4-Year Bachelor of Pharmacy (B.Pharm) Curriculum and Syllabus

Course Structure

Seventh Semester

Course Code	Name of the course	No.of hours	Tutorial	Credit points
TIU-UBP-701T	Instrumental Methods of Analysis– Theory	3	1	4
TIU-UBP-702T	Industrial Pharmacy II– Theory	3	1	4
TIU-UBP-703T	Pharmacy Practice- Theory	3	1	4
TIU-UBP-704T	Novel Drug Delivery System- Theory	3	1	4
TIU-UBP-705P	Instrumental Methods of Analysis– Practical	4	-	2
TIU-UBP-706PS	Practice School*	12	-	6
	Total	**28**	**4**	**24**

*Non University Examination (NUE)

B.PHARM SYLLABUS

SEMESTER –VII

INSTRUMENTAL METHODS OF ANALYSIS – Theory (TIU-UBP-701T)

Contact hours: 45 hr

Course Objectives

1. To understand the interaction of matter with electromagnetic radiations and its applications in drug analysis.
2. To understand the chromatographic separation and analysis of drugs.
3. To Describe quantitative & qualitative analysis of drugs using various analytical instruments.

Course Outcomes

On completion of this course, the students will be able to

CO1. **Understand** the interaction of matter with electromagnetic radiations and its applications in drug analysis.
CO2. **Understand** the chromatographic separation and analysis of drugs.
CO3. **Describe** quantitative & qualitative analysis of drugs using various analytical instruments.

Course Content — 45 Hours

UNIT-I — 10 Hours

UV Visible spectroscopy

Electronic transitions, chromophores, auxochromes, spectral shifts, solvent effect onabsorption spectra, Beer and Lambert's law, Derivation and deviations.

Instrumentation - Sources of radiation, wavelength selectors, sample cells, detectors- Photo tube, Photomultiplier tube, Photo voltaic cell, Silicon Photodiode.

Applications - Spectrophotometric titrations, Single component and multi componentAnalysis

Fluorimetry

Theory, Concepts of singlet, doublet and triplet electronic Describes, internal and externalconversions, factors affecting fluorescence, quenching, instrumentation andapplications

UNIT-II — 10 Hours

IR spectroscopy

Introduction, fundamental modes of vibrations in poly atomic molecules, samplehandling, factors affecting vibrations

Instrumentation - Sources of radiation, wavelength selectors, detectors - Golaycell,Bolometer, Thermocouple, Thermister, Pyroelectric detector and applications

Flame Photometry-Principle, interferences, instrumentation and applications

Atomic absorption spectroscopy- Principle, interferences, instrumentation andapplications

Nepheloturbidometry- Principle, instrumentation and applications

UNIT-III **10 Hours**

Introduction to chromatography

Adsorption and partition column chromatography-Methodology, advantages,disadvantages and applications.

Thin layer chromatography- Introduction, Principle, Methodology, Rf values,advantages, disadvantages and applications.

Paper chromatography-Introduction, methodology, development techniques,advantages, disadvantages and applications

Electrophoresis– Introduction, factors affecting electrophoretic mobility, Techniquesof paper, gel, capillary electrophoresis, applications

UNIT-IV **8 Hours**

Gas chromatography - Introduction, theory, instrumentation, derivatization,temperature programming, advantages, disadvantages and applications

High Describeance liquid chromatography (HPLC)-Introduction, theory,instrumentation, advantages and applications.

UNIT-V **7 Hours**

Ion exchange chromatography- Introduction, classification, ion exchange resins,properties, mechanism of ion exchange process, factors affecting ion exchange,
methodology and applications

Gel chromatography- Introduction, theory, instrumentation and applications

Affinity chromatography- Introduction, theory, instrumentation and applications

Reference Books (Latest edition)

1. Instrumental Methods of Chemical Analysis by B.K Sharma
2. Organic spectroscopy by Y.R Sharma
3. Text book of Pharmaceutical Analysis by Kenneth A. Connors
4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel
5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake
6. Organic Chemistry by I. L. Finar
7. Organic spectroscopy by William Kemp
8. Quantitative Analysis of Drugs by D. C. Garrett

9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
10. Spectrophotometric identification of Organic Compounds by Silverstein

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Understand** the interaction of matter with electromagnetic radiations and its applications in drug analysis.	PO1, PO2, PO5, PO6, PO8, PO10, PO11, PO12, PEO1,PEO2,PEO3
CO2	**Understand** the chromatographic separation and analysis of drugs	PO1, PO2, PO5, PO6, PO10, PO11, PEO1,PEO2,PEO3
CO3	**Describe**quantitative & qualitative analysis of drugs using various analytical instruments	PO1, PO2, PO3, PO4, PO5, PO6, PO9, PO7, PO10, PO11, PO12, PEO1,PEO2,PEO3

		Pharmaceutical Knowledge	Problem solving	Conduct, analyze and interpret data	Ability to design and formulating a process	Ability to understand mechanism	Demonstrate skills in problem solving	Professional and ethical responsibilities	Communication to present a technical report	Impact on society and responsibilities	Leadership qualities	Self educating and Life-long Learning	Preparation for competitive examinations	Building a theoretical knowledge base along with necessary practical skills	To build a strong foundation as per the requirements of pharmaceutical Industries, Community and Hospital	Training students to achieve expertise
Course Code	**Course Title**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PEO1**	**PEO2**	**PEO3**
TIU-UBP-701T	Instrumental Methods of Analysis Theory	3	3	3	3	3	2	2	2	2	2	2	3	3	3	3

1=weakly mapped
2= moderately mapped
3=strongly mapped

INSTRUMENTAL METHODS OF ANALYSIS – Practical (TIU-UBP-705P)
Contact hours: 4 hr/week

Course Objectives

1. To understand the interaction of matter with electromagnetic radiations and its applications in drug analysis.
2. To understand the chromatographic separation and analysis of drugs.
3. To Describe quantitative & qualitative analysis of drugs using various analytical instruments.

Course Outcomes

On completion of this course, the students will be able to

CO4. **Understand** the interaction of matter with electromagnetic radiations and its applications in drug analysis.
CO5. **Understand** the chromatographic separation and analysis of drugs.
CO6. **Describe** quantitative & qualitative analysis of drugs using various analytical instruments.

Course Content

1	Determination of absorption maxima and effect of solvents on absorption maxima of organic compounds
2	Estimation of dextrose by colorimetry
3	Estimation of sulfanilamide by colorimetry
4	Simultaneous estimation of ibuprofen and paracetamol by UV spectroscopy
5	Assay of paracetamol by UV- Spectrophotometry
6	Estimation of quinine sulfate by fluorimetry
7	Study of quenching of fluorescence
8	Determination of sodium by flame photometry
9	Determination of potassium by flame photometry
10	Determination of chlorides and sulphates by nepheloturbidometry
11	Separation of amino acids by paper chromatography
12	Separation of sugars by thin layer chromatography
13	Separation of plant pigments by column chromatography
14	Demonstration experiment on HPLC
15	Demonstration experiment on Gas Chromatography

Reference Books (Latest edition)

1. Instrumental Methods of Chemical Analysis by B.K Sharma
2. Organic spectroscopy by Y.R Sharma
3. Text book of Pharmaceutical Analysis by Kenneth A. Connors
4. Vogel's Text book of Quantitative Chemical Analysis by A.I. Vogel
5. Practical Pharmaceutical Chemistry by A.H. Beckett and J.B. Stenlake
6. Organic Chemistry by I. L. Finar

7. Organic spectroscopy by William Kemp
8. Quantitative Analysis of Drugs by D. C. Garrett
9. Quantitative Analysis of Drugs in Pharmaceutical Formulations by P. D. Sethi
10. Spectrophotometric identification of Organic Compounds by Silverstein

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Understand** the interaction of matter with electromagnetic radiations and its applications in drug analysis.	**PO1, PO2, PO5, PO6, PO10, PO11, PEO1,PEO2,PEO3**
CO2	**Understand** the chromatographic separation and analysis of drugs	**PO1, PO2, PO5, PO6, PO10, PO11, PEO1,PEO2,PEO3**
CO3	**Describe** quantitative & qualitative analysis of drugs using various analytical instruments	**PO1, PO2, PO3, PO4, PO5, PO6, PO10, PO11, PEO1,PEO2,PEO3**

		Pharmaceutical Knowledge	Problem solving	Conduct, analyze and interpret data	Ability to design and formulating a process	Ability to understand mechanism	Demonstrate skills in problem solving	Professional and ethical responsibilities	Communication to present a technical report	Impact on society and responsibilities	Leadership qualities	Self educating and Life-long Learning	Preparation for competitive examinations	Building a theoretical knowledge base along with necessary practical skills	To build a strong foundation as per the requirements of pharmaceutical Industries, Community and Hospital Pharmacy	Training students to achieve expertise
Course Code	**Course Title**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PEO1**	**PEO2**	**PEO3**
TIU-UBP-705P	Instrumental Methods of Analysis - Practical	3	3	3	3	3	2	-	2	-	2	2	2	3	2	3

1=weakly mapped
2= moderately mapped

3=strongly mapped

Industrial Pharmacy II – Theory (TIU-UBP-702T)
Contact Hours: 45 hrs

Course Objectives: -

1.Know the process of pilot plant and scale up of pharmaceutical dosage forms
2.Identify the process of technology transfer from lab scale to commercial batch
3.Know different Laws and Acts that regulate pharmaceutical industry
4.know the approval process and regulatory requirements for drug products

Course Outcomes

Upon completion of the course, the student shall be able

CO1.Describe the importance of the process of pilot plant and scale up of pharmaceutical dosage forms.

CO2.Identify the various process of technology transfer from lab scale to commercial batch.

CO3.Explain different Laws and Quality management systems that govern pharmaceutical industry.

CO4. Demonstrate the different approval process and regulatory requirements for drug products.

Course Content	**45 Hours**

Unit – 1 **9h**

Pilot plant scale up techniques: General considerations - including significance of personnel requirements, space requirements, raw materials, Pilot plant scale up considerations for solids, liquid orals, semi solids and relevant documentation, SUPAC guidelines, Introduction to platform technology

Unit -II **10h**

Technology development and transfer: WHO guidelines for Technology Transfer(TT): Terminology, Technology transfer protocol, Quality risk management, Transfer from R & D to production (Process, packaging and cleaning), Granularity of TT Process (API, excipients, finished products, packaging materials) Documentation, Premises and equipments, qualification and validation, quality control, analytical method transfer, Approved regulatory bodies and agencies, Commercialization - practical aspects and problems (case studies), TT agencies in India - APCTD, NRDC, TIFAC, BCIL, TBSE / SIDBI; TT related documentation - confidentiality agreement, licensing, MoUs, legal issues

Unit – III **8h**

Regulatory affairs: Introduction, Historical overview of Regulatory Affairs, Regulatoryauthorities, Role of Regulatory affairs department, Responsibility of Regulatory Affairs ProfessionalsRegulatory requirements for drug approval: Drug Development Teams, Non-Clinical Drug Development, Pharmacology, Drug Metabolism and Toxicology, General considerations of Investigational New Drug (IND) Application, Investigator's Brochure (IB) and New Drug Application (NDA), Clinical research / BE studies, Clinical Research Protocols, Biostatistics in Pharmaceutical Product Development, Data Presentation for FDA Submissions, Management of Clinical Studies.

Unit- IV **10h**

Quality management systems: Quality management & Certifications: Concept of Quality, Total Quality Management, Quality by Design (QbD), Six Sigma concept, Out of Specifications (OOS), Change control, Introduction to ISO 9000 series of quality systems standards, ISO 14000, NABL, GLP

Unit- V **8h**

Indian Regulatory Requirements: Central Drug Standard Control Organization (CDSCO) and Describe Licensing Authority: Organization, Responsibilities, Certificate of Pharmaceutical Product (COPP), Regulatory requirements and approval procedures for New Drugs.

Reference Books (Latest Editions)

1.Regulatory Affairs from Wikipedia, the free encyclopedia modified on 7th April available at http,//en.wikipedia.org/wiki/Regulatory Affairs.

2.International Regulatory Affairs Updates, 2005. available at http://www.iraup.com/about.php

3.Douglas J Pisano and David S. Mantus. Text book of FDA Regulatory Affairs A Guide for

4.Regulatory Affairs brought by learning plus, inc. available at http.//www.cgmp.com/ra.htm.

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and Pos		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Recognize** the importance of the process of pilot plant and scale up of pharmaceutical dosage forms	PO1, PEO1, PEO2, PO6
CO2	**Identify** the various process of technology transfer from lab scale to commercial batch	PO1, PEO2, PO6

CO3	**Illustrate** different Laws and Acts that regulate pharmaceutical industry	PO1, PO4, PO11, PO12,PEO1,PEO2, PEO3,PO12, PO6,
CO4	**Application** of different approval process and regulatory requirements for drug products	PO1,PO2,PO3, PEO1, PEO2, PEO3

		Pharmaceutical Knowledge	Problem solving	Conduct, analyze and interpret data	Ability to design and formulating a process	Ability to understand mechanism	Demonstrate skills in problem solving	Professional and ethical responsibilities	Communication to present a technical report	Impact on society and responsibilities	Leadership qualities	Self educating and Life-long Learning	Preparation for competitive examinations	Building a theoretical knowledge base along with necessary practical skills	To build a strong foundation as per the requirements of pharmaceutical Industries, Community and Hospital Pharmacy	Training students to achieve expertise
Course Code	**Course Title**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PEO1**	**PEO2**	**PEO3**
TIU-UBP-702T	Industrial Pharmacy II-Theory	3	3	2	2	2	3	-	-	-	-	3	3	3	3	2

1=weakly mapped
2= moderately mapped
3=strongly mapped

PHARMACY PRACTICE –Theory (TIU-UBP-703T)
Contact hours: 45 hrs

Course Objectives

1. To know various drug distribution methods in a hospital.
2. To administer the knowledge of pharmacy stores management and inventory control monitor drug therapy of patient through medication chart review and clinical review.
3. To obtain medication history interview and counsel the patients.
4. To identify drug related problems and detect and assess adverse drug reactions.
5. To know pharmaceutical care services.
6. To interpret selected laboratory results (as monitoring parameters in therapeutics) of specific disease Describes.

Course Outcomes

Upon completion of the course, the student shall be able

CO1. **Describe** hospital pharmacy, its organization and the pharmacy stores management and inventory control.

CO2. **Identify** drug related problems and detect and assess adverse drug reactions.

CO3. **Produce** the knowledge about drugs by obtain medication history interview and counsel the patients.

CO4. **Compare** the selected laboratory results (as monitoring parameters in therapeutics) of specific disease Describes.

CO5. **Explain** the concept of Rational drug therapy.

Course Content **45 Hours**

UNIT-I **10 Hours**

Hospital and it's organization

Definition, Classification of hospital- Primary, Secondary and Tertiary hospitals, Classification based on clinical and non- clinical basis, Organization Structure of a Hospital, and Medical staffs involved in the hospital and their functions.

Hospital pharmacy and its organization

Definition, functions of hospital pharmacy, Organization structure, Location, Layout and staff requirements, and Responsibilities and functions of hospital pharmacists.

c) Adverse drug reaction

Classifications - Excessive pharmacological effects, secondary pharmacological effects, idiosyncrasy, allergic drug reactions, genetically determined toxicity, toxicity following sudden withdrawal of drugs, Drug interaction- beneficial interactions, Adverse interactions, and pharmacokinetic drug interactions, Methods for detecting drug interactions, spontaneous case reports and record linkage studies, and Adverse drug reaction reporting and management.

Community Pharmacy

Organization and structure of retail and wholesale drug store, types and design, Legal requirements for establishment and maintenance of a drug store, Dispensing of proprietary products, maintenance of records of retail and wholesale drug store.

UNIT-II **10 Hours**

Drug distribution system in a hospital

Dispensing of drugs to inpatients, types of drug distribution systems, charging policy and labelling, Dispensing of drugs to ambulatory patients, and Dispensing of controlled drugs.

Hospital formulary

Definition, contents of hospital formulary, Differentiation of hospital formulary and Drug list, preparation and revision, and addition and deletion of drug from hospital

formulary.

Therapeutic drug monitoring

Need for Therapeutic Drug Monitoring, Factors to be considered during the Therapeutic Drug Monitoring, and Indian scenario for Therapeutic Drug Monitoring.

Medication adherence

Causes of medication non-adherence, pharmacist role in the medication adherence, and monitoring of patient medication adherence.

Patient medication history interview

Need for the patient medication history interview, medication interview forms.

Community pharmacy management

Financial, materials, staff, and infrastructure requirements.

UNIT-III **10 Hours**

Pharmacy and therapeutic committee

Organization, functions, Policies of the pharmacy and therapeutic committee inincluding drugs into formulary, inpatient and outpatient prescription, automatic stoporder, and emergency drug list preparation.

Drug information services

Drug and Poison information centre, Sources of drug information, Computerisedservices, and storage and retrieval of information.

Patient counselling

Definition of patient counseling; steps involved in patient counseling, and Specialcases that require the pharmacist.

Education and training program in the hospital

Role of pharmacist in the education and training program, Internal and externaltraining program, Services to the nursing homes/clinics, Code of ethics for communitypharmacy, and Role of pharmacist in the interdepartmental communication andcommunity health education.

Prescribed medication order and communication skills

Prescribed medication order- interpretation and legal requirements, and Communication skills- communication with prescribers and patients.

UNIT IV **08 Hours**

Budget preparation and implementation: Budget preparation and implementation

Clinical Pharmacy

Introduction to Clinical Pharmacy, Concept of clinical pharmacy, functions andresponsibilities of clinical pharmacist, Drug therapy monitoring - medication chartreview, clinical review, pharmacist intervention, Ward round participation, Medicationhistory and Pharmaceutical care.

Dosing pattern and drug therapy based on Pharmacokinetic & disease pattern.

Over the counter (OTC) sales

Introduction and sale of over the counter, and Rational use of common over thecounter medications.

UNIT V **07 Hours**

Drug store management and inventory control

Organisation of drug store, types of materials stocked and storage conditions, Purchaseand inventory control: principles, purchase procedure, purchase order, procurementand stocking, Economic order quantity, Reorder quantity level, and Methods used forthe analysis of the drug expenditure

Investigational use of drugs

Description, principles involved, classification, control, identification, role of hospitalpharmacist, advisory committee.

Interpretation of Clinical Laboratory Tests

Blood chemistry, hematology, and urinalysis

Reference Books (Latest Editions)

Merchant S.H. and Dr. J.S.Quadry. A textbook of hospital pharmacy, 4th ed. Ahmadabad: B.S. Shah Prakakshan; 2001.

2. Parthasarathi G, Karin Nyfort-Hansen, Milap C Nahata. A textbook of Clinical Pharmacy Practice- essential concepts and skills, 1st ed. Chennai: Orient Longman Private Limited; 2004.

3. William E. Hassan. Hospital pharmacy, 5th ed. Philadelphia: Lea &Febiger;1986.

4. Tipnis Bajaj. Hospital Pharmacy, 1st ed. Maharashtra: Career Publications; 2008.

5. Scott LT. Basic skills in interpreting laboratory data, 4thed. American Society of Health System Pharmacists Inc; 2009.

6. Parmar N.S. Health Education and Community Pharmacy, 18th ed. India: CBS Publishers & Distributers; 2008.

Journals:

1. Therapeutic drug monitoring. ISSN: 0163-4356
2. Journal of pharmacy practice. ISSN : 0974-8326
3. American journal of health system pharmacy. ISSN: 1535-2900 (online)
4. Pharmacy times (Monthly magazine)

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	**Mapped Program Outcomes**
CO1	**Describe** hospital pharmacy, its organization and the pharmacy stores management and inventory control.	PO1, PO9, PEO1
CO2	**Identify** drug related problems and detect and assess adverse drug reactions.	PO1, PO5, PO11, PO12, PEO1, PEO2

CO3	**Produces** the knowledge about drugs by obtain medication history interview and counsel the patients.	PO1, PO2, PO9, PO11, PO12, PEO1, PEO2, PEO3
CO4	**Compare** the selected laboratory results (as monitoring parameters in therapeutics) of specific disease Describes.	PO1, PO3, PO5, PO9, PO12, PEO1, PEO2, PEO3
CO5	**Explain** the concept of Rational drug therapy.	PO1, PO5, PO9, PEO1, PEO2, PEO3

		Pharmaceutical Knowledge	Problem solving	Conduct, analyze and interpret data	Ability to design and formulating a process	Ability to understand mechanism	Demonstrate skills in problem solving	Professional and ethical responsibilities	Communication to present a technical report	Impact on society and responsibilities	Leadership qualities	Self educating and Life-long Learning	Preparation for competitive examinations	Building a theoretical knowledge base along with necessary practical skills	To build a strong foundation as per the requirements of pharmaceutical Industries, Community and Hospital Pharmacy.	Training students to achieve expertise
Course Code	**Course Title**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PEO1**	**PEO2**	**PEO3**
TIU-UBP-703T	Pharmacy Practice - Theory	3	-	2	-	2	-	-	-	3	-	3	3	3	3	2

1=weakly mapped
2= moderately mapped
3=strongly mapped

Novel Drug Delivery System-Theory (TIU-UBP-704T)

Contact Hours: 45 hours

Course Objectives

1. To understand various approaches for development of novel drug delivery systems.
2. To understand the criteria for selection of drugs and polymers for the development of Novel drug delivery systems, their formulation and evaluation
3. To gain knowledge about modern and advanced drug delivery system
4. To have an overall idea controlled release and sustained release formulations.

Course Outcomes

Upon completion of the course, the student shall be able:

CO1. **Identify** the various approaches that helps in designing the controlled and sustained release dosage forms.
CO2. **Summarize** about microencapsulation, Mucosal Drug Delivery System and Implantable Drug Delivery System
CO3. **Summarize** about Transdermal, Gastroretentive and Nasopulmonary drug delivery system
CO4. **Identify** the Concepts and various approaches of Targeted drug delivery system
CO5. **Demonstrate**Ocular and Intrauterine Drug delivery system.

Course content:

UNIT-I **10**

Hours

Controlled drug delivery systems: Introduction, terminology/definitions and rationale, advantages, disadvantages, selection of drug candidates.Approaches to design controlled release formulations based on diffusion, dissolution and ion exchange principles. Physicochemical and biological properties of drugs relevant to controlled release formulations

Polymers: Introduction, classification, properties, advantages and application of polymers in formulation of controlled release drug delivery systems.

UNIT-II **10**

Hours

Microencapsulation: Definition, advantages and disadvantages, microspheres /microcapsules, microparticles, methods of microencapsulation, applications

Mucosal Drug Delivery system: Introduction, Principles of bioadhesion / mucoadhesion, concepts, advantages and disadvantages, transmucosal permeability and formulation considerations of buccal delivery systems

Implantable Drug Delivery Systems: Introduction, advantages and disadvantages, concept of implantsand osmotic pump

UNIT-III **10**

Hours

Transdermal Drug Delivery Systems: Introduction, Permeation through skin, factors affecting permeation, permeation enhancers, basic components of TDDS, formulation approaches

Gastroretentive drug delivery systems: Introduction, advantages, disadvantages, approaches for GRDDS – Floating, high density systems, inflatable and gastroadhesive systems and their applications

Nasopulmonary drug delivery system: Introduction to Nasal and Pulmonary routes of drug delivery, Formulation of Inhalers (dry powder and metered dose), nasal sprays, nebulizers

UNIT-IV **08 Hours**

Targeted drug Delivery: Concepts and approaches advantages and disadvantages, introduction to liposomes, niosomes, nanoparticles, monoclonal antibodies and their applications

Unit-V **07 Hours**

Ocular Drug Delivery Systems: Introduction, intra ocular barriers and methods to overcome –Preliminary study, ocular formulations and ocuserts

Intrauterine Drug Delivery Systems: Introduction, advantages and disadvantages, development of intra uterine devices (IUDs) and applications.

Recommended Books: (Latest Editions)

1. Y W. Chien, Novel Drug Delivery Systems, 2nd edition, revised and expanded, Marcel Dekker, Inc., New York, 1992.
2. Robinson, J. R., Lee V. H. L, Controlled Drug Delivery Systems, Marcel Dekker, Inc., New York, 1992.
3. Encyclopedia of Controlled Delivery. Edith Mathiowitz, Published by Wiley Interscience Publication, John Wiley and Sons, Inc, New York. Chichester/Weinheim
4. N.K. Jain, Controlled and Novel Drug Delivery, CBS Publishers & Distributors, New Delhi, First edition 1997 (reprint in 2001).
5. S.P. Vyas and R.K. Khar, Controlled Drug Delivery -concepts and advances, Vallabh Prakashan, New Delhi, First edition 2002.

Journals

1. Indian Journal of Pharmaceutical Sciences (IPA)
2. Indian Drugs (IDMA)
3. Journal of Controlled Release (Elsevier Sciences)
4. Drug Development and Industrial Pharmacy (Marcel & Decker)

International Journal of Pharmaceutics (Elsevier Sciences)

Relationship between the Course Outcomes (COs) and Program Outcomes (POs)

Mapping between COs and POs		
	Course Outcomes (COs)	Mapped Program Outcomes
CO1	**Identify** the various approaches that help in designing the controlled and sustained release dosage forms.	PO1, PO2, PO5, PO4, PO6, PO12, PEO1, PEO2, PEO3
CO2	**Summarize** about microencapsulation, Mucosal Drug Delivery System and Implantable Drug Delivery System	PO1, PO4, PO11, PO12, PEO1, PEO2, PEO3.
CO3	**Summarize** about Transdermal, Gastroretentive and Nasopulmonary drug delivery system	PO1, PO4, PO9, PO11, PO12, PEO1,PEO2, PEO3
CO4	**Identify** the Concepts and various approaches of Targeted drug delivery system	PO1, PO4, PO5, PO11,PO12,PEO1, PEO2, PEO3
CO5	**Demonstrate** Ocular and Intrauterine Drug delivery system.	PO1, PO4, PO11, PO12, PEO1,PEO2, PEO3

		Pharmaceutical Knowledge	Problem solving	Conduct, analyze and interpret data	Ability to design and formulating a process	Ability to understand mechanism	Demonstrate skills in problem solving	Professional and ethical responsibilities	Communication to present a technical report	Impact on society and responsibilities	Leadership qualities	Self educating and Life-long Learning	Preparation for competitive examinations	Building a theoretical knowledge base along with necessary practical skills	To build a strong foundation as per the requirements of pharmaceutical Industries, Community and Hospital Pharmacy	Training students to achieve expertise

Course Code	Course Title	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PEO1	PEO2	PEO3
TIU-UBP-704T	Novel Drug Delivery System - Theory	3	2	-	3	2	2	-	-	2	-	3	3	3	3	3

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2= moderately mapped
3=strongly mapped