

Learning Outcomes

- Understand the theoretical principles involved in unit operations
- Apply the knowledge of unit operations in the formulations of various dosage forms.

Unit No.	Topics to be Covered	Contact Hours	Learning Outcome
1	**Heat Transfer**: Basic principles of heat Transfer, Heat transfer from solid surface and fluid-fluid systems. Elementary knowledge of heat transfer equipment such as heat exchangers, condensers, boilers, evaporator, etc.	**7 L + 3 T**	Understanding principles of heat transfer and heat transfer equipment in process industries
2	**Mass Transfer**: Principles of mass transfer, solid/fluid and fluid/fluid mass transfer.	**7 L + 3 T**	Learning the fundamental concepts of diffusion and convective mass transfer
3	**Filtration**: Theory and mechanism of filtration process, filter media, filter aids, types and operation of filters, industrial filters-leaf filter, filter press, rotary filter, Edge filters, Membrane filter, etc. Batch filtration. Applications of filtration in pharmaceutical industry. **Centrifugation**: Principle and theory of centrifugation, industrial centrifuges and their application in pharmaceutical industry.	**7 L + 3 T**	Understanding the theory of filtration and centrifugation mechanical separations and their applications in pharmaceutical operations.
4	**Drying:** Principles and mechanism of drying, drying rate and time calculations, drying of dilute solutions and suspensions. Drying of solid materials. Drying in pharmaceutical industry	**6 L + 2 T**	Understanding the theoretical concepts of batch drying and its applications in pharmaceutical operations
5	**Humidification and Dehumidification**: Theory and calculations of humidification and dehumidification processes, humidification equipment. Humidity control in pharmaceutical processes such as formulation of tablets, capsules, etc	**7 L + 3 T**	Learning the fundamental concepts of humidification and dehumidification processes.
6	**Refrigeration and Air Conditioning**: Basic concepts of refrigeration cycles and air conditioning. Applications in pharmaceutical industry	**8 L + 0 T**	Understanding refrigeration cycles and their application for designing an air conditioning system
	Total	**56**	

Textbooks:

1) Geankoplis, C. J. (2003). Transport Processes and Separation Process Principles, Prentice-Hall, 4th Edition.

2) Mc-Cabe, W.L. Smith J.M. and Harriott, P. (2004). Unit Operations in Chemical Engineering, 7 th Ed., McGraw Hill.

Reference books:

1) Badger, W. L. and Banchero, J. T. (1997). Introduction to Chemical Engineering, McGraw-Hill India.

2) Coulson, J. M. and Richardson, J. F. (1999). Chemical Engineering, Volume 1 & 2, Butterworth