

Course Description Form

1. Course Name:					
Drug Delivery System					
2. Course Code:					
Phind25 5210--					
3. Semester / Year:					
2 nd Semester/5 th year					
4. Description Preparation Date:					
01/02/2026					
5. Available Attendance Forms:					
Students' signature on attendance sheet					
6. Number of Credit Hours (Total) / Number of Units (Total)					
2 hours Theoretical /2 units					
7. Course administrator's name					
Theoretical					
Name: Lec. Dr Omar Abdulhakeem Email: omar.hamid@uomosul.edu.iq Name : Lec. Dr Mohanad Alfahad ail: Dr.ma.alfahad@uomosul.edu.iq					
8. Course Objectives					
<p>☐ Develop an advanced understanding of drug delivery principles across multiple administration routes, including nasal, ocular, transdermal, pulmonary, and nanotechnology-based systems.</p> <p>☐ Critically evaluate the relationship between physiological barriers and drug delivery performance, and apply this knowledge to optimize formulation strategies for different routes.</p> <p>☐ Analyze and compare conventional and advanced drug delivery systems, including nanomedicines and targeted delivery platforms, in terms of design, efficacy, and clinical applicability.</p> <p>☐ Design and assess drug delivery systems using scientific and regulatory considerations, including formulation challenges, stability, bioavailability, and patient-related factors.</p> <p>☐ Integrate emerging technologies and current research trends in drug delivery, and critically appraise their potential for improving therapeutic outcomes and translational success.</p>					
9. Teaching and Learning Strategies					
Strategy	Lecturing Homework Quiz				
10. Course Structure					
Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	<ul style="list-style-type: none"> • Critically evaluate the stages of new drug discovery and design, • Analyze the role of biologic 	New drug development and approval process Introduction, Drug Discovery, Drug	Theoretical lectures	Paper-based exams

		characterization in drug development,	Design, Biologic Characterization		
2	2	<ul style="list-style-type: none"> Assess the importance of early formulation studies Explain and critically appraise the requirements and components of an Investigational New Drug (IND) application, 	<p>New drug development and approval process</p> <p>Early Formulation Studies, Investigational New Drug Application - (IND)</p>	Theoretical lectures	Paper-based exams
3		<ul style="list-style-type: none"> Differentiate between various drug approval pathways Examine the role of the International Conference on Harmonization (ICH) 	<p>New drug development and approval process</p> <p>NDA, ANDA, Supplemental Applications, ICH Guidelines)</p>	Theoretical lectures	Paper-based exams
4	2	<ul style="list-style-type: none"> Critically explain the principles and scope of pharmaceutical nanotechnology Analyze the design, synthesis, and therapeutic performance of polymer–drug conjugates and dendrimers 	<p>Pharmaceutical Nanotechnology Nanomedicines (Introduction, Applications, Polymer drug conjugates, Dendrimers)</p>	Theoretical lectures	Paper-based exams
5	2	<ul style="list-style-type: none"> Compare and evaluate different nanoscale delivery systems (micelles, solid nanoparticles, liposomes, and lipid nanoparticles) Assess the influence of physicochemical properties (particle size, surface charge, hydrophobicity) on biodistribution, cellular uptake, and therapeutic efficacy of nanomedicines. 	<p>Pharmaceutical Nanotechnology Nanomedicines (Micelles, Solid nanoparticles, Liposomes, Bilayer vesicles, Lipid nanoparticles)</p>	Theoretical lectures	Paper-based exams

6	2	<ul style="list-style-type: none"> • Differentiate between microcapsules and microspheres • Critically appraise current challenges and emerging trends in nanomedicine, 	Pharmaceutical Nanotechnology and Nanomedicines (Microcapsules, Microspheres, Ongoing developments)	Theoretical lectures	Paper-based exams
7	2	<ul style="list-style-type: none"> • Explain the principles and advantages of nasal drug delivery, including its role in local, systemic, and nose-to-brain drug targeting. • Analyze the anatomical and physiological features of the nasal cavity 	Nasal drug delivery (Introduction, Anatomy and Physiology)	Theoretical lectures	Paper-based exams
8	Midterm exam				
9	2	<ul style="list-style-type: none"> • Evaluate the key factors influencing nasal drug delivery, • Compare and critically assess different nasal delivery systems (e.g., sprays, drops, gels, powders, and advanced systems) 	Nasal Drug Delivery (Drug Delivery, Nasal Delivery Systems)	Theoretical lectures	Paper-based exams
10	2	<ul style="list-style-type: none"> • Explain the principles of ocular drug delivery and critically evaluate how ocular anatomy and physiology influence drug absorption, distribution, and elimination. • Analyze common ocular diseases and their pharmacological management, linking drug properties and dosage forms to therapeutic outcomes. 	Ocular Drug Delivery (Introduction, Anatomy & Physiology, Ocular Conditions, Pharmacological Interventions)	Theoretical lectures Laboratory demonstration	Paper-based exams
11	2	<ul style="list-style-type: none"> • Evaluate formulation strategies for 	Ocular Drug Delivery	Theoretical lectures	Paper-based exams

		<ul style="list-style-type: none"> ophthalmic preparations, Critically assess barriers to ocular drug delivery and advanced targeting approaches, including posterior segment delivery, novel systems, 	(Formulation, Barriers, Pharmacokinetics, Advanced Systems, Patient Factors)		
12	2	<ul style="list-style-type: none"> Explain the fundamental principles of transdermal drug delivery systems (TDDS) and critically analyze the physicochemical and physiological factors influencing percutaneous absorption. Evaluate percutaneous absorption enhancement strategies and predictive models, drug delivery. 	Transdermals and Transdermal Drug Delivery Systems (Introduction, Factors Affecting Absorption, Enhancers, Models)	Theoretical lectures	Paper-based exams
13		<ul style="list-style-type: none"> Assess the design features and performance of transdermal drug delivery systems, including drug selection criteria, system components, and release mechanisms, with comparison to patches and tapes. Critically appraise the clinical applications of transdermal systems, including their advantages, limitations, patient considerations, and examples of marketed transdermal preparations. 	Transdermals and Transdermal Drug Delivery Systems (Design Features, Advantages/Disadvantages, Clinical Use, Patches & Tapes)	Theoretical lectures	Paper-based exams

14		<ul style="list-style-type: none"> Explain the principles of pulmonary drug delivery, including lung anatomy relevant to deposition, and evaluate the advantages and limitations of inhalation as a drug delivery route. Analyze the factors influencing aerosol deposition in the respiratory tract, 	Pulmonary Drug Delivery (Inhaled Drug Delivery, Principles of Aerosols)	Theoretical lectures	Paper-based exams
15		<ul style="list-style-type: none"> Evaluate formulation strategies for therapeutic inhalation aerosols, Critically assess methods of aerosol particle size analysis (e.g., cascade impaction, laser diffraction) 	Pulmonary Drug Delivery (Formulation of Inhalation Aerosols, Aerosol Size Analysis Methods)	Theoretical lectures	Paper-based exams

11. Course Evaluation

- 30 M Theoretical assessment; (paper-based mid-term exam + quiz + attendance + seminar)
- 70 M paper-based theoretical final exam

100 M total

12. Learning and Teaching Resources

Required textbooks	Ansel's Pharmaceutical Dosage Forms and Drug Delivery
Main references (sources)	(Aulton's Pharmaceutics; The Design and Manufacture of Medicines; 6th edition, 2022)
Electronic resources	Youtube.com