Course Type	Course Code	Name of Course	L	T	P	Credit
DC	NCYC502	Formulation & Drug Delivery Technology	3	1	0	4

Course Objective
• This course will introduce the students to the principles of drug formulation and delivery.
Learning Outcomes
The students should be able to: • Understanding how the dosage form can be tailored to the needs of the patient and disease to be treated**.** • Learn about the physicochemical and physiological principles that are forming the basis of a rational development of modern dosage forms.

Unit No.	Topics to be Covered	Lecture Hours	Learning Outcome
1	Preformulation studies: Preformulation studies of drug substances. Role of pre-formulation in drug discovery: Material properties in lead selection, high throughput pre-formulation studies. Preformulation as a support for formulation development, identification of challenges during formulation development.	7L+2T	At the end of the course students will be able to learn the Preformulation idea of drug substances, proteins and peptides.
2	Influence of Drug Properties and Routes of Drug Administration on the design of sustained and controlled release systems: Rationale for controlled drug delivery, physiochemical properties and biological factors influencing the design and performance of sustained/controlled release products. Preparation method of tablets, capsules, emulsions and suspensions. Overview of different carrier systems for drug delivery. Formulations using nano systems like Lipid nanoparticles; Polymeric nanoparticles; Polymeric micelles; Nanofibers; Dendrimers; Nanogels and biosilica; Quantum dots; Nanotubes; Magnetic and metallic nanoparticles.	10L+4T	Learn the criteria for selection of drugs and polymers for the development of Novel drug delivery systems.
3	Biopharmaceutic and pharmacokinetic aspects of PO CRDDS: Strategies and design, factor effecting controlled release drug delivery systems, Computation of desired release rate and dose for CRDDS, Pharmacokinetic design for DDS; in-vitro/in-vivo considerations, Intermittent zero order and first order release.	10L+4T	Explain the formulation and evaluation of Novel drug delivery systems.

4	Peroral controlled-release delivery: Design and fabrication of oral systems, dissolution-controlled release, diffusion-controlled release, diffusion and dissolution-controlled release, ion-exchange resins, pH-independent formulations, osmotically controlled release, altered density formulations, Case studies.	6 L+2T	Explain the principles and technology used in the design of sustained release and controlled release drug delivery systems.
5	Transdermal/skin drug delivery system Principles of skin permeation, factors affecting percutaneous absorption of drugs, sorption promoters, absorption enhancement by energy input - iontophoresis, sonophoresis and electroporation, pharmacokinetics of skin permeation, development and evaluation of transdermal devices, Case studies. Drug targeting: Different levels of targeting-first order, second order and third order targeting, active and passive targeting, prodrug based drug targeting, brain targeting, tumor targeting.	9L+2T	Students will learn the various approaches for the development of targeted drug Delivery systems.
	Total	**42L+14T**	

Text Books:

1) Drug Delivery Systems, KK Jain, Humana Press, 1st Ed. (2008).

Reference Books:

1. Performulation in Solid Dosage Form Development, Edited by Moji ChristianahAdeyeye and Harry G. Brittain, CRC Press, 1st Ed. (2008).
2. Handbook of Performulation: Chemical, Biological and Botanical Drugs, Edited by Sarfaraz K. Niazi, CRC Press, 2nd Ed. (2019).
3. Handbook of Pharmaceutical Excipients, Rowe, R.C.,P. J. Sheskey, Pharmaceutical Press, 6th Ed. (2009).
4. Pharmaceutical Excipients: Characterization by IR, Raman, NMR Spectroscopy, M. Dekker. Bugay, D.E. and W.P. Findlay, CRC Press, 6th Ed. (1999).