



Rungta College of Pharmaceutical Sciences & Research

Kohka-Kurud Road, Bilai

Affiliated to

Chhattisgarh Swami Vivekanand Technical University, Bilai

Course File

(Theory+ Lab)

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Name of Course	:	Physical Pharmaceutics-I
Course Code	:	341352(41) [T], 341362(41) [P]
Semester	:	3rd
Section	:	A & B
Academic Year	:	2023-2024

1. Vision

To achieve recognition at national level for excellence in quality pharmacy education and research by 2025.

2. Mission

To produce dynamic, competent and qualified manpower for healthcare services, aware of social, environmental, ethical responsibilities and capable of creating/ disseminating new knowledge as the field of pharmaceutical sciences evolves.

3. Programme Educational Objectives (PEOs)

The graduates of pharmacy will:

1. Possess strong knowledge of Pharmaceutical Sciences required to pursue career/higher education or to become entrepreneur.
2. Acquire professional skills in making the products and providing services in health care system.
3. Be effective communicators, contributors in teams and efficient managers.
4. Be ethical, professional and conscious of their environmental and social responsibilities.
5. Possess an attitude for continuous learning and practicing in the field of work.

4. Programme Outcomes (POs)

After completion of graduation, the students will:

1. **Pharmacy Knowledge:** Possess knowledge and comprehension of the core and basic knowledge associated with the profession of pharmacy, including biomedical sciences; pharmaceutical sciences; behavioral, social, and administrative pharmacy sciences; and manufacturing practices.
2. **Planning Abilities:** Demonstrate effective planning abilities including time management, resource management, delegation skills and organizational skills. Develop and implement plans and organize work to meet deadlines.
3. **Problem analysis:** Utilize the principles of scientific enquiry, thinking analytically, clearly and critically, while solving problems and making decisions during daily practice. Find, analyze, evaluate and apply information systematically and shall make defensible decisions.
4. **Modern tool usage:** Learn, select, and apply appropriate methods and procedures, resources, and modern pharmacy-related computing tools with an understanding of the limitations.
5. **Leadership skills:** Understand and consider the human reaction to change, motivation issues, leadership and team-building when planning changes required for fulfillment of practice, professional and societal responsibilities. Assume participatory roles as responsible citizens or leadership roles when appropriate to facilitate improvement in health and well- being.

6. **Professional identity:** Understand, analyze and communicate the value of their professional roles in society (e.g. health care professionals, promoters of health, educators, managers, employers, employees).
7. **Pharmaceutical ethics:** Honour personal values and apply ethical principles in professional and social contexts. Demonstrate behavior that recognizes cultural and personal variability in values, communication and lifestyles. Use ethical frameworks; apply ethical principles while making decisions and take responsibility for the outcomes associated with the decisions.
8. **Communication:** Communicate effectively with the pharmacy community and with society at large, such as, being able to comprehend and write effective reports, make effective presentations and documentation, and give and receive clear instructions.
9. **Pharmacist and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety and legal issues and the consequent responsibilities relevant to the professional pharmacy practice.
10. **Environment and Sustainability:** Understand the impact of the professional pharmacy solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
11. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. Self-assess and use feedback effectively from others to identify learning needs and to satisfy these needs on an ongoing basis.

5. Academic Calendar (2023-24)

Commencement of Session	: 09/10/2023
First Sessional Exam	: 03/01/24-06/01/2024
Second Sessional Exam	: 05/02/2024-08/02/2024
Annual Practical Exam	: 15/07/24-19/07/24
Annual Theory Exam	: 04/07/24-13/07/24
List of holidays	
Muharram	: 29/07/23
Independence Day	: 15/08/23
Raksha Bandhan	: 30/08/23
Krishna Janmashtami	: 07/09/23
Gandhi Jayanti	: 02/10/23
Maha Navami	: 23/10/23
Dussehra	: 24/10/23
Chhath Puja	: 19/11/23
Guru Nanak jayanti	: 27/11/23
Guru Ghasi Das jayanti	: 18/12/23
Christmas	: 25/12/23

Note : Schedule for guest lectures, staff seminars, NSS/ISTE activities, student elections etc.will be declared separately.

6. Course Syllabus

6.1.Theory

Module:1 (10 Hrs.)

The solubility of drugs: Solubility expressions, mechanisms of solute-Solvent interactions,ideal solubility parameters, solvation & association, quantitative approach to the factors influencing solubility of drugs, Dissolution & drug release, diffusion principles in biological systems. The solubility of gases in liquids, the solubility of liquids in liquids, (Binary solutions, ideal solutions) Raoult's law, real solutions, azeotropic mixtures, fractional distillation.Partially miscible liquids, Critical solution temperature and applications. Distribution law, its limitations and applications

Module: 2 (10 Hrs.)

States of Matter and properties of matter:State of matter, changes in the state of matter,latent heats, vapour pressure, sublimation critical point, eutectic mixtures, gases, aerosols-inhalers, relative humidity, liquid complexes, liquid crystals, glassy states, solid-crystalline, amorphous & polymorphism.

Physicochemical properties of drug molecules: Refractive index, optical rotation,dielectric constant, dipole moment, dissociation constant, determinations and applications

Module: 3 (10 Hrs.)

Micromeritics: Particle size and distribution, average particle size, number and weight distribution, particle number, methods for determining particle size by (different methods), counting and separation method, particle shape, specific surface, methods for determining surface area, permeability, adsorption, derived properties of powders, porosity, packing arrangement, densities, bulkiness & flow properties.

Module: 4 (8 Hrs.)

Complexation and protein binding: Introduction, Classification of Complexation,Applications, methods of analysis, protein binding, Complexation and drug action, crystalline structures of complexes and thermodynamic treatment of stability constants.

Module: 5 (7 Hrs.)

pH, buffers and Isotonic solutions: Sorensen's pH scale, pH determination(electrometric and calorimetric), applications of buffers, buffer equation, buffer capacity, buffers in pharmaceutical and biological systems, buffered isotonic solutions.

Recommended Textbooks/ Reference books:

1. A. Martin, Physical Pharmacy, Lippincott Williams & Wilkins, London.
2. S.J. Carter, Tutorial Pharmacy, Copper & Gunn, CBS Publishers, New Delhi.
3. E.A. Rawlins, Bentley, Bailliere Tindall, Textbook of Pharmaceutics, London.
<https://www.youtube.com/watch?v=fDScNUzEV5o>
<https://www.youtube.com/watch?v=ExvzdUA6Ed0>
<https://www.youtube.com/watch?v=WuGZxbvo-EA>
<https://www.youtube.com/watch?app=desktop&v=wFLHY1CvOw4>

https://www.youtube.com/watch?v=iB4_Sip13wg

6.2.Practical

1. Determination the solubility of drug at room temperature
2. Determination of pKa value by Half Neutralization/ Henderson Hassel Balch equation.
3. Determination of Partition co- efficient of benzoic acid in benzene and water
4. Determination of Partition co- efficient of Iodine in CCl₄ and water
5. Determination of % composition of NaCl in a solution using phenol-water system by CST method
6. Determination of particle size, particle size distribution using sieving method
7. Determination of particle size, particle size distribution using Microscopic method
8. Determination of bulk density, true density and porosity
9. Determine the angle of repose and influence of lubricant on angle of repose
10. Determination of stability constant and donor-acceptor ratio of PABA-Caffeine complex by solubility method
11. Determination of stability constant and donor-acceptor ratio of CupricGlycine complex by pH titration method

Text Books / Reference Books (Latest Edition):

1. Physical pharmacy by Alfred Martin
2. Experimental pharmaceutics by Eugene, Parott.
3. Tutorial pharmacy by Cooper and Gunn.
4. Stocklosam J. Pharmaceutical calculations, Lea &Febiger, Philadelphia.
5. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, MarcelDekkar Inc.
6. Liberman H.A, Lachman C, Pharmaceutical dosage forms. Disperse systems, volume 1, 2, 3. Marcel Dekkar Inc.
7. Physical pharmaceutics by Ramasamy C and ManavalanR.
8. Laboratory manual of physical pharmaceutics, C.V.S. Subramanyam, J. Thimma settee

7. Time Table

Section A

Days/Periods	(9:40 – 10:25)	(10:25 – 11:10)	(11:10 – 11:55)	(11:55 – 12:40)	(12:40 – 01:20)	6 (01:20 – 02:05)	7 (02:05 – 02:50)	8 (02:50 – 03:35)	9 (03:35 – 04:20)
Monday				L	Lunch Break				
Tuesday				L			P (AB)		
Wednesday				L			P (AA)		
Thursday				T					
Friday				L					
Saturday				L					

Section B

Days/Periods	(9:40 – 10:25)	(10:25 – 11:10)	(11:10 – 11:55)	(11:55 – 12:40)	(12:40 – 01:20)	6 (01:20 – 02:05)	7 (02:05 – 02:50)	8 (02:50 – 03:35)	9 (03:35 – 04:20)
Monday		L			Lunch Break			P (BA)	
Tuesday		L							
Wednesday		L							
Thursday		T					P (BB)		
Friday		L							
Saturday		L							

L- Lecture T- Tutorial P- Practical

8. Course Objectives

The graduates of the programme will demonstrate:

1. Understand various physicochemical properties of drug molecules in the designing of dosage form
2. Know the principles of chemical kinetics and to use them in assigning expiry date for formulation
3. Demonstrate use of physicochemical properties in the evaluation of dosage form

4. Appreciate physicochemical properties of drug molecules in formulation, research and development

9. Course Outcomes (COs)

After completion of the course, the students are will be able to:

1. Understand the facts regarding different concepts related to solubility of drugs.
2. Understand the information of different states of matter, their properties, changes in the states of matter and physicochemical properties of drug molecules.
3. Apply the information and concepts related to particle size, particle number, particle size distribution, methods of particle size determination and derived properties of powder in formulation and development of dosage forms.
4. Understand the information about pH, buffer, buffered isotonic solutions and the phenomenon like complexation and drug protein binding.

10. Mapping of COs with POs

PO	CO 1	CO 2	CO 3	CO 4
1	X	X	X	X
2				
3	X		X	X
4	X		X	X
5				
6				
7				
8				
9		X		
10				
11	X	X	X	X

11. Attainment Targets for COs

Level of Course: (II)

Outcome	Level of Bloom's taxonomy to be met	Target set for attainment
CO 1	Understand	90 % students will achieve 50%
CO 2	Understand	90 % students will achieve 50%
CO 3	Apply	90 % students will

		achieve 50%
CO 4	Understand	90 % students will achieve 50%

12. Assessment Methods for COs

12.1. Theory

SN	Assessment tool	Marks	Outcomes
1	Sessional examinations	30	CO 1, CO 2, CO 3, CO 4
2	Assignments	10	CO 1, CO 2, CO 3, CO 4
3	Quizzes	10	CO 1, CO 2, CO 3, CO 4
4	Teacher's assessment*	10	NA
5	University examination	75	NA
6	Project	-	-

12.2. Practical

SN	Assessment tool	Marks	Outcomes
1	Sessional examinations	40	CO 1, CO 2, CO 3, CO 4
2	Teacher's assessment*	05	NA
3	University marks	35	NA
4	Experiment valuation	10	CO 1, CO 2, CO 3, CO 4

*Teacher's assessment marks has been given using Rubrics (scoring criteria)

13. Delivery Methodology

Outcomes	Methods	Supporting Tools
CO 1	Chalk-Talk, Practical, Interactive classroom, Simulation class, Flipped classroom, Group discussions, Web based learning	Board, Laptop, Projector, You Tube, Whatsapp, Google
CO 2	Chalk-Talk, Practical, Interactive classroom, Flipped classroom, Group discussions, Web based learning	Board, Laptop, Projector, You Tube, Whatsapp, Google
CO 3	Chalk-Talk, Practical, Interactive classroom, Flipped classroom, Group discussions, Web based learning	Board, Laptop, Projector, You Tube, Whatsapp, Google
CO 4	Chalk-Talk, Practical, Interactive classroom, Simulation class, Flipped classroom, Group discussions, Web based learning	Board, Laptop, Projector, You Tube, Whatsapp, Google

14. Daily Teaching plan**14.1. Theory**

Lecture No.		Contents	Other activities related to the topic, if any
1	09/10/23	Topic: Subject and Syllabus discussion Topic objective: Students should understand about the core concept and the various topics in the course of physical pharmaceutics	NA
2	10/10/23	Topic: Introduction of the topic,Solubility of drugs Topic objective: Students should understand about the concepts and broad aspects of solubility of drugs	NA
3	11/10/23	Topic: Solubility expressions, mechanisms of Solute-Solvent interactions Topic objective: Students should understand the Solubility expressions, mechanisms of solute-Solute-Solvent interactions	NA
4	13/10/23	Topic: Ideal Solubility parameters Topic objective: Students should understand about Ideal Solubility parameters	NA
5	14/10/23	Topic: Solvation & Association Topic objective: Students should understand the solvation & association	NA
6	16/10/23	Topic: quantitative approach to the factors influencing solubility of drugs Topic objective: Students should understand the concept of quantitative approach to the factors influencing solubility of drugs	NA
7	17/10/23	Topic: Dissolution & drug release Topic objective: Students should understand the concept of Dissolution & drug release	NA
8	18/10/23	Topic: diffusion principles in biological systems Topic objective: Students should understand diffusion principles in biological systems	NA
9	20/10/23	Topic: The solubility of a gas in liquids	NA

		Topic objective: Students should understand diffusion principles in biological systems	
10	21/10/23	Topic: the solubility of liquids in liquids Topic objective: Students should understand the solubility of liquids in liquids	NA
11	25/10/23	Topic: Raoult's law, Ideal and real solutions Topic objective: Students should understand Raoult's law, Ideal and real solutions.	NA
12	27/10/23	Topic: Partially miscible liquids,Azeotropic mixtures, Fractional distillation Topic objective: Students should understand Partially miscible liquids,Azeotropic mixture, Fractional distillation	NA
13	28/10/23	Topic: Critical solution temperature and applications. Distribution law, its limitations and applications Topic objective: Students should understand about Critical solution temperature and applications. Distribution law, its limitations and applications	Quiz 1, Assignment
Unit 2			
14	30/10/23	Topic: Introduction of topic states of matter Topic objective: Students should understand the core concepts of topic states of matter	NA
15	31/10/23	Topic: Changes in the state of matter Topic objective: Students should understand Changes in the state of matter	NA
16	03/11/23	Topic: Latent heats, vapour pressure Topic objective: Students should understand Sublimation Critical point	NA
17	04/11/23	Topic: Sublimation Critical point Topic objective: Students should understand Sublimation Critical point	NA
18	06/11/23	Topic: Eutectic mixtures, gases, aerosols–inhalers Topic objective: Students should understand	NA

		Eutectic mixtures, gases, aerosols– inhalers	
19	07/11/23	Topic: Relative humidity, liquid complexes Topic objective: Students should understand Relative humidity, liquid complexes	NA
20	08/11/23	Topic: Liquid crystals, glassy states Topic objective: Students should understand the Liquid crystals, glassy states	NA
21	17/11/23	Topic: Solid-crystalline, amorphous & Polymorphism Topic objective: Students should understand Solid-crystalline, amorphous & Polymorphism	NA
22	18/11/23	Topic: Physicochemical properties of drug molecules, Refractive index, and optical rotation and their determination and applications Topic objective: Students should understand Physicochemical properties of drug molecules, Refractive index, and optical rotation and their determination and applications	NA
23	20/11/23	Topic: Dielectric constant, dipole moment determinations and applications Topic objective: Students should understand Students should understand the determinations and applications of physicochemical properties of drug molecules like dielectric constant	NA
24	21/11/23	Topic: Dissociation constant,determinations and applications Topic objective: Students should understand the determinations and applications of properties of drug molecules like Dissociation constant	Quiz 2, Assignment
Unit 3			
25	22/11/23	Topic: Introduction to micromeretics, Particle size and particle size distribution Topic objective: Students should understand the concepts of micromeretics, Particle size	NA

		and particle size distribution	
26	24/11/23	Topic: Average particle size, Particle Number Topic objective: Students should demonstrate Average particle size, Particle Number	NA
27	25/11/23	Topic : Number and Weight distribution Topic objective: Students should demonstrate Number and Weight distribution	NA
28	04/12/23	Topic: Methods for determining particle size (Manual counting and Microscopy) Topic objective: Students should demonstrate the Methods for determining particle size	NA
29	05/12/23	Topic: Sieving, Sedimentation and Coulter counter method Topic objective: Students should Students should demonstrate the Methods for determining particle size	NA
30	06/12/23	Topic: Particle shape, Specific surface of powder Topic objective: Students should demonstrate Particle shape, Specific surface of powder	NA
31	08/12/23	Topic: Methods for determining surface area,adsorption method Topic objective: Students should demonstrate Adsorption method of surface area determination of powder	NA
32	09/12/23	Topic: Air permeability method Topic objective: Students should demonstrate Air permeability method of surface area determination powder	NA
33	11/12/23	Topic: Derived properties of powders, Densities	NA

		Topic objective: Students should demonstrate derived properties of powders	
34	12/12/23	Topic: Porosities, Compressibility (packing arrangement) Topic objective: Students should demonstrate derived properties of powders	NA
35	13/12/23	Topic: Flow properties of powder Topic objective: Students should demonstrate Flow properties of powder	Quiz 3, Assignment
Unit 4			
36	15/12/23	Topic: Introduction to Complexation Topic objective: Students should understand the concepts of complexation	NA
37	16/12/23	Topic: Classification of Complexes Topic objective: Students should understand Classification of Complexes	NA
38	19/12/23	Topic: Classification of Complexes Topic objective: Students should understand Classification of Complexes	NA
39	20/12/23	Topic: Applications of complexation Topic objective: Students should understand Applications of complexation	NA
40	22/12/23	Topic: Methods of analysis of complexes Topic objective: Students should understand Methods of analysis of complexes	NA
41	23/12/23	Topic: Methods of analysis of complexes Topic objective: Students should understand Methods of analysis of complexes	NA
42	26/12/23	Topic: Protein binding, Kinetics and factors affecting protein binding Topic objective: Students should understand Protein binding, Kinetics and factors affecting	NA

		protein binding	
43	27/12/23	Topic: Applications of protein binding Topic objective: Students should understand Applications of protein binding	NA
44	29/12/23	Topic: Complexation and drug action Topic objective: Students should understand Complexation and drug action	NA
45	30/12/23	Topic: Crystalline structures of complexes Topic objective: Students should understand Crystalline structures of complexes	NA
46	01/01/24	Topic: Thermodynamic treatment of stability constants Topic objective: Students should understand Thermodynamic treatment of stability constants	NA
Unit 5			
47	02/01/24	Topic: Introduction to the topic pH, Buffer and Isotonic solutions Topic objective: Students should understand the concepts of pH, Buffer and Isotonic solutions	NA
48	08/01/24	Topic: Sorenson's pH scale Topic objective: Students should understand Sorenson's pH scale	NA
49	13/01/24	Topic: Methods for pH determination Topic objective: Students should understand the Methods for pH determination	NA
50	15/01/24	Topic: Methods for pH determination Topic objective: Students should understand the Methods for pH determination	NA
51	16/01/24	Topic: Appliations of Buffer	NA

		Topic objective: Students should understand the Applications of Buffer	
52	20/01/24	Topic: Applications of Buffer Topic objective: Students should understand the Applications of Buffer	NA
53	23/01/24	Topic: Buffer equations Topic objective: Students should understand about Buffer equations	NA
54	24/01/24	Topic: Buffer capacity Topic objective: Students should understand about Buffer capacity	Assignment
55	27/01/24	Topic: Buffers in pharmaceutical and Biological systems Topic objective: Students should understand about Buffers in pharmaceutical and Biological systems	NA
56	29/01/24	Topic: Buffered isotonic solutions Topic objective: Students should understand about Buffered isotonic solutions	NA
57	30/01/24	Topic: Buffered isotonic solutions Topic objective: Students should understand about Buffered isotonic solutions	Quiz 4

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14.2. Tutorial**Section A**

SN	Date of Class		Topic	Other activities related to the topic, if any
	Batch A	Batch B		
1.	12/10/23	12/10/23	Discussion on the topic solute-solvent interaction	Related to Module-1
2.	19/10/23	19/10/23	Discussion on topic solvation and association	Related to Module-1
3.	26/10/23	26/10/23	Doubt clearing on topic Raoult's law	Related to Module-1
4.	02/11/23	02/11/23	Discussion on the topic changes in states of matter	Related to Module-2
5.	09/11/23	09/11/23	Doubt clearing on topic Eutectic mixture	Related to Module-2
6.	23/11/23	23/11/23	Discussion on the topic dissociation constant	Related to Module-2
7.	07/12/23	07/12/23	Doubt clearing on topic Number and Weight distribution	Related to Module-3
8.	14/12/23	14/12/23	Discussion on the topic Air permeability method	Related to Module-3
9.	21/12/23	21/12/23	Discussion on the topic classification of complexes	Related to Module-4
10.	18/02/24	18/02/24	Discussion on topic electrometric method for pH determination	Related to Module-5

Section B

SN	Date of Class		Topic	Other activities related to the topic, if any
	Batch A	Batch B		
11.	12/10/23	12/10/23	Discussion on the topic solute-solvent interaction	Related to Module-1
12.	19/10/23	19/10/23	Discussion on topic solvation and association	Related to Module-1
13.	26/10/23	26/10/23	Doubt clearing on topic Raoult's law	Related to Module-1
14.	02/11/23	02/11/23	Discussion on the topic changes in states of matter	Related to Module-2
15.	09/11/23	09/11/23	Doubt clearing on topic Eutectic mixture	Related to Module-2
16.	23/11/23	23/11/23	Discussion on the topic dissociation constant	Related to Module-2
17.	07/12/23	07/12/23	Doubt clearing on topic Number and Weight distribution	Related to Module-3
18.	14/12/23	14/12/23	Discussion on the topic Air permeability method	Related to Module-3
19.	21/12/23	21/12/23	Discussion on the topic	Related to Module-4

			classification of complexes	
20.	18/02/24	18/02/24	Discussion on topic electrometric method for pH determination	Related to Module-5

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14.3. Practical**Section A**

Exp. No.	Date		Objective of Experiment	Other activities related to the topic, if any
	Batch A	Batch B		
1.	11/10/23	10/10/23	To determine the solubility of drug (benzoic acid) at room temperature.	Related to Module-1
2.	18/10/23	17/10/23	To determine the solubility of drug (benzoic acid) at different temperature(effect of temperature on solubility of drug)	Related to Module-1
3.	25/10/23	07/11/23	To determine partition coefficients of drug between benzene and water.	Related to Module-1
4.	08/11/23	21/11/23	To determine True density, Bulk density and Tapped density of pharmaceutical powders	Related to Module-3
5.	22/11/23	05/12/23	To determine angle of repose of given sample of powder/granules and influence of lubricant on angle of repose.	Related to Module-3
6.	06/12/23	12/12/23	To determine the concentration of given solution of NaCl using phenol water system	Related to Module-1 & 2
7.	13/12/23	19/12/23	To determine the pKa value of the given weak acid by using pH meter.	Related to Module-5
8.	27/12/23	26/12/23	To determine average particle size and find out their distribution pattern by sieving method (By sieve analysis of the supplied granular sample)	Related to Module-3
9.	17/01/24	16/01/24	To determine particle size and particle size distribution using microscopy method.	Related to Module-3
10.	24/01/24	23/01/24	To determine the stability constant and donor acceptor ratio of cupric glycine complex by pH titration method.	Related to Module-4

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Section B

Exp. No.	Date		Objective of Experiment	Other activities related to the topic, if any
	Batch A	Batch B		
1.	09/10/23	12/10/23	To determine the solubility of drug (benzoic acid) at room temperature.	Related to Module-1
2.	16/10/23	14/10/23	To determine the solubility of drug (benzoic acid) at different temperature(effect of temperature on solubility of drug)	Related to Module-1
3.	30/10/23	26/10/23	To determine partition coefficients of drug between benzene and water.	Related to Module-1
4.	06/11/23	02/11/23	To determine True density, Bulk density and Tapped density of pharmaceutical powders	Related to Module-3
5.	20/11/23	09/11/23	To determine angle of repose of given sample of powder/granules and influence of lubricant on angle of repose.	Related to Module-3
6.	04/12/23	23/11/23	To determine the concentration of given solution of NaCl using phenol water system	Related to Module-1 & 2
7.	11/12/23	07/12/23	To determine the pKa value of the given weak acid by using pH meter.	Related to Module-5
8.	01/01/23	14/12/23	To determine average particle size and find out their distribution pattern by sieving method (By sieve analysis of the supplied granular sample)	Related to Module-3
9.	08/01/24	21/12/23	To determine particle size and particle size distribution using microscopy method.	Related to Module-3
10.	15/01/24	18/01/24	To determine the stability constant and donor acceptor ratio of cupric glycine complex by pH titration method.	Related to Module-4

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15. Attendance Sheets

15.1. Lecture - Attached

15.2. Practical - Attached

15.3. Tutorial - Attached

16. Question Papers

16.1. Sessional Examinations - Attached

16.2. Assignments - Attached

16.3. Quizzes - Attached

16.4. University Examination - Attached

16.5. Annual Practical Examination - Attached

17. Mark Records

17.1. Sessional Examinations - Attached

17.2. Assignments - Attached

17.3. Quizzes - Attached

17.4. Teacher's Assessment - Attached

17.5. University Examination - Attached

17.6. Annual Practical Examination - Attached

18. Attainment of COs

Sr. No.	Target set for attainment	Course Outcome Met/Not	Target Attained
1.	90 % students will achieve 50%	Met	99 % students achieved 50%
2.	90 % students will achieve 50%	Met	99 % students achieved 50%
3.	90 % students will achieve 50%	Met	96 % students achieved 50%
4.	90 % students will achieve 50%	Met	99 % students achieved 50%

19. Attainment of POs**MAPPING OF COs WITH POs USING LEVELS 1,2,3****Total No of Students: 87**

S.No.	Exam	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
1	CO1	H	-	M	M	-	-	-	-	-	-	M
2	CO2	H	-	-	-	-	-	-	-	L	-	M
3	CO3	H	-	H	H	-	-	-	-	-	-	M
4	CO4	H	-	H	H	-	-	-	-	-	-	M

MAPPING OF COs WITH POs USING LEVELS 1,2,3**Total No of Students: 87**

S.No.	Exam	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
1	CO1	3	0	2	2	0	0	0	0	0	0	2
2	CO2	3	0	0	0	0	0	0	0	1	0	2
3	CO3	3	0	3	3	0	0	0	0	0	0	2
4	CO4	3	0	3	3	0	0	0	0	0	0	2
Average CO		3	0	3	3	0	0	0	0		0	2

RECORD OF ATTAINMENT OF COs WITH POs

S.No.	Exam	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
Physical Pceutics.-I		2.90	0	2.55	2.55	0	0	0	0	0.99	0	1.94