INSTITUTE	**FACULTY OF PHARMACY**
PROGRAM	**MASTER OF PHARMACY (PHARMACEUTICS)**
SEMESTER	**1**
COURSE TITLE	**DRUG DELIVERY SYSTEMS**
COURSE CODE	**13MC0102**
COURSE CREDITS	**4**

Objective:

1 This course is designed to impart knowledge in the area of advances in novel drug delivery systems.

Course Outcomes: After completion of this course, student will be able to:

1 The various approaches for the development of novel drug delivery systems.

2 The criteria for the selection of drugs and polymers for the development of delivering system.

3 The formulation and evaluation of novel drug delivery systems.

Pre-requisite of course:B.Pharm. Degree holder from an Indian university established by law in India from an institution approved by the Pharmacy Council of India and has scored not less than 55 percent of the maximum marks (aggregate of 4 years of B.Pharm.).

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
4	0	0	75	15	10	0	0

Contents : Unit	Topics	Contact Hours
1	**Unit-1** Sustained Release (SR) and Controlled Release (CR) formulations: Introduction & basic concepts, advantages/ disadvantages, factors influencing, Physicochemical & biological approaches for SR/CR formulation, Mechanism of Drug Delivery from SR/CR formulation. Polymers: Introduction, definition, classification, properties, and application. Dosage Forms for Personalized Medicine: Introduction, Definition, Pharmacogenetics, Categories of Patients for Personalized Medicines: Customized drug delivery systems, Bioelectronic Medicines, 3D printing of pharmaceuticals, Tele pharmacy.	10

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Contents : Unit	Topics	Contact Hours
2	**Unit-2** Rate Controlled Drug Delivery Systems: Principles & Fundamentals, Types, Activation; Modulated Drug Delivery Systems; Mechanically activated, pH activated, Enzyme activated, and Osmotic activated Drug Delivery Systems; Feedback regulated Drug Delivery Systems; Principles & Fundamentals.	10
3	**Unit-3** Gastro-Retentive Drug Delivery Systems: Principle, concepts advantages and disadvantages, Modulation of GI transit time approaches to extend GI transit. , Buccal Drug Delivery Systems: Principle of mucoadhesion, advantages, and disadvantages, Mechanism of drug permeation, Methods of formulation and its evaluations.	10
4	**Unit-4** Ocular Drug Delivery Systems: Barriers of drug permeation, Methods to overcome barriers.	6
5	**Unit-5** Transdermal Drug Delivery Systems: Structure of skin and barriers, Penetration enhancers, Transdermal Drug Delivery Systems, Formulation, and evaluation.	10
6	**Unit-6** Protein and Peptide Delivery: Barriers for protein delivery. Formulation and Evaluation of delivery systems of proteins and other macromolecules	8
7	**Unit-7** Vaccine delivery systems: Vaccines, uptake of antigens, single-shot vaccines, mucosal and transdermal delivery of vaccines.	6
Total Hours		**60**

Textbook :

1 Novel Drug Delivery Systems, Y. W. Chien, , Marcel Dekker, Inc., New York,, 1992

2 Controlled Drug Delivery Systems, Robinson, J. R., Lee V. H. L, , Marcel Dekker, Inc, 1992

3 Encyclopaedia of controlled delivery, Edith Mathiowetz, Published by Wiley Interscience Publication, John Wiley and Sons, 1992

4 Controlled and Novel Drug Delivery, NK Jain, CBS Publishers & Distributors, 1997

5 Controlled Drug Delivery - concepts and advances, 5. S.P. Vyas and R.K. Khar, Vallabh Prakashan, 2000

Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery					
Remember / Knowledge	**Understand**	**Apply**	**Analyze**	**Evaluate**	**Higher order Thinking / Creative**
20.00	25.00	25.00	15.00	10.00	5.00

Instructional Method:

1. The course delivery method will depend upon the requirement of content and the need of students. The teacher in addition to the conventional teaching method by the blackboard may also use any tools such as demonstration, role play, quiz, brainstorming, MOOCs etc.
2. The internal evaluation will be done based on continuous evaluation of students in the laboratory and classroom
3. Students will use supplementary resources such as online videos, NPTEL videos, MOOCs/ e-courses, virtual laboratories.

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