

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

PREAMBLE:

This syllabus is prepared for first year undergraduate students. At this level, encourage students to study drug chemistry (with chemistry and microbiology) and also excel them for the academic and industrial exposure simultaneously. As per the UGC norms and industry requirement content of the syllabus have been framed. 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 drug chemistry which include 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 laboratory skills through practical work 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 natural drug resources, analytical skills along with excipients, 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 the fields including pharmaceuticals and research.
4. The students will graduate with proficiency in the subject of drug chemistry.
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: (BDCT-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: (BDCT-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: (BDCT-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: (BDCT-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 books, Journals and Periodicals. –List Attached

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

C) Laboratory Equipments: Apparatus & equipments 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. Thiele tube
12. Capillary tube
13. Evaporating dish
14. Glass rod
15. Wire gauze
16. Burner
17. Water bath
18. Chromatography paper
19. Glass jar
20. Watch glass
21. Tripod stand
22. Burette stand
23. Iron stand
24. Test tube holder
25. Test tube 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	6 L		
		Unit II: Chemical Communication	8 L		
		Unit III: Drug Synthetic Approches	10 L		
		Unit IV: Drug Intermediates	12 L		
	BDCP-I- 103	Lab-I			
Drug Chemistry-II					
	BDCT-II- 101	Fundamentals of States of Matter			
		Unit I: Measurements	6 L		
		Unit II: Fluid Statics	6 L		
		Unit III: Surface Tension	8 L		
		Unit IV: Refrigeration	6 L		
		Unit V: Charge and Matter	8 L		
	BDCT-II- 102	Fundamentals of Biological Chemistry			
		Unit I: Fundamentals of Biological Chemistry	8 L		
		Unit II: Basic Biomolecules	8 L		
		Unit III: Protein	5 L		
		Unit IV: Bioavailability	8 L		
		Unit V: Permeability	7 L		
	BDCP-II-103	Lab-I			
Semester II					
Drug Chemistry-I					
	BDCT-I-201	Introduction to Pharmaceutical Chemistry-I			



		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-I			
		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: Harmones	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. Related to ayurvedic medicines

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 chemical communication of hormones.
3. Study the nomenclature of organic compounds.
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: Chemical Communication (8 L)

Various types of communication systems with an emphasis on endocrine hormones and their action (Pituitary and Adrenal glands)

Unit III: Drug Synthetic Approaches (10 L)

Nomenclature, Paracetamol, Niacin, Metroindazole, Aspirin, Ibuprofen

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 an idea about chemical communication
3. Learn various drug synthesis
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. Safety symbol on labels of pack of chemicals and its meaning
2. Details about MSDS sheet and its importance
3. Purification of organic pharmaceutical compounds (Any 2)
4. Preparation and standardization of solutions (Any 2)
5. Determination of solubility, MP and BP of drug (Any 4)
6. Detection of elements and functional group (Any 4)
7. Estimation of tincture iodine
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 States of Matter [36 Lectures]
30 Marks (2 Credits)

BDCT-II-101: Fundamentals of States of Matter

Course Objectives: Students should

1. Know about various measurement criterias.
2. Be Familiar with fluid statistics.
3. Study surface tension and its applications.
4. Learn about charge and matter.

Unit I: Measurements

(8 L)

Interrelationship between Physics and Life sciences, Physical quantities, standards and units: Length: radius of proton to size to astronomical distances. Mass: atomic mass unit



to mass of earth. Time: time for fast elementary particle to pass through nucleus to age of earth. Electric current. Thermodynamic temperature. Amount of substance. Luminous intensity. International systems and units: Units for measuring physical quantities and their inter-conversion.

Unit II: Fluid Statistics (6 L)

Fluids: Definition, Pressure and Density. The variation of pressure in a fluid at rest. Pascal's Principle. Measurement of pressure. Various units of pressure and their inter-conversion

Unit III: Surface Tension (8 L)

Surface tension and surface energy: Definition, concept and derivation. Capillary action. Angle of contact. Wettability. Temperature dependence of surface tension. Relevance to life sciences and applications.

Unit IV: Refrigeration (6 L)

Introduction to refrigeration principle: Difference between Heat Engine and refrigerator with the help of Carnot cycle. Adiabatic and isothermal process. Coefficient of performance. Conditions for good refrigerant.

Unit IV: Charge and Matter (8 L)

Electromagnetism – preview, Electric charge. Conductor, Semiconductor and Insulator. Coulomb's law. Charge is quantized. Charge and matter. Charge is conserved. Electricity with minimum 3 examples.

Reference Books:

1. Fundamentals of Physics. 9th edition. (2010). David Halliday, Robert Resnick, Jearl Walker John Wiley & Sons, USA.
2. Perspectives of modern physics. Digitized edition (2007) Arthur Beiser, Mc Graw Hill, USA
3. Heat and thermodynamics. 7th edition (1996). Zemansky Mark. Mc Graw Hill, USA
4. Fundamentals of optics. 3rd edition digitized (2009) Francis Arthur Jenkins, Harvey Elliott White. Mc Graw Hill, USA
5. Solar Energy- Principles of thermal collection and storage. 3rd edition (2008) Suhas Sukhatme and J P Nayak. Tata Mc Graw Hill, India.
6. Digital principles and applications 2nd edition (1975) Donald Leach, Albert Malvino, Tata Mc Graw Hill, USA
7. Introduction to atomic spectra. (1934) H.E. White, Mc Graw Hill, USA

Course Outcomes:

After completion of the units students will be able to:

1. Get information about measurement criterias
2. Know about fluid statistics
3. Understand surface tension and its applications
4. Get knowledge about refrigeration technique



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

BDCT-II-102: Fundamentals of Biological Chemistry

Course Objectives: Students should

1. Study the fundamentals of biological chemistry.
2. Know about basic biomolecules.
3. Gain knowledge about amino acids and proteins.
4. Be familiar with the term bioavailability.

Unit I: Fundamentals of Biological Chemistry (8 L)

Configuration and Information in 3D structure of biomolecules: Stereochemistry, chiral interaction, enantiomers etc. Interaction between biomolecules, stereospecificity, Types of bonds in biomolecule [Covalent (glycoside, peptide, phosphodiester), ionic, hydrogen, Van der Waals, hydrophobic, coordinate] their formation and interaction

Unit II: Basic Biomolecules (8 L)

Carbohydrates: Introduction, biological importance. Definition, Classification, {glyceraldehydes, Simple Aldose, Simple Ketoses, D-glucose, Conformation of D-glucose} Monosaccharides other than glucose, glycosidic bond, disaccharides polysaccharides [starch, glycogen] peptidoglycan, proteoglycan matrix. polysaccharides [starch, glycogen] peptidoglycan, proteoglycan matrix.

Unit III: Protein (5 L)

Amino acids: Structure and properties of amino acids. Acid base behavior/ amino acid analysis/ reactions/ Zwitter ions/ classification. Structure-peptide bond

Unit IV: Bioavailability (8 L)

Definition in pharmacology, nutritional science, environmental science, absolute bioavailability, relative bioavailability and bioequivalence, factors influencing bioavailability, bioavailability of drugs versus dietary supplements, Nutritional Science: reliable and universal bioavailability.

Unit V: Permeability (7 L)

Diffusion – Definition, significance, mechanism, laws and factors affecting diffusion

Osmosis – Definition, mechanism, significance, osmotic pressure (OP), types of osmosis – endosmosis, exosmosis, turgor pressure (TP) and wall pressure (WP), relation between OP, DPD (Suction pressure) and TP

Reference Books:

1. Economic Zoology, Shukla & Upadhyaya, 4th Edition., Rastogi Publications, 2009.
2. Sericulture: www.csb.gov.in/publications/books by Central Silk Board, Ministry of Textiles - Govt of India
3. Kumar H. D. (1999) Biodiversity and sustainable conservation (Oxford & IBH, New Delhi)



4. Outlines of Biochemistry: 5th Edition, (2009), Erice Conn & Paul Stumpf ; John Wiley and Sons, USA
5. Fundamentals of Biochemistry. 3rd Edition, (2008), Donald Voet & Judith Voet, John Wiley and Sons, Inc. USA
6. Principles of Biochemistry, 4th edition (1997), Jeffery Zubey, McGraw-Hill College, USA
7. Biochemistry: 7th Edition, (2012), Jeremy Berg, Lubert Stryer, W.H.Freeman and company, NY
8. Lehninger , Principles of Biochemistry. 5th Edition (2008), David Nelson & Michael Cox, W. H. Freeman and company, NY.
9. Biochemistry. 5th Edition, (copu right 2013), Reginald Garrett and Charles Grisham, Brook/Cole, Cengage Learning, Boston, USA.
10. An Introduction to Practical Biochemistry.3rd Edition, (2001), David Plummer, Tata McGraw Hill Edu.Pvt.Ltd. New Delhi, India
11. Biochemical Methods. 1st , (1995), S. Sadashivam, A. Manickam, New Age International Publishers, India

Course Outcomes:

After completion of the units students will be able to:

1. Get information about metrology
2. Know packging 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 various .
2. Learn spot tests for carbohydrates and amino acids.
3. Become skilled for isolation of starch and protein.
4. Study estimation of protein by using various methods.

Experiments:

1. Preparation of Antimony potassium tartarate, milk of magnesia, Ferrous ammonium sulphate, alum, aluminium hydroxide gel (Any 3)
2. Spot test for carbohydrates & amino acids
3. Isolation of starch from potato
4. Isolation of protein from plant source
5. Isolation of oil from plant source
6. Estimation of protein by Biuret method
7. Estimation of protein by Lowry method
8. Synthesis of Aspirin
9. Viva voce
10. 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 various compounds
2. Detect carbohydrates and proteins
3. Isolate starch and protein
4. Estimate protein by using various method

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

BDCT-I- 201: Introduction to Pharmaceutical Chemistry-I

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)

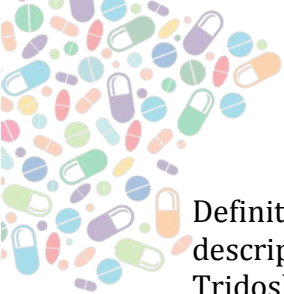
Boric acid, Hydrochloric acid, Ammonium hydroxide, Sodium hydroxide and official buffers. Buffer equations and buffer capacity in general, buffers in pharmaceutical systems, preparation, stability, buffered isotonic solutions, measurements of tonicity, calculations and methods of adjusting isotonicity. 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 –I [36 Lectures]
30 Marks (2 Credits)

BDCT-I- 202: Analysis Techniques-I

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-Hasselbach 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. Khopkar, 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.

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. Recapitulate 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, Addison 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 Applicatoins in Chemistry and Biology, ACS Book Catalog
5. B. Harrow and A. Mazur, Textbdok 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 harmones
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 computer handling.
2. Learn MS word and MS Excel.
3. Become skilled to find out food adultration.
4. Study separation of amino acids, lipids and carbohydrates.

Experiments:

Synthesis of various compounds and drugs:

1. Computer- getting started, file handling, Scanning for viruses & using anti-virus programs
2. Word Processing (Microsoft Word): Creating, Saving & Operating a document, Editing, Inserting, Deleting, Formatting, Moving & Copying Text, Find & Replace, Spell Checker & Grammar Checker, Document Enhancement (Borders, Shading, Header, Footer), Printing document (Page layout, Margins), Introduction to the use of Wizards & Templates, Working with Graphics (Word Art), Working with Tables & Charts, Inserting Files (Pictures, Databases, Spreadsheets)
3. Spreadsheet Applications (Microsoft Excel): Worksheet Basics: Entering information in a Worksheet, Saving & Opening a Worksheet, Editing, Copying & Moving data, Inserting, Deleting & Moving Columns & Rows, Clearing
4. Usage of multimedia – Creation of Computer Presentations with graphics (Microsoft Power Point): Creation of slides, Rapid Presentation design using wizards.
5. To find out isoelectric point of amino acids
6. Chromatographic Separation of lipid, amino acids and carbohydrates
7. Determination of food adultration
8. Viva voce
9. 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.
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. Familiar with computer handling
2. Use MS word and MS Excel routinely
3. Trained to find isoelectric point of amino acids
4. Detect food adulteration