

Rayat Shikshan Santha's
Yashavantrao Chavan Institute of Science (Autonomous), Satara
Department of Chemistry
B. Sc. I Drug Chemistry Syllabus
2021-2022

PREAMBLE:

This updated syllabus is prepared for first year undergraduate students. At this level, to encourage students to study drug chemistry (with chemistry and microbiology) and also to excel them for the academic and industrial exposure simultaneously. The content of the syllabus have been framed as per the UGC norms and industry requirement. The depth of the syllabi is compatible to the syllabi of other universities, at the same time is not rigid for the students at first year of their graduation. The units in the syllabus are well defined with scope and the number of lectures. The references are mentioned with relevance.

GENERAL OBJECTIVES OF THE COURSE:

1. To Introduce to drug chemistry which include basic and detail study of drug will help them to enhance their interdisciplinary approach with vigor.
2. To understand the fundamentals, principles, mathematical concepts and recent developments in the subject area.
3. To create a skilled workforce to match the requirements of the society.
4. To develop scientific attitude is the major objective so as to make the students open minded, and curious.
5. To develop skill in practical work, experiments and laboratory material and equipments along with the collection and interpretation of scientific data to contribute to science.

PROGRAM OBJECTIVES AND OUTCOMES:

PROGRAM OUTCOMES:

Students gain a deep knowledge regarding drug molecules, analytical skills along with excipients, natural drug resources, chemistry involved in API (Active Pharmaceutical Ingredients) including commonly used drugs, effect of drugs on human body, toxicity and impurity profile

PROGRAM SPECIFIC OUTCOMES:

1. Able to apply the knowledge gained during the course of the program from biochemistry, drug analysis, medicinal chemistry and environmental studies.
2. Able to communicate easily and confidently
3. Able to perform multitask in fields including drug, pharmaceuticals and research.
4. The students will graduate with proficiency in the subject of their choice.
5. The students will be eligible to continue higher studies in their subject.

1. TITLE: B.Sc. Drug Chemistry

6. YEAR OF IMPLEMENTATION: 2021-22

7. DURATION: one year

8. PATTERN: Semester

9. MEDIUM OF INSTRUCTION: English

10. STRUCTURE OF COURSE:

1) FIRST SEMESTER ----- (NO. OF THEORY PAPERS 4)

Drug Chemistry-I

(BDCT-I-101) Paper I: Introduction to Drug Chemistry- I

(BDCT -I-102) Paper II: Introduction to Drug Chemistry- II

Lab-I: (BDCEP-I-103) (Practical examination is semester wise)

Drug Chemistry-II

(BDCT-II-101) Paper I: Fundamentals of Drug – I

(BDCT-II-102) Paper II: Fundamentals of Drug – II

Lab-I: (BDCEP-II- 103) (Practical examination is semester wise)

2) SECOND SEMESTER ----- (NO. OF PAPERS 4)

Drug Chemistry-I

(BDCT-I-201) Paper V: Introduction to Pharmaceutical Chemistry

(BDCT-I -202) Paper VI: Experimental Techniques

Lab-II: (BDCEP-I-203) (Practical examination is semester wise)

Drug Chemistry-II

(BDCT-II-201) Paper VII: Remedial Mathematics

(BDCT-II-202) Paper VIII: Introduction to Biochemistry

Lab-II: (BDCEP-II- 203) (Practical examination is semester wise)

CBCS STRUCTURE OF B. Sc I in Drug Chemistry

SHIVAJI UNIVERSITY, KOLHAPUR								
YASHAVANTRAO CHAVAN INSTITUTE OF SCIENCE ,SATARA								
TEACHING AND EXAMINATION SCHEME UNDER CHOICE BASED CREDIT SYSTEM (CBCS)								
FACULTY :SCIENCE								
PATTERN : FULL TIME SEMESTER								
DURATION OF COURSE : SIX SEMESTERS								
B. Sc -I SEMESTER -I -DURATION : 06 MONTHS (24 WEEKS)								
Sr. No.	SUBJECT TITLE	PAPER NO	TEACHING SCHEME					
			THEORY (TH)			PRACTICAL (PR)		
			No. of lectures	Hours	Credits	No. of lectures	Hours	Credits
1	Drug chemistry I	I & II	5	4	4	4	3.2	2
2	Drug Chemistry II	I & II	5	4	4	4	3.2	2
3	Chemistry	I & II	5	4	4	4	3.2	2
4	Microbiology	I & II	5	4	4	4	3.2	2
5	AECC -I	I	4	3.2	2	---	---	---
	TOTAL OF SEM - I		24	19.2	18	16	12.8	8
B. Sc -I SEMESTER -II -DURATION : 06 MONTHS (24 WEEKS)								
Sr. No.	SUBJECT TITLE	PAPER NO	TEACHING SCHEME					
			THEORY (TH)			PRACTICAL (PR)		
			No. of lectures	Hours	Credits	No. of lectures	Hours	Credits
1	Drug Chemistry-I	III & IV	5	4	4	4	3.2	2
2	Drug Chemistry-II	III & IV	5	4	4	4	3.2	2
3	Chemistry	III & IV	5	4	4	4	3.2	2
4	Microbiology	III & IV	5	4	4	4	3.2	2
5	AECC -II	II	4	3.2	2	---	---	---
	TOTAL OF SEM - II		24	19.2	18	16	12.8	8
	TOTAL OF SEM -I & II		48	38.4	36	32	25.6	16
<ul style="list-style-type: none"> ➤ Theory & Practical lectures of 48 minutes each. ➤ Total marks for B. Sc part - I including English -1100 ➤ Total Credit for B.Sc part -I Semester I & II -52 ➤ AECC -ABILITY ENHANCEMENT COMPULSORY COURSE (I & II) -English ➤ DESIGN SYLLABUS OF 36 LECTURES FOR EACH PAPER 								

CBCS STRUCTURE OF B. Sc II

SHIVAJI UNIVERSITY ,KOLHAPUR								
YASHAVANTRAO CHAVAN INSTITUTE OF SCIENCE ,SATARA								
TEACHING AND EXAMINATION SCHEME UNDER CHOICE BASED CREDIT SYSTEM (CBCS)								
FACULTY :SCIENCE								
PATTERN : FULL TIME SEMESTER								
DURATION OF COURSE : SIX SEMESTERS								
B. Sc -II SEMESTER -III -DURATION : 06 MONTHS (24 WEEKS)								
Sr. No	SUBJECT TITLE	PAPER NO	TEACHING SCHEME					
			THEORY (TH)			PRACTICAL (PR)		
			No. of lectures	Hours	Credits	No. of lectures	Hours	Credits
1	Drug Chemistry-I	V & VI	6	4.8	4	8	6.4	4
2	Drug Chemistry-II	V & VI	6	4.8	4	8	6.4	4
3	Chemistry	V & VI	6	4.8	4	8	6.4	4
4	AECC-I	I	2	1.6	2	---	---	---
	TOTAL OF SEM -III		20	16.0	14	24	19.2	12
B. Sc -II SEMESTER -IV -DURATION : 06 MONTHS (24 WEEKS)								
Sr. No	SUBJECT TITLE	PAPER NO	TEACHING SCHEME					
			THEORY (TH)			PRACTICAL (PR)		
			No. of lectures	Hours	Credits	No. of lectures	Hours	Credits
1	Drug Chemistry-I	VII & VIII	6	4.8	4	8	6.4	4
2	Drug Chemistry-II	VII & VIII	6	4.8	4	8	6.4	4
3	Chemistry	VII & VIII	6	4.8	4	8	6.4	4
4	AECC -II	II	2	2.4	2	---	----	----
	TOTAL OF SEM - IV		20	16.8	14	24	19.2	12
	TOTAL OF SEM -III& IV		42	33.6	28	48	38.4	24
<p>¶ Theory & Practical lectures of 48 minutes each.</p> <p>¶ Total marks for B. Sc part - II excluding Skill & AECC -900</p> <p>¶ Total Credit for B. Sc part -II Semester III& IV -52</p> <p>¶ AECC -ABILITY ENHANCEMENT CUMPULSORY COURSE (I & II) -ENVIRONMENTAL SCIENCE</p> <p>¶ SKILL ENHANCEMENT COURSE FOR EACH SUBJECT</p> <p>¶ DESIGN SYLLABUS OF 36 LECTURES FOR EACH PAPER</p>								

CBCS STRUCTURE OF B. Sc III

SHIVAJI UNIVERSITY ,KOLHAPUR								
YASHAVANTRAO CHAVAN INSTITUTE OF SCIENCE ,SATARA								
TEACHING AND EXAMINATION SCHEME UNDER CHOICE BASED CREDIT SYSTEM (CBCS)								
FACULTY :SCIENCE								
PATTERN : FULL TIME SEMESTER								
DURATION OF COURSE : SIX SEMESTERS								
B. Sc -III SEMESTER -V -DURATION : 06 MONTHS (24 WEEKS)								
Sr. No	SUBJECT TITLE	PAPER NO	TEACHING SCHEME					
			THEORY (TH)			PRACTICAL (PR)		
			No. of lectures	Hours	Credits	No. of lectures	Hours	Credits
1	Drug Chemistry-I	IX & X	6	4.8	4	10	8	4
2	Drug Chemistry-II	IX & X	6	4.8	4	10	8	4
4	Skill enhancement -4 (SECC-II)	III	2	1.2	2	4	3.2	2
5	AECC -III	I	2	1.2	2	---	---	---
	TOTAL OF SEM -III		16	12.0	12	24	19.2	10
B. Sc -III SEMESTER -VI -DURATION : 06 MONTHS (24 WEEKS)								
Sr. No	SUBJECT TITLE	PAPER NO	TEACHING SCHEME					
			THEORY (TH)			PRACTICAL (PR)		
			No. of lectures	Hours	Credits	No. of lectures	Hours	Credits
1	Drug Chemistry-I	XIII & XIV	6	4.8	4	10	8	4
2	Drug Chemistry-II	XV & XVI	6	4.8	4	10	8	4
4	Skill enhancement (SECC-II)	IV	2	1.2	2	4	3.2	2
5	AECC -IV	II	2	1.2	2	---	---	---
	TOTAL OF SEM - IV		16	12.0	12	24	19.2	10
	TOTAL OF SEM -III & IV		32	24.0	24	48	38.4	20
<p>Theory & Practical lectures of 48 minutes each.</p> <p>Total marks for B. Sc part - III excluding Skill & AECC -600</p> <p>Total Credit for B. Sc part -III Semester V&VI -44</p> <p>AECC -ABILITY ENHANCEMENT CUMPULSORY COURSE (III & IV) -ENGLISH</p> <p>SKILL ENHANCEMENT COURSE FOR EACH SUBJECT</p>								

DESIGN SYLLABUS OF 36 LECTURES FOR EACH PAPER

Class	Theory	Practical	Total
B. Sc I	36	16	52
B. Sc II	28	24	52
B. Sc III	24	20	44
Total	88 (60.24%)	60 (39.75%)	148

Credit Structure for B. Sc

B. Sc I		No. of Lectures	Hours	Credit
Semester I	Drug Chemistry I	5	4	4
	Drug Chemistry II			
	Chemistry			
	Microbiology			
	Lab I	4	3.2	2
Semester II	Drug Chemistry I	5	4	4
	Drug Chemistry II			
	Chemistry			
	Microbiology			
	Lab II	4	3.2	2

2) OTHER FEATURES:

A) **LIBRARY:** Reference and Textbooks, Journals and Periodicals, Reference Books for Advanced Books for chemistry Advanced studies. –List Attached

B) **SPECIFIC EQUIPMENTS:** Necessary to run the Course, Computer, LCD, Projector, Visualizer, Smartboard

C) Laboratory Equipment's: Apparatus & equipment's and chemicals required.

1. Viscometer
2. Stopwatch
3. Eudiometer
4. Digital balance with 1 mg accuracy
5. Burette, pipette and conical flask 6.1/10⁰C thermometer

7. Polythene bottles
8. Measuring cylinder
9. Stopper bottle
10. Test tube, Beaker
11. Thile's tube
12. Capillary tube
13. Evaporating dish
14. Glass rod
15. Wire gauze
16. Burner
17. Waterbath
18. Chromatography paper
19. Glass jar
20. Watch glass
21. Tripod stand
22. Burette stand
23. Iron stand
24. Testtube holder
25. Testtube stand
26. Spot tiles
27. Dropper
28. Dryer



Rayat Shikshan Sanstha's

**Yashavantrao Chavan Institute of Science,
Satara(Autonomous)**

Syllabus Introduced from Aug, 2021
B.Sc I (Sem I&II)

B. Sc. I Drug Chemistry

Sr. No	Paper code	Paper	No. of Lectures		
Semester I					
Drug Chemistry-I					
	BDCT-I-101	Introduction to Drug Chemistry- I			
		Unit I: Introduction	7 L		
		Unit II: Sources of Drugs	7 L		
		Unit III: Classification of Drugs	9 L		
		Unit IV: Plant taxonomy	13 L		
	BDCT-I-102	Introduction to Drug Chemistry- II			
		Unit I: Introduction to Pharmaceutical Chemistry	10 L		
		Unit II: Drug Action Receptor Theory	10 L		
		Unit III: Drug Administration and Dosage	4 L		
		Unit IV: Drug Intermediates	12 L		
	BDCP-I-103	Lab-I			
Drug Chemistry-II					
	BDCT-II-101	Fundamentals of Drug - I			
		Unit I: Introduction to Drying Process	9 L		
		Unit II: Aseptic Technique	9 L		
		Unit III: Processing of Tablet	9 L		
		Unit IV: Processing of Capsule	9 L		
	BDCT-II-102	Fundamentals of Drug - II			
		Unit I: Metrology	9 L		
		Unit II: Packaging of Pharmaceuticals	9 L		
		Unit III: Size Separation	9 L		
		Unit IV: Drug Absorption	9 L		
	BDCP-II-103	Lab-I			



Semester II				
Drug Chemistry-I				
BDCT-I-201	Introduction to Pharmaceutical Chemistry			
	Unit I: Acids, Bases and Buffers	9L		
	Unit II: Inorganic Official Compounds	7L		
	Unit III: Ayurvedic Medicine-I	11L		
	Unit IV: Ayurvedic Medicine-II	9L		
BDCT-I-202	Analysis Techniques			
	Unit I: Acid-Base Titration	9L		
	Unit II: Oxidation Reduction Titration	9L		
	Unit III: Precipitation Titration	9L		
	Unit IV: Theory of Gravimetric Analysis	9L		
BDCP-I-203	Lab-II			
Drug Chemistry-II				
BDCT-II-201	Remedial Mathematics			
	Unit I: Introduction to Need of Computer for Chemistry	9L		
	Unit II: Probability and Regression	9L		
	Unit III: Algebra	9L		
	Unit IV: Calculus	9L		
BDCT-II-202	Introduction to Biochemistry			
	Unit I: Hormones	9L		
	Unit II: Vitamins	9L		
	Unit III: Mineral Metabolism	9L		
	Unit IV: Blood and Body Fluid	9L		
BDCP-II-203	Lab-II			

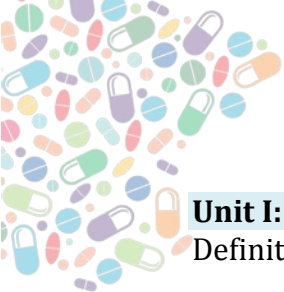
- **Note- This syllabus is subject to change**

Semester - I
Drug Chemistry-I
BDCT-I- 101 Paper - I
Introduction to Drug Chemistry- I [36 Lectures]
30 Marks **(2 Credits)**

BDCT-I-101: Introduction to Drug Chemistry- I

Course Objectives: Students should

1. Understand the basic concepts in drug chemistry.
2. Know different natural sources of drugs.
3. Study the classification of drugs.
4. Learn plant taxonomy.



Unit I: Introduction (7 L)

Definition, history, scope and development of Pharmacognosy

Unit II: Sources of Drugs (7 L)

Biological, marine, mineral and plant tissue cultures as sources of drugs

Unit III: Classification of Drugs (9 L)

Alphabetical, morphological, taxonomical, chemical and pharmacological classification of drugs

Unit IV: Plant Taxonomy (13 L)

Study of the following families with special reference to medicinally important plants – Apocynaceae, Solanaceae, Rutaceae, Umbelliferae, Leguminosae, Rubiaceae, Liliaceae, Graminae, Labiatae, Cruciferae, Papaveraceae.

Reference Books-

1. G. R. Chatwal, Pharmaceutical Chemistry Inorganic Vol. I, Himalaya Publishing House, Bombay.
2. Dr. J. L. Jain, Fundamentals of Biochemistry, S. Chand & Company Ltd. New Delhi.
3. F. S. Barar, Essentials of Pharmacotherapeutics, S. Chand & Company Ltd. New Delhi
4. R. S. Gaud & Dr. G. D. Gupta, Practical Pharmaceutics, CBS Publishers and Distributors, New Delhi
5. N. C. Choudhary and N. K. Gurbani, Pharmaceutical Chemistry. Vallabh Prakashan, Delhi
6. N. K. Jain, Textbook of Professional Pharmacy, Vallabh Prakash, Delhi
7. B. M. Mithal, A text book of Pharmaceutical formulation, Vallabh Prakash, Delhi
8. Stenlake & Beckett, Practical Pharmaceutical Chemistry, Part-I, CBS Publishers and Distributors, New Delhi.

Course Outcome:

After completion of the units students will be able to:

1. Understand fundamentals of drug chemistry
2. Know natural sources of drugs
3. Acquire classification of drugs
4. Get details about plant taxonomy

Semester – I
Drug Chemistry-I
BDCT-I- 102 Paper – II
Introduction to Drug Chemistry- I [36 Lectures]
30 Marks (2 Credits)

BDCT-I-102: Introduction to Drug Chemistry- II



Course Objectives: Students should

1. Understand the basic regarding pharmaceutical chemistry.
2. Know about drug action theory.
3. Study the drug administration and dosage.
4. Learn drug intermediates.

Unit I: Introduction to Pharmaceutical Chemistry (10 L)

Pharmacy and pharmaceutical chemistry as a career, important aspects of pharmaceutical chemistry, importance of chemistry in pharmacy, history of pharmacopoeia

Unit II: Drug Action Receptor Theory (10 L)

Drug, Receptor, Classification of ligand, Agonists and antagonists, Drug receptor interaction, Forces involved in drug receptor interaction, Occupation theory, Rate theory, The induced fit theory of enzyme substrate interaction, Macromolecular perturbation theory, Activation aggregation theory, Two state model of receptor activation.

Unit III: Drug Administration and Dosage (4 L)

Oral and parenteral routes with advantages and disadvantages
Formulation, different dosage forms-emphasis on sustained release formulation

Unit IV: Drug Intermediates (12 L)

2-amino-5-chlorobenzophenone from p-chloronitrobenzene
2,4,6-triamino-6-hydroxypyrimidine from guanidine
4-chloro-5-sulphonyl amino anthranilic acid from 4-chloro-2-toluidine
P-[2'-(5-chloro-2-methoxy benzoamido) ethyl]-benzenesulphonamide from Methyl-5-chloro-2-methoxybenzoate
4-(P-Chlorophenyl)-4-hydroxypiperidine from 4-Chloroacetophenone
p-Acetyl amino benzenesulphonyl chloride from aniline
Epichlorohydrine from propene

Reference Books-

1. Ansel H C, Introduction to Pharmaceutical Dosage Forms, K M Varghese & Co., Bombay.
2. Aulton M E Pharmaceutics - The Science of Dosage Form Design, ELBS/ Churchill Livingstone.
3. Robinson J R & Lee Vincent, Controlled Drug Delivery: Fundamentals & Applications, Marcel Dekker Inc., NY.
4. Acheson R N, An Introduction to the Chemistry of Heterocyclic Compounds, Interscience Publishers, New York.
5. Atherden L M, Bentley and Driver's Text book of Pharmaceutical Chemistry, Oxford University Press, London.
6. Organic Medicinal and Pharmaceutical Chemistry, J. Lippincott Co., Philadelphia

Course Outcomes:

After completion of the units students will be able to:

1. Know about pharmaceutical chemistry



2. Get details about drug action
3. Misappropriation of dosage of drugs
4. Get knowledge about drug intermediates

Lab-I: BDCP-I-103: Practical Course

Course Objectives: Students should

1. Know purification of organic pharmaceutical compounds.
2. Learn preparation and standardization of solutions
3. Study how to find out functional groups.
4. Become skilled to synthesize different compounds

Experiments:

1. Purification of organic pharmaceutical compounds (Any 2)
 2. Preparation and standardization of solutions (Any 2)
 3. Determination of solubility, MP and BP of drug (Any 4)
 4. Detection of elements and functional group (Any 2)
 5. Estimation of tincture iodine
 6. Chromatographic Separation of lipid, amino acids and carbohydrates
 7. Preparation of Antimony potassium tartarate, milk of magnesia, Ferrous ammonium sulphate, alum, aluminium hydroxide gel (Any two)
 8. Preparation of Buffer solution and measurement of pH
 9. Viva voce
 10. Practical record
- Note- Any other relevant practical may be added

Reference Books-

1. A. J. Hannaford, P. W. G. Smith and A. R. Tatehell, Vogel's Textbook of Practical Organic Chemistry, The ELBS/Longman, London.
2. F. C. Mann, and B. C. Saunders, Practical Organic Chemistry, The English Language Book Society and logman Group limited, London.
3. A. H. Beckett and J. B. Stenlake, Practical Pharmaceutical Chemistry Vol. I and II., The Athlone Press of the University of London.

Course Outcomes:

After completion of the units students will be able to:

1. Know about how to purify organic pharmaceutical compounds
2. Trained to find out elements and functional groups of different compounds
3. Prepare buffer solutions and will be able to measure its pH
4. Gain knowledge about separation of lipids, amino acids and carbohydrates

Semester – I
Drug Chemistry-II
BDCT-II-101 Paper – I
Fundamentals of Drug-I [36 Lectures]
30 Marks **(2 Credits)**



BDCT-II-101: Fundamentals of Drug-I

Course Objectives: Students should

1. Know about drying processes.
2. Be Familiar with aseptic techniques.
3. Be acquainted with processing of tablets.
4. Gain knowledge of processing of capsule.

Unit I: Introduction to Drying Processes (9 L)

Study of Tray Dryers, Fluidized Bed Dryer, Vacuum Dryer and Freeze Dryer. Sterilization- Concept of sterilization and its differences from disinfection, Thermal resistance of microorganisms. Detailed study of the following sterilization processes- Sterilization with moist heat, Dry heat sterilization, Sterilization by radiation, Sterilization by filtration and Gaseous sterilization.

Unit II: Aseptic Technique (9 L)

Applications of sterilization process in hospitals particularly with reference to surgical dressings and intravenous fluids. Precautions for safe and effective handling of sterilization equipment.

Unit III: Processing of Tablet (9 L)

Definition, different type of compressed tablets and their properties. Processes involved in the production of tablets; Tablets excipients ; Defects in tablets; Evaluation of Tablets; Physical standards including Disintegration and Dissolution. Tablet coating-sugar coating; film coating, enteric coating and micro-encapsulation

Unit IV: Processing of Capsule (9 L)

Hard and soft gelatin capsules; different sizes of capsules; filling of capsules; handling and storage of capsules. Special applications of capsules.

Study of immunological products like sera, vaccines, toxoids & their preparations.

Reference Books:

1. Remington's Pharmaceutical Sciences.
2. Martindale -The Extra Pharmacopoeia
3. Indian pharmacopoeia.
4. L. G. Chatten, A Textbook of Pharmaceutical Chemistry, Vol. I and II, Marcel Dekker, New York.
5. J. H. Block, E. Roche, T. Soine and C. Wilson, Inorganic Medicinal and Pharmaceutical Chemistry, Lea and Febiger, Philadelphia

Course Outcomes:

After completion of the units students will be able to:

1. Get information about drying processes
2. Know about aseptic techniques
3. Understand processing of tablets
4. Get knowledge about processing of capsule



Semester – I
Drug Chemistry-II
BDCT-II-102 Paper – II
Fundamentals of Drug-II [36 Lectures]
30 Marks **(2 Credits)**

BDCT-II-102: Fundamentals of Drug-II

Course Objectives: Students should

1. Study the metrology.
2. Know about packaging of pharmaceuticals.
3. Gain knowledge about size separation.
4. Be familiar with drug absorption.

Unit I: Metrology **(9 L)**

System of weights and measures. Calculations including conversion from one to another system. Percentage calculations and adjustment of products .Use of alligation met calculations. Isotonic solutions.

Unit II: Packaging of Pharmaceuticals **(9 L)**

Features and types of containers. Study of glass & plastics as materials for containers and rubber as a material for closure-their merits and demerits.

Introduction to aerosol packaging.

Size reduction-objectives and factors affecting size reduction. Methods of size reduction- study of Hammer mill, ball mill, Fluid energy mill and Disintegrator.

Unit III: Size Separation **(9 L)**

Size separation by sifting. Official standards for powders. Sedimentation methods of size separation. Construction and working of Cyclone separator.

Unit IV: Drug Absorption **(9 L)**

Routes of drug administration, absorption of drugs and factors affecting absorption

Physiology of biomolecules

Physiological functions of carbohydrates, lipids and proteins, digestion and biological oxidation of carbohydrates, fats and proteins.

Reference Books:

1. Remington's Pharmaceutical Sciences.
2. Martindale -The Extra Pharmacopoeia.
3. Indian pharmacopoeia.
4. Ladu B N, Mandel H G and way E L., Fundamentals of Drug Metabolism and Disposition, William andwelkins Co. 428 E, Preston Street. Baltimore.
5. Robinson J R & Lee Vincent, Controlled Drug Delivery: Fundamentals & Applications, Marcel Dekker Inc., NY.

Course Outcomes:



After completion of the units students will be able to:

1. Get information about metrology
2. Know packing of pharmaceuticals
3. Understand size separation in detail
4. Get knowledge about drug absorption

Lab-I : BDCP-II-103 : Practical Course

Course Objectives: Students should

1. Know preparation of syrup.
2. Learn preparation of Elixirs.
3. Become skilled to prepare various solutions.
4. Study synthesis of creams.

Experiments:

- 1 . Preparation of Syrups
 - a) Syrup IP'66
 - b) Compound syrup of Ferrous Phosphate BPC'68
2. Preparation of Elixirs
 - a) Piperazine citrate elixir
 - b) Paracetamol pediatric elixir
4. Preparation of Solutions
 - a) Strong solution of ammonium acetate
 - b) Cresol with soap solution
 - c) Lugol's solution
5. Preparation of Suspensions
6. Preparation of Creams
7. Viva voce
8. Practical record

Note- Any other relevant practical may be added

Reference Books-

1. D. M. Parikh: Handbook of Pharmaceutical Granulation Technology, Marcel Dekker,INC, New York.
2. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone Press of University of London, 4th edition.
3. M. Paye, A. O. Barel, H. Maibach, Handbook of Cosmetic Science and Technology.
4. G. R. Chatwal, Pharmaceutical Chemistry-Inorganic

Course Outcomes:

After completion of the units students will be able to:

1. Know synthesis procedures of syrup
2. Prepare Elixirs
3. Prepare various solutions
4. Synthesize different types of creams



Semester – II
Drug Chemistry-I
BDCT-I- 201 Paper – III
Introduction to Pharmaceutical Chemistry [36 Lectures]
30 Marks (2 Credits)

BDCT-I- 201: Introduction to Pharmaceutical Chemistry

Course Objectives: Students should

1. Learn basic chemistry of acids, bases and buffers.
2. Gain knowledge about inorganic official compounds.
3. Study fundamentals of ayurvedic medicine.
4. Be familiar with some ayurvedic drugs.

Unit I: Acids, Bases and Buffers (9L)

Boric acid, Hydrochloric acid, Ammonium hydroxide, Sodium hydroxide and official buffers. Buffer equations and buffer capacity in general, buffers in pharmaceutical systems, preparation, stability, buffered isotonic solutions, measurements of tonicity, calculations and methods of adjusting isotonicity. Antioxidants- Hypophosphorous acid, Sulphur dioxide, Sodium bisulphite, Sodium meta-bisulphite, Sodium thiosulphate, Nitrogen and Sodium nitrite.

Unit II: Inorganic Official Compounds (7L)

Introduction, properties and applications of - Iron, Iodine, Calcium, Ferrous Sulphate and Calcium Gluconate.

Unit III: Ayurvedic Medicine-I (11L)

Introduction to basic principles of Ayurveda and their significance, conceptual study of fundamental principles of Ayurvediya Kriya Sharir e.g - Panchamahabhuta, Tridosha, Triguna, Loka-Purusha Samya, Samanya-Vishesha. Description of basics of Srotas. Definition and synonyms of the term Sharir, definition and synonyms of term Kriya, description of Sharir Dosh and Manasa Dosh. Mutual relationship between Triguna-Tridosha & Panchmahabhuta. Difference between Shaarir and Sharir. Description of the components of Purusha and classification of Purusha, role of Shatdhatupurusha in Kriya Sharira and Chikitsa

Unit IV: Ayurvedic Medicine-II (9L)

Studies of some Ayurvedic medicines- Ashwagandha, Boswellia, Triphala, Brahmi, Cumin, Turmeric, Licorice root, Gotu kola, Bitter melon, Cardamom

Reference Books-

1. A. H. Beckett & J. B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, StahlonePress of University of London
4. Bentley and Driver's Textbook of Pharmaceutical Chemistry



3. J. H. Block, E. Roche, T. Soine and C. Wilson, Inorganic Medicinal and Pharmaceutical Chemistry, Lea and Febiger, Philadelphia,
4. L. A. Diseher, Modern Inorganic Pharmaceutical Chemistry. Eliel E L,
5. V. Lad, The Textbook of Ayurveda, Volume One. The Ayurvedic Press: Albuquerque, 2002.
6. R. E. Svoboda, Ayurveda: Life, Health and Longevity. The Ayurvedic Press: Albuquerque, 2004.
7. R. E. Svoboda, The Hidden Secret of Ayurveda. The Ayurvedic Press: Albuquerque, 1997.

Course Outcomes:

After completion of the units students will be able to:

1. Define what are acids, bases and buffers
2. Know details about inorganic official compounds used in drug
3. Describe about ayurvedic medicines
4. Identify importance of ayurvedic medicine

Semester – II
Drug Chemistry-I
BDCT –I-202 Paper – IV
Experimental Techniques [36 Lectures]
30 Marks **(2 Credits)**

BDCT-I- 202: Analysis Techniques

Course Objectives: Students should

1. Study fundamentals of titrations.
2. Learn acid base titrations .
3. Know about oxidation reduction titration.
4. Be familiar gravimetric analysis.

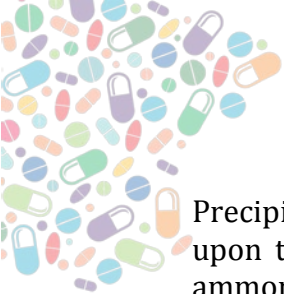
Unit I: Acid Base Titrations **(9L)**

Acid base concepts, Role of solvent, Relative strengths of acids and bases, Ionization, Law of mass action, Commonion effect, Ionic product of water, pH, Hydrolysis of salts, Henderson-Hassel bach equation, Buffer solutions, Neutralization curves, Acid-base indicators, Theory of indicators, Choice of indicators, mixed indicators, Polyprotic system, Polyamine and amino acid systems, Amino acid titration, applications in assay of HIO_4 , NaOH , CaCO_3 etc.

Unit II: Oxidation Reduction Titrations **(9L)**

Concepts of oxidation and reduction, Redox reactions, Strengths and equivalent weights of oxidizing and reducing agents, Theory of redox titrations, Redox indicators, Cell representations, Measurement of electrode potential, Oxidation-reduction curves, Iodimetry and Iodometry, Titrations involving ceric sulphate, potassium iodate, potassium bromate, potassium permanganate; titanous chloride and Sodium 2, 6-dichlorophenol indophenol.

Unit III: Precipitation Titrations **(9L)**



Precipitation reactions, Solubility products, Effect of acids, temperature and solvent upon the solubility of a precipitate. Argentometric titrations and titrations involving ammonium or potassium thiocyanate, mercuric nitrate, and barium sulphate, Indicators, Gaylussac method; Mohr's method, Volhard's method and Fajan's method.

Unit IV: Theory of Gravimetric Analysis

(9L)

Precipitation techniques, Solubility products; The colloidal state, Supersaturation coprecipitation, Postprecipitation, Digestion washing of the precipitate, Filtration, Filter papers and crucibles, Ignition, Thermogravimetric curves, Specific examples like barium sulphate, aluminium as aluminium oxide, calcium as calcium oxalate and magnesium as magnesium pyrophosphate, Organic precipitants.

Reference Books-

1. A. H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone Press of University of London
2. A. I. Vogel, Text Book of Quantitative Inorganic analysis
3. P. Gundu Rao, Inorganic Pharmaceutical Chemistry
4. Bentley and Driver's Textbook of Pharmaceutical Chemistry
5. J. H. Kennedy, Analytical chemistry principles
6. S. M. Khopakar, Concepts in analytical chemistry

Course Outcomes:

After completion of the units students will be able to:

1. Define titration and know about its type
2. Know applications of various titrations in different fields
3. Describe the importance of different analytical techniques
4. Discover importance of thermal methods of analysis

LAB-II: BDCP-I-203: Practical Course-II

Course Objectives: Students should

1. Know identification tests for inorganic compounds (drugs).
2. Learn preparation of aromatic water.
3. Become skilled to do various types of titrations.
4. Study extraction of essential oils.

Experiments-

1. Identification tests for inorganic compounds particularly drugs and pharmaceuticals- Limit test for chloride, Sulfate, Arsenic, Iron and Heavy metals
2. Preparation of aromatic water
3. Assay of inorganic pharmaceuticals involving each of the following methods of compounds under theory.
4. Acid-Base titrations (at least 3)
5. Redox titrations (one each of permanganometry and iodimetry).
6. Precipitation titrations (at least 2)
7. Complexometric titration (Calcium and Magnesium).
8. Extraction of Essential oil



9. Viva voce
 10. Practical record
- Note- Any other relevant practical may be added

References-

1. A. H. Beckett & J. B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone Press of University of London, 4th edition.
2. A.I. Vogel, Text Book of Quantitative Inorganic analysis
3. E. J. Schellard, Practical Plant Chemistry for Pharmacy Students, Pitman Medical, London.
4. A. H. Beckett and J. B. Stenlake, Practical Pharmaceutical Chemistry Vol. I and II., The Athlone Press of the University of London.

Course Outcomes:

After completion of the units students will be able to:

1. Know about different tests for identification of compounds
2. Learn how to synthesize aromatic water
3. Trained to do various types of titrations
4. Gain knowledge about extraction of essential oils

Semester – II
Drug Chemistry-II
BDCT-II- 201 Paper – III
Remedial Mathematics [36 Lectures]
30 Marks **(2 Credits)**

BDCT-II-201: Remedial Mathematics

Course Objectives: Students should

1. Study need of computers for chemistry.
2. Learn probability and regression .
3. Have knowledge of basics of algebra.
4. Be familiar to calculus.

Unit I: Introduction to The Need of Computers for Chemistry (9L)

Computers for Analytical Chemists- Introduction to computers: Organization of computers, CPU, Computer memory, I/O devices, information storage, software components, Types of computers, Programming languages, Computer programs, Stored program concept, Operating systems, Algorithm, program flow charts.

Unit II: Probability and Regression (9L)

Probability distributions, normal, binomial and polynomial distributions, continuous data distribution, fiducial limits, probit and logit analysis. Linear regression and correlation, method of least squares, significance of correlation and regression.

Unit III: Algebra (9L)

Equations reducible to quadratics, simultaneous equations (linear and quadratic), Determinants, properties of solution of simultaneous equations by Cramer's rule,



matrices, definition of special kinds of matrices, arithmetic operations on matrices, inverse of a matrix, solution of simultaneous equations by matrices, pharmaceutical applications of determinants and matrices. Evaluation of E_{n1} , E_{n2} , and E_{n3} , mensuration and its pharmaceutical applications.

Unit IV: Calculus

(9L)

Differential: Limits and functions, definition of differential coefficient, differentiation of standard functions, including function of a function (Chain rule). Differentiation of implicit functions, logarithmic differentiation, parametric differentiation, successive differentiation.

Integral: Integration as inverse of differentiation, indefinite integrals of standard forms, integration by parts, substitution and partial fractions, formal evaluation of definite integrals.

Reference Books-

1. P. C. Jurs, Computer Software Application in Chemistry, John Wiley & Sons, New York.
2. P. Grogona, Programming in Pascal, Adeison Wesley, Reading, M A ..
3. N. Hunt and J. Shelley,. Computers and Commonsense, Prentice Hall of India, New Delhi.
3. Popst and Perrum "Computer Aided Drug Design", Academic Press, New York.
4. V. Rajanunan, Computer Programming nu Pascal, Prentice- Hall of India, New Delhi, 1983.
5. A Textbook of mathematics for XI-XII Students, NCERT Publications, vol. I-IV
Boltons,
6. N. Y. Dekker, Pharmaceutical Statistics. Practical and Clinical Applications
7. W. W. Daniel, Biostatistics. A Foundation for Analysis in Health Sciences, John Wiley, NY.
8. B. S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi.
9. S. P. Gupta, Statistical Methods, Sultan Chand & Co., New Delhi.
10. Schaum, Differential Equations, McGraw- Hill Singapore.

Course Outcomes:

After completion of the units students will be able to:

1. Define the scope of computer in chemistry
2. Be acquainted with probability and regression
3. Learn basics of algebra
4. Discover importance of calculus in various subjects

Semester – II
Drug Chemistry-II
BDCT –II-202 Paper – IV
Introduction to Biochemistry [36 Lectures]
30 Marks **(2 Credits)**



BDCT-II- 202: Introduction to Biochemistry

Course Objectives: Students should

1. Study fundamentals of endocrine system, various hormones and diseases related to it.
2. Know about vitamins in detail and its importance in our life.
3. Gain knowledge about mineral metabolism.
4. Learn in detail about body fluid and blood.

Unit I: Hormones

(9L)

What are Hormones? Endocrine system, Types, Glands, Functions, Diseases, Chemical Messengers, Feedback Mechanism, Diseases related to hormones (Thyroid hormones and anti thyroid drugs, parathormone, calcitonin and Vitamin D), Insulin, oral hypoglycaemic agents & glucagon, ACTH and corticosteroids, Androgens and anabolic steroids, Estrogens, progesterone and oral contraceptives, Drugs acting on the uterus.

Unit II: Vitamins

(9L)

What are Vitamins? Types of vitamins- fat soluble and water soluble, Various vitamins- its solubility, food sources, deficiency diseases, Interaction with other nutrients, antagonists and analogues of vitamins

Unit III: Mineral Metabolism

(9L)

General definition and history of minerals; causes of macro and micro mineral deficiencies in India. Chronology, chemistry, distribution, functions, absorption, transport, metabolism, deficiency manifestations. Nutritional requirements, methods of assay of all the minerals. Interactions of minerals with other nutrients, antagonists and analogues of minerals.

Unit IV: Body Fluid and Blood

(9L)

Body fluids, composition and functions of blood, hemopoiesis, formation of hemoglobin, anemia, mechanisms of coagulation, blood grouping, Rh factors, transfusion, its significance and disorders of blood, Reticulo endothelial system.

Lymphatic system

Lymphatic organs and tissues, lymphatic vessels, lymph circulation and functions of lymphatic system

Reference Books:

1. T. G. Palmetto, Principles of Anatomy and Physiology , GA, U.S.A.
2. Dr. C. C. Chatterrje, Human Physiology (vol 1 and 2), Academic Publishers Kolkata
3. E. E. Conn and P. K. Stumpf, Outlines of Biochemistry, John Wiley and Sons, New York
4. C. Harish and A. Leo, Fundamentals and Applications in Chemistry and Biology, ACS Book Catalog
5. B. Harrow and A. Mazur, Textbook of Biochemistry, W. B. Saunders Co., Philadelphia
6. A. L. Lehninger, Biochemistry, Worth Publisher, Inc.,
7. A. L. Lehninger, Principles of Biochemistry, CBS Publishers and Distributors.

Course Outcomes:

After completion of the units students will be able to:

1. Define endocrine system and importance of various hormones
2. Describe the importance of vitamins



3. Explain mineral metabolism
4. Know details about body fluid and blood

Lab-II: BDCP-II-203: Practical Course-II

Course Objectives: Students should

1. Know preparation of emulsion.
2. Learn preparation of powders and granules.
3. Become skilled to prepare gargles and mouth washes.
4. Study synthesis of Suppositories.

Experiments:

Synthesis of various compounds and drugs:

1. Emulsions
 - a) Turpentine Liniment
 - b) Liquid paraffin emulsion
2. Powders and Granules
 - a) ORS powder (WHO)
 - b) Effervescent granules
 - c) Dusting powder
 - d) Divided powders
3. Suppositories
 - a) Glycero gelatin suppository
 - a) Sulphur ointment
 - b) Non staining-iodine ointment with methyl salicylate
 - c) Carbopal gel
5. Gargles and Mouthwashes
 - a) Iodine gargle
 - b) Chlorhexidine mouthwash
6. Viva voce
7. Practical record

Note- Any other relevant practical may be added

Reference Books-

1. D. M. Parikh: Handbook of Pharmaceutical Granulation Technology, Marcel Dekker, INC, New York.
2. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II, Stahlone Press of University of London, 4th edition.
3. M. Paye, A. O. Barel, H. Maibach, Handbook of Cosmetic Science and Technology.
4. Dr. S. Naskar, A Handbook of Practical Pharmaceutical Chemistry, Pharmamedix India Publication Pvt. Ltd.; I edition (1 January 2014)
5. Dr. P. Mondal and Dr. S. Mondal, Handbook of Practical Pharmaceutical Organic, Inorganic and Pharmaceutical Chemistry, EDUCREATION PUBLISHING, RZ 94, Sector - 6, Dwarka, New Delhi - 110075

Course Outcomes:



After completion of the units students will be able to:

1. Synthesis emulsions
2. Learn preparation of powders and granules
3. Trained to prepare mouth washes
4. Synthesize different types of Suppositories