Gyanmanjari
Innovative University

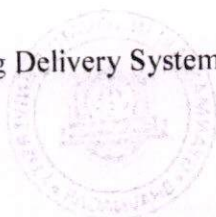**Subject:** Drug Delivery System (MPHPC11502)

Type of course: Major

Prerequisite: B.Pharmacy

Rationale: The Drug Delivery Systems course aimed to provide knowledge and application are integral to producing industry-ready professionals capable of formulating innovative drug products. This course ensures students develop the technical, research, and regulatory competencies needed to excel in the pharmaceutical sector and contribute to improved healthcare outcomes.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					Total Marks
				Theory Marks		Practical Marks		CA	
CI	T	P	C	ESE	MSE	V	P	ALA	
4	-	-	4	75	25	-	-	50	150

Legends: CI-Class Room Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.

Course Syllabus
Gyanmanjari Pharmacy College
Semester-1(M. Pharm.)

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Course Content:

Chapter No.	Course content	Hrs	% Weightage
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, Telepharmacy.	10	16.66
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	16.66
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 muco adhesion, advantages and disadvantages, Mechanism of drug permeation, Methods of formulation and its evaluations.	10	16.66
4.	**Occular Drug Delivery Systems:** Barriers of drug permeation. Methods to overcome barriers.	06	10
5.	**Transdermal Drug Delivery Systems:** Structure of skin and barriers, Penetration enhancers, Transdermal Drug Delivery Systems, Formulation and evaluation.	10	16.66
6.	**Protein and Peptide Delivery:** Barriers for protein delivery. Formulation and Evaluation of delivery systems of proteins and other macromolecules	08	13.36
7.	**Vaccine delivery systems:** Vaccines, uptake of antigens, single shot vaccines, mucosal and transdermal delivery of vaccines.	06	10

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1.	**Journal Club / Literature Review Seminars:** Faculty will assign each student a **recent journal article** on advanced drug delivery systems (e.g., nanoparticulate drug carriers) Students present a summary and lead discussions on potential implications, innovations, or improvements and upload GMIU web portal.	25
2.	**Design Thinking: Innovative Drug Delivery Challenge:** Present students with a problem statement, such as "Design a delivery system for pediatric use that improves compliance." Use the Design Thinking Process (Empathize, Define, Ideate, Prototype, Test) in teams to create a solution and also can upload GMIU web portal.	25
	Total	50

Suggested Specification table with Marks (Theory):75

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	20%	45 %	20%	10%	05 %	-

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcome:

After learning the course the students should be able to:	
CO1	Design delivery systems that enhance the efficacy and reduce the toxicity of drugs
CO2	Perform critical analysis on many drugs have poor bioavailability, short half-lives, or stability issues that traditional dosage forms cannot address. DDS introduces techniques like controlled, sustained, and targeted delivery systems that help to overcome these limitations.
CO3	Develop DDS that can deliver drugs based on patient-specific factors like genetics, disease type, and metabolism.
CO4	Encourages innovation in drug formulation, including Nanotechnology-based delivery systems (e.g., liposomes, nanoparticles). Polymer-based systems for controlled release etc.

Instructional Method:

The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in laboratory.

Reference Books:

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[1] Y.W. Chien, Novel Drug Delivery Systems, 2nd edition, revised and expanded, Marcel Dekker, Inc., New York.

[2] Robinson, J. R., Lee V. H. L, Controlled Drug Delivery Systems, Marcel Dekker,Inc., New York.

[3] Encyclopedia of controlled delivery, Editor- Edith Mathiowitz, Published by Wiley Interscience Publication, John Wiley and Sons, Inc, New York.

[4] N.K. Jain, Controlled and Novel Drug Delivery, CBS Publishers & Distributors, New Delhi, First edition.

[5] S.P.Vyas and R.K.Khar, Controlled Drug Delivery - concepts and advances. Vallabh Prakashan, New Delhi. Latest edition.

JOURNALS:

[6] Indian Journal of Pharmaceutical Sciences (IPA)

[7] Indian drugs (IDMA)

[8] Journal of controlled release (Elsevier Sciences) desirable

[9] Drug Development and Industrial Pharmacy (Marcel & Decker) desirable