

**DR. A.P.J. ABDUL KALAM TECHNICAL UNIVERSITY,
UTTAR PRADESH, LUCKNOW**

EVALUATION SCHEME & SYLLABUS



**BACHELOR OF PHARMACY
I, II, III & IV Year**

On PCI Guidelines

(EFFECTIVE FROM THE SESSION: 2019-20)

Bachelor of Pharmacy (B. Pharm.)
COURSE OF STUDY & SCHEME OF EVALUATION FOR INTERNAL AND END SEMESTER EXAMINATIONS
(W.E.F. Session 2019-20)

FIRST SEMESTER

Course Code	Name of the Course	No. of Hours/ week	Continuous Mode	Internal Assessment			End Semester Exams		Total Marks	Credit Points
				Sessional Exams		Total	Marks	Duration		
				Marks	Duration					
BP101T	Human Anatomy and Physiology– Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP102T	Pharmaceutical Analysis I – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP103T	Pharmaceutics I – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP104T	Pharmaceutical Inorganic Chemistry– Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP105T	Communication Skills – Theory	2	20	30	2 Hrs	50	---	---	50	2
BP106RBT BP106RMT	Remedial Biology/ Mathematics – Theory	2	20	30	2 Hrs	50	---	---	50	2
BP107P	Human Anatomy and Physiology – Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP108P	Pharmaceutical Analysis I – Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP109P	Pharmaceutics I – Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP110P	Pharmaceutical Inorganic Chemistry– Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP111P	Communication Skills – Practical	2	10	15	2 Hrs	25	---	---	25	1
BP112RBP	Remedial Biology– Practical	2			2 Hrs	25	---	---	25	1
Total		38 ^{\$} / 40 [#]	110 ^{\$} / 110 [#]	175 ^{\$} / 175 [#]	26 ^{\$} /28 [#] Hrs	285 ^{\$} / 310 [#]	440 [#]	28 [#] Hrs	725 ^{\$} / 750 [#]	29 ^{\$} / 30 [#]

[#]Applicable ONLY for the students who have studied Mathematics/ Physics/ Chemistry at HSC and appearing for Remedial Biology (RB) course.

^{\$}Applicable ONLY for the students who have studied Physics/ Chemistry/ Botany/ Zoology at HSC and appearing for Remedial Mathematics (RM) course.

ECOND SEMESTER

Course Code	Name of the Course	No. of Hours/ week	Internal Assessment				End Semester Exams		Total Marks	Credit Points
			Continuous Mode	Sessional Exams		Total	Marks	Duration		
				Marks	Duration					
BP201T	Human Anatomy and Physiology II – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP202T	Pharmaceutical Organic Chemistry I – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP203T	Biochemistry– Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP204T	Pathophysiology– Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP205T	Computer Applications in Pharmacy– Theory	3	25	50	2 Hrs	75	---	---	75	3
BP206T	Environmental Sciences – Theory	3	25	50	2 Hrs	75	---	---	75	3
BP207P	Human Anatomy and Physiology II – Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP208P	Pharmaceutical Organic Chemistry I – Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP209P	Biochemistry– Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP210P	Computer Applications in Pharmacy – Practical	2	10	15	2 Hrs	25	---	---	25	1
Total		36	115	205	22 Hrs	320	405	24 Hrs	725	29

THIRD SEMESTER*

Course Code	Name of the Course	No. of Hours/ week	Internal Assessment				End Semester Exams		Total Marks	Credit Points
			Continuous Mode	Sessional Exams		Total	Marks	Duration		
				Marks	Duration					
BP301T	Pharmaceutical Organic Chemistry II – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP302T	Physical Pharmaceutics I – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP303T	Pharmaceutical Microbiology – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP304T	Pharmaceutical Engineering – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP305P	Pharmaceutical Organic Chemistry II – Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP306P	Physical Pharmaceutics I – Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP307P	Pharmaceutical Microbiology – Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP308P	Pharmaceutical Engineering –Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
KVE301	Universal Human Values and Professional Ethics**	3	20	30	1 Hr	50	100	3 Hrs	150	3
Total		35	80	130	21 Hrs	210	540	31 Hrs	750	27

*The lateral entry students taking admission directly to second year shall compulsorily appear for and pass the Communications Skill Subject Examination in the Third Semester.

Human values & Professional Ethics will be offered as a **compulsory course for which passing marks shall be 30% in End Semester Examination and 40% in aggregate.

FOURTH SEMESTER*

Course Code	Name of the Course	No. of Hours/ week	Internal Assessment				End Semester Exams		Total Marks	Credit Points
			Continuous Mode	Sessional Exams		Total	Marks	Duration		
				Marks	Duration					
BP401T	Pharmaceutical Organic Chemistry III – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP402T	Medicinal Chemistry I – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP403T	Physical Pharmaceutics II – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP404T	Pharmacology I – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP405T	Pharmacognosy I – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP406P	Medicinal Chemistry I – Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP407P	Physical Pharmaceutics II – Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP408P	Pharmacology I – Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP409P	Pharmacognosy I – Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
Total		36	70	115	21 Hrs	185	515	31 Hrs	700	28

*The lateral entry students taking admission directly to second year shall compulsorily appear for and pass the Computer Applications in Pharmacy Subject Examination in the Fourth Semester.

FIFTH SEMESTER

Course Code	Name of the Course	No. of Hours/ week	Internal Assessment				End Semester Exams		Total Marks	Credit Points
			Continuous Mode	Sessional Exams		Total	Marks	Duration		
				Marks	Duration					
BP501T	Medicinal Chemistry II – Theory	3	10	15	1 Hr	25	75	3 Hrs	100	4
BP502T	Industrial Pharmacy I – Theory	3	10	15	1 Hr	25	75	3 Hrs	100	4
BP503T	Pharmacology II – Theory	3	10	15	1 Hr	25	75	3 Hrs	100	4
BP504T	Pharmacognosy and Phytochemistry	3	10	15	1 Hr	25	75	3 Hrs	100	4
BP505T	Pharmaceutical Jurisprudence – Theory	3	10	15	1 Hr	25	75	3 Hrs	100	4
BP506P	Industrial Pharmacy I – Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP507P	Pharmacology II – Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP508P	Pharmacognosy and Phytochemistry II – Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP509P	Report on Hospital Training-I	-	-	-	-	-	100	-	100	2
Total		27	65	105	17 Hrs	170	580	27 Hrs	750	28

SIXTH SEMESTER

Course Code	Name of the Course	No. of Hours/ week	Internal Assessment				End Semester Exams		Total Marks	Credit Points
			Continuous Mode	Sessional Exams		Total	Marks	Duration		
				Marks	Duration					
BP601T	Medicinal Chemistry III – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP602T	Pharmacology III – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP603T	Herbal Drug Technology – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP604T	Biopharmaceutics and Pharmacokinetics – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP605T	Pharmaceutical Biotechnology– Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP606T	Quality Assurance– Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP607P	Medicinal Chemistry III – Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP608P	Pharmacology III – Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP609P	Herbal Drug Technology – Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP610P	Report on Industrial Training	-	-	-	-	-	100	-	100	2
Total		36	75	120	18 Hrs	195	655	30 Hrs	850	32

SEVENTH SEMESTER

Course Code	Name of the Course	No. of Hours/week	Internal Assessment				End Semester Exams		Total Marks	Credit Points
			Continuous Mode	Sessional Exams		Total	Marks	Duration		
				Marks	Duration					
BP701T	Instrumental Methods of Analysis – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP702T	Industrial Pharmacy II – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP703T	PharmacyPractice – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP704T	Novel Drug Delivery System (NDDS) – Theory	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP705P	Instrumental Methods of Analysis/ NDDS – Practical	4	5	10	4 Hrs	15	35	4 Hrs	50	2
BP706PS	Practice School	12	50	100	5 Hrs	150	---	---	150	6
BP707P	Report on Hospital Training-II	-	-	-	-	-	100	-	100	2
Total		32	95	170	13 Hrs	265	435	16 Hrs	700	26

EIGHTH SEMESTER

Course Code	Name of the Course	No. of Hours/	Internal Assessment				End Semester Exams		Total Marks	Credit Points
			Continuous Mode	Sessional Exams		Total	Marks	Duration		
				Marks	Duration					
BP801T	Biostatistics and Research Methodology	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP802T	Social and Preventive Pharmacy	4	10	15	1 Hr	25	75	3 Hrs	100	4
BP803ET	Pharma Marketing Management*	4 + 4 = 8	10 + 10 = 20	15 + 15 = 30	1 + 1 = 2 Hrs	25 + 25 = 50	75 + 75 = 150	3 + 3 = 6 Hrs	100 + 100 =200	4 + 4 = 8
BP804ET	Pharmaceutical Regulatory Science*									
BP805ET	Pharmacovigilance*									
BP806ET	Quality Control and Standardization of Herbal*									
BP807ET	Computer Aided Drug									
BP808ET	Cell and Molecular									
BP809ET	Cosmetic Science*									
BP810ET	Experimental									
BP811ET	Advanced Instrumentation Techniques*									
BP812ET	Dietary Supplements and Nutraceuticals*									
BP813ET	Pharmaceutical Product Develonment*									
BP814ET	LSSSDC Elective*									
BP815PW	Project Work (On Elective)	12	-	-	-	-	150	4 Hrs	150	6
BP816P	Report on Industrial Tour	-	-	-	-	-	100	-	100	2
Total		28	40	6	4 Hrs	10	550	16 Hrs	650	24

*(ET: Elective subject) Every candidate has to **opt for two** of the elective subjects, and has to carry out **project on any one** of them. The student has the choice to choose both the elective subjects from the already prescribed list of elective subjects by the PCI **or** choose one elective subject from the existing prescribed list of elective subjects of B. Pharm. programme by the PCI and the other (second subject) elective from list of skill pack/modules available with the LSSSDC from time to time.

Semester I

BP101T. HUMAN ANATOMY AND PHYSIOLOGY-I (Theory)

45 Hours

Course Content:

Unit-I

10 hours

Introduction to human body: Definition and scope of anatomy and physiology, levels of structural organization and body systems, basic life processes, homeostasis, basic anatomical terminology.

Cellular level of organization: Structure and functions of cell, transport across cell membrane, cell division, cell junctions. General principles of cell communication, intracellular signaling pathway activation by extracellular signal molecule, Forms of intracellular signaling: a) Contact-dependent; b) Paracrine; c) Synaptic; d) Endocrine.

Tissue level of organization: Classification of tissues, structure, location and functions of epithelial, muscular and nervous and connective tissues.

Unit-II

10 hours

Integumentary system: Structure and functions of skin.

Skeletal system: Divisions of skeletal system, types of bone, salient features and functions of bones of axial and appendicular skeletal system. Organization of skeletal muscle, physiology of muscle contraction, neuromuscular junction.

Joints: Structural and functional classification, types of joints movements and its articulation.

Unit-III

10 hours

Body fluids and blood: 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.

Unit-IV

08 hours

Peripheral nervous system: Classification of peripheral nervous system: Structure and functions of sympathetic and parasympathetic nervous system. Origin and functions of spinal and cranial nerves.

Special senses: Structure and functions of eye, ear, nose and tongue and their disorders.

Unit-V

07 hours

Cardiovascular system

Heart – anatomy of heart, blood circulation, blood vessels, structure and functions of artery, vein and capillaries, elements of conduction system of heart and heartbeat, its regulation by autonomic nervous system, cardiac output, cardiac cycle. Regulation of blood pressure, pulse, electrocardiogram and disorders of heart.

BP107P. HUMAN ANATOMY AND PHYSIOLOGY (Practical)

4 Hours/weeks

1. Study of compound microscope.
2. Microscopic study of epithelial and connective tissue.
3. Microscopic study of muscular and nervous tissue.
4. Identification of axial bones.
5. Identification of appendicular bones.
6. Introduction to hemocytometry.
7. Enumeration of white blood cell (WBC) count.
8. Enumeration of total red blood corpuscles (RBC) count.
9. Determination of bleeding time.
10. Determination of clotting time.
11. Estimation of hemoglobin content.
12. Determination of blood group.
13. Determination of erythrocyte sedimentation rate (ESR).
14. Determination of heart rate and pulse rate.
15. Recording of blood pressure.

Recommended Books (Latest Editions)

- Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York.
- Physiological Basis of Medical Practice by Best and Taylor, Williams & Wilkins Co, Riverview, MI, USA.
- Textbook of Medical Physiology by Arthur C, Guyton and John, E. Hall, Miamisburg, Ohio, U.S.A.
- Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.
- Human Anatomy and Physiology by Marieb E.N., Benjamin Cummings, Pearson Education Inc., San Francisco.
- Preventive and Social Medicine by Park K., Banarsidas Bhanot Publishers, Jabalpur.
- Anatomy and Physiology in Health and Illness by Ross & Wilson Churchill Livingstone, London.
- Essentials of Anatomy and Physiology by Seeley R.R., Stephens T.D. and Tate P. McGraw-Hill, New York.
- Health Education and Community Pharmacy by Parmar N.S., CBS Publishers, Delhi.
- Health Education and Community Pharmacy by Dandiya P.C., Zafer Z.Y.K., and Zafer A. Vallabh Prakashan, Delhi.
- Samson Wright's Applied Physiology by Keele C.A., Niel E. and Joels N., Oxford University Press, New York.
- Human Physiology - Volume 1 and 2 by Dr. C.C. Chatterjee, Academic Publishers, Kolkata.

BP102T. PHARMACEUTICAL ANALYSIS (Theory) 45 Hours

Course Content:

Unit-I

10 Hours

Pharmaceutical analysis: Definition and scope.

- i) Different techniques of analysis.
- ii) Methods of expressing concentration.
- iii) Primary and secondary standards.
- iv) Preparation and standardization of various molar and normal solutions- Oxalic acid, sodium hydroxide, hydrochloric acid, sodium thiosulphate, sulphuric acid, potassium permanganate and ceric ammonium sulphate.

Errors: Sources of errors, types of errors, methods of minimizing errors, accuracy, precision and significant figures.

Pharmacopoeia, Sources of impurities in medicinal agents, limit tests.

Unit-II

10 Hours

Acid base titration: Theories of acid base indicators, classification of acid base titrations and theory involved in titrations of strong, weak, and very weak acids and bases, neutralization curves.

Non-aqueous titration: Solvents, acidimetry and alkalimetry titration and estimation of Sodium benzoate and Ephedrine HCl.

Unit-III

10 Hours

Precipitation titrations: Mohr's method, Volhard's, Modified Volhard's, Fajan's method, estimation of sodium chloride.

Complexometric titration: Classification, metal ion indicators, masking and demasking reagents, estimation of Magnesium sulphate, and calcium gluconate.

Gravimetry: Principle and steps involved in gravimetric analysis. Purity of the precipitate: co-precipitation and post precipitation, Estimation of barium sulphate.

Basic Principles, methods and application of diazotization titration.

Unit-IV

08 Hours

Redox titrations: Concepts of oxidation and reduction, Types of redox titrations (Principles and applications).

Cerimetry, Iodimetry, Iodometry, Bromometry, Dichrometry and titration with potassium-iodate.

Unit-V

07 Hours

Electrochemical methods of analysis:

Conductometry- Introduction, Conductivity cell, Conductometric titrations, applications.

Potentiometry- Electrochemical cell, construction and working of reference (Standard hydrogen, silver chloride electrode and calomel electrode) and indicator electrodes (metal electrodes and glass electrode), methods to determine end point of potentiometric titration and applications.

Polarography - Principle, Ilkovic equation construction and working of dropping mercury electrode and rotating platinum electrode, applications.

BP108P. PHARMACEUTICAL ANALYSIS (Practical)

4 Hours / Week

I Limit Test of the following:

- (1) Chloride.
- (2) Sulphate.
- (3) Iron.
- (4) Arsenic.

II Preparation and standardization of

- (1) Sodium hydroxide.
- (2) Sulphuric acid.
- (3) Sodium thiosulfate.
- (4) Potassium permanganate.
- (5) Ceric ammonium sulphate.

III Assay of the following compounds along with Standardization of Titrant:

- (1) Ammonium chloride by acid base titration.
- (2) Ferrous sulphate by Cerimetry.
- (3) Copper sulphate by Iodometry.
- (4) Calcium gluconate by Complexometry.
- (5) Hydrogen peroxide by Permanganatometry.
- (6) Sodium benzoate by non-aqueous titration.
- (7) Sodium Chloride by precipitation titration.

IV Determination of Normality by electro-analytical methods:

- (1) Conductometric titration of strong acid against strong base.
- (2) Conductometric titration of strong acid and weak acid against strong base.
- (3) Potentiometric titration of strong acid against strong base.

Recommended Books: (Latest Editions)

- Vogel's Textbook of Quantitative Chemical Analysis by Mendham J., Denney R.C., Barnes J.D., Thomas M, Jeffery G.H., Pearson Education Asia.
- A Textbook of Pharmaceutical by Connors K.A., Wiley Inter-science.
- Practical Pharmaceutical Chemistry by Beckett A.H., and Stenlake J.B., Vol. I & II. Athlone Press, University of London.
- British Pharmacopoeia, Her Majesty's Stationary Office, University Press, Cambridge.
- Quantitative Analysis by Alexeyev V., CBS Publishers & Distributors, New Delhi.
- The Pharmacopoeia of India, the Controller of Publications, Delhi.
- Bentley and Driver's Textbook of Pharmaceutical Chemistry, Oxford University Press, New Delhi.
- Analytical Chemistry Principles by John H. Kennedy, Cengage Learning, Delhi.

BP103T. PHARMACEUTICS-I (Theory)

45 Hours

Course Content:

Unit-I

10 Hours

Historical background and development of profession of pharmacy: History of profession of Pharmacy in India in relation to pharmacy education, industry and organization, Pharmacy as a career, Pharmacopoeias: Introduction to IP, BP, USP and Extra Pharmacopoeia.

Dosage forms: Introduction to dosage forms, classification and definitions.

Prescription: Definition, Parts of prescription, handling of Prescription and Errors in prescription.

Posology: Definition, Factors affecting posology. Pediatric dose calculations based on age, body weight and body surface area.

Unit-II

10 Hours

Pharmaceutical calculations: Weights and measures– Imperial & Metric system, Calculations involving percentage solutions, allegation, proof spirit and isotonic solutions based on freezing point and molecular weight.

Powders: Definition, classification, advantages and disadvantages. Simple & compound powders– official preparations, dusting powders, effervescent, efflorescent and hygroscopic powders, eutectic mixtures. Geometric dilutions.

Liquid dosage forms: Advantages and disadvantages of liquid dosage forms. Excipients used in formulation of liquid dosage forms. Solubility enhancement techniques.

Unit-III

10 Hours

Monophasic liquids: Definitions and preparations of Gargles, Mouthwashes, Throat Paint, Eardrops, Nasal drops, Enemas, Syrups, Elixirs, Liniments and Lotions.

Biphasic liquids:

Suspensions: Definition, advantages and disadvantages, classifications, Preparation of suspensions; Flocculated and Deflocculated suspension & stability problems and methods to overcome.

Emulsions: Definition, classification, emulsifying agent, test for the identification of type of Emulsion, Methods of preparation & stability problems and methods to overcome.

Unit-IV

08 Hours

Suppositories: Definition, types, advantages and disadvantages, types of bases, methods of preparations. Displacement value & its calculations, evaluation of suppositories.

Pharmaceutical incompatibilities: Definition, classification, physical, chemical and therapeutic incompatibilities with examples.

Unit-V

07 Hours

Semisolid dosage forms: Definitions, classification, mechanisms and factors influencing dermal penetration of drugs. Preparation of ointments, pastes, creams and gels. Excipients used in semi-solid dosage forms. Evaluation of semi-solid dosages forms.

BP109P. PHARMACEUTICS I (Practical)

3 Hours/week

1. Syrups

- a) Syrup IP'66.
- b) Compound syrup of Ferrous Phosphate BPC'68.

2. Elixirs

- a) Piperazine citrate elixir.
- b) Paracetamol pediatric elixir.

3. Linctus

- a) Terpen Hydrate Linctus IP'66.
- b) Iodine Throat Paint (Mandl's Paint).

4. Solutions

- a) Strong solution of ammonium acetate.
- b) Cresol with soap solution.
- c) Lugol's solution.

5. Suspensions

- a) Calamine lotion.
- b) Magnesium Hydroxide mixture.
- c) Aluminum Hydroxide gel.

6. Emulsions

- a) Turpentine Liniment.
- b) Liquid paraffin emulsion.

7. Powders and Granules

- a) ORS powder (WHO).
- b) Effervescent granules.
- c) Dusting powder.
- d) Divided powders.

8. Suppositories

- a) Glycero -Gelatin suppository.
- b) Cocoa butter suppository.
- c) Zinc Oxide suppository.

9. Semisolids

- a) Sulphur ointment.
- b) Non staining-iodine ointment with methyl salicylate.
- c) Carbopol gel.

10. Gargles and Mouthwashes

- a) Iodine gargle.
- b) Chlorhexidine mouthwash.

Recommended Books: (Latest Editions)

- Pharmaceutical Dosage Form and Drug Delivery System by H.C. Ansel et al., Lippincott Williams and Wilkins, New Delhi.
- Cooper and Gunn's Dispensing for Pharmaceutical Students by Carter S.J., CBS Publishers, New Delhi.
- A Practical Guide to Contemporary Pharmacy Practice by Judith E. Thompson, 1st ed., Lippincott Williams & Wilkins.
- Pharmaceutics, The Science & Dosage Form Design by M.E. Aulton, Churchill Livingstone, Edinburgh.
- Pharmacopoeia of India, The Controller of Publications, Delhi.
- British Pharmacopoeia, Her Majesty's Stationary Office, University Press, Cambridge.
- United States Pharmacopoeia (National Formulary).
- Theory and Practice of Industrial Pharmacy by Lachman, Lea & Febiger Publisher, the University of Michigan.
- Remington. The Science and Practice of Pharmacy by Alfonso R. Gennaro, Lippincott Williams and Wilkins, New Delhi.
- Cooper and Gunn's Tutorial Pharmacy by Carter S.J., CBS Publications, New Delhi.
- Bentley's Textbook of Pharmaceutics by E.A. Rawlins, English Language Book Society, Elsevier Health Sciences, USA.
- Pharmaceutical Palletization Technology by Isaac Ghebre Sellassie, Marcel Dekker Inc., New York.
- Handbook of Pharmaceutical Granulation Technology, Marcel Dekker Inc., New York.
- Pharmaceutical Emulsions and Suspensions, Francoise Nieloud and Gilberte Marti-Mestres Marcel Dekker, INC, New York.
- Textbook of Pharmaceutics, Volume - I & II by Aulton M.E., Churchill Livingstone, London.
- Modern Dispensing Pharmacy by Jain N.K., 2nd Ed, PharmaMed Press, Hyderabad.
- Calculations for Pharmaceutical Practice by A. Winfiled and I. Edafigho, Elsevier Churchill Livingstone, London.
- Elementary Pharmaceutical Calculations by Tripathi D.K., PharmaMed Press, Hyderabad.

BP104T. PHARMACEUTICAL INORGANIC CHEMISTRY (Theory)

45 Hours

Course Content:

Unit-I

10 Hours

Impurities in pharmaceutical Substances: History of Pharmacopoeia, Sources and types of impurities, principle involved in the limit test for Chloride, Sulphate, Iron, Arsenic, Lead and Heavy metals, modified limit test for Chloride and Sulphate.

General methods of preparation, assay for the compounds superscripted with asterisk (*), properties and medicinal uses of inorganic compounds belonging to the following classes.

Unit-II

10 Hours

Acids, Bases and 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.

Major extra and intracellular electrolytes: Functions of major physiological ions, Electrolytes used in the replacement therapy: Sodium chloride*, Potassium chloride, Calcium gluconate* and Oral Rehydration Salt (ORS), Physiological acid base balance.

Dental products: Dentifrices, role of fluoride in the treatment of dental caries, Desensitizing agents, Calcium carbonate, Sodium fluoride, and Zinc eugenol cement.

Unit-III

10 Hours

Gastrointestinal agents

Acidifiers: Ammonium chloride* and Dil. HCl.

Antacid: Ideal properties of antacids, combinations of antacids, Sodium Bicarbonate*, Aluminum hydroxide gel, Magnesium hydroxide mixture.

Cathartics: Magnesium sulphate, Sodium orthophosphate Kaolin and Bentonite.

Antimicrobials: Mechanism, classification, Potassium permanganate, Boric acid, Hydrogen peroxide*, Chlorinated lime*, Iodine and its preparations.

Unit-IV

08 Hours

Miscellaneous compounds

Expectorants: Potassium iodide, Ammonium chloride*.

Emetics: Copper sulphate*, Sodium potassium tartrate.

Hematinics: Ferrous sulphate*, Ferrous gluconate.

Poison and Antidote: Sodium thiosulphate*, Activated charcoal, Sodium nitrite³³³.

Astringents: Zinc Sulphate, Potash Alum.

Unit-V

07 Hours

Radiopharmaceuticals: Radio activity, measurement of radioactivity, properties of α , β , γ radiations, half-life, radio isotopes and study of radio isotopes- Sodium iodide I^{131} , storage conditions, precautions & pharmaceutical application of radioactive substances.

BP110P. PHARMACEUTICAL INORGANIC CHEMISTRY (Practical)

4 Hours / Week

I Limit tests for following ions

Limit test for Chlorides and Sulphates
Modified limit test for Chlorides and Sulphates
Limit test for Iron
Limit test for Heavy metals
Limit test for Lead
Limit test for Arsenic

II Identification test

Magnesium hydroxide
Ferrous sulphate
Sodium bicarbonate
Calcium gluconate
Copper sulphate

III Test for purity

Swelling power of Bentonite
Neutralizing capacity of aluminum hydroxide gel
Determination of potassium iodate and iodine in potassium Iodide

IV Preparation of inorganic pharmaceuticals

Boric acid
Potash alum
Ferrous sulphate

Recommended Books (Latest Editions)

- Pharmacopoeia of India, the Controller of Publications, Delhi.
- British Pharmacopoeia, Her Majesty's Stationary Office, University Press, Cambridge.
- United States Pharmacopoeia (National Formulary).
- Inorganic, Medicinal & Pharmaceutical Chemistry by Block J.H., Roche E., Soine, T. and Wilson, C., Lea & Febiger, Philadelphia.
- Bentley and Driver's Textbook of Pharmaceutical Chemistry by Atherden L.M., Oxford University Press, London.
- Inorganic Chemistry by Miessler, G.L. and Tarr, D.A., Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), New Delhi.
- Vogel's Qualitative Inorganic Analysis by Svehla, G. and Sivasankar, B. Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), New Delhi.

- Pharmaceutical Inorganic Chemistry by Rao K.S. and Suresh C.V., PharmaMed Press, Hyderabad.
- Pharmaceutical Inorganic Chemistry: Theory and Practice by Chenchu Lakshmi, N.V., Dorling Kindersley (India) Pvt. Ltd. (Pearson Education), New Delhi.
- Bentley and Driver's Textbook of Pharmaceutical Chemistry, Oxford University Press, New Delhi.
- Inorganic Pharmaceutical Chemistry by M.L. Schroff, National Book Centre, Kolkata.

BP105T. COMMUNICATION SKILLS (Theory)

30 Hours

Course content:

Unit-I

07 Hours

Communication Skills: Introduction, Definition, The Importance of Communication, the communication process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback, Context.

Barriers to communication: Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotional barriers.

Perspectives in communication: Introduction, Visual perception, Language, Other factors affecting our perspective - Past Experiences, Prejudices, Feelings, Environment.

Unit-II

07 Hours

Elements of communication: Introduction, Face to Face Communication - Tone of Voice, Body Language (Non-verbal communication), Verbal Communication, Physical Communication.

Communication styles: Introduction, The Communication Styles Matrix with example for each Direct communication style, Spirited Communication Style, Systematic Communication Style, Considerate Communication Style.

Unit-III

07 Hours

Basic listening skills: Introduction, Self-Awareness, Active Listening, Becoming an Active Listener, Listening in difficult situations.

Effective written communication: Introduction, When and When Not to Use Written Communication- Complexity of the Topic, Amount of Discussion Required, Shades of Meaning, Formal Communication.

Writing effectively: Subject Lines, Put the Main Point First, Know Your Audience, Organization of the Message.

Unit-IV

05 Hours

Interview skills: Purpose of an interview, Do's and Don'ts of an interview.

Giving presentations: Dealing with Fears, planning your Presentation, Structuring Your Presentation, Delivering Your Presentation, Techniques of Delivery.

Unit-V

04 Hours

Group discussion: Introduction, Communication skills in group discussion, Do's and Don'ts of group discussion.

BP111P. COMMUNICATION SKILLS (Practical)

2 Hours / Week

Course content:

The following learning modules are to be conducted using words worth[®] English language lab software.

Basic communication covering the following topics

Meeting People.
Asking Questions.
Making Friends.
What did you do?
Do's and Don'ts.

Pronunciations covering the following topics

Pronunciation (Consonant Sounds).
Pronunciation and Nouns.
Pronunciation (Vowel Sounds).

Advanced Learning

Listening Comprehension / Direct and Indirect Speech.
Figures of Speech.
Effective Communication.
Writing Skills.
Effective Writing. Interview
Handling Skills.
E-Mail etiquette. Presentation Skills.

Recommended Books: (Latest Edition)

- Basic Communication Skills for Technology, Andreja. J. Ruther Ford, 2nd Edition, Pearson Education, 2011.
- Communication Skills, Sanjay Kumar, Pushpalata, 1st Edition, Oxford Press, 2011.
- Organizational Behavior, Stephen P. Robbins, 1st Edition, Pearson, 2013.
- Brilliant- Communication Skills, Gill Hasson, 1st Edition, Pearson Life, 2011.
- The Ace of Soft Skills: Attitude, Communication and Etiquette for success, Gopala Swamy Ramesh, 5th Edition, Pearson, 2013.
- Developing Your Influencing Skills, Deborah Dalley, Lois Burton, Margaret, Green hall,

1st Edition Universe of Learning Ltd., 2010.

- Communication Skills for Professionals, Konar Nira, 2nd Edition, New arrivals, PHI, 2011.
- Personality Development and Soft Skills, Barun K Mitra, 1st Edition, Oxford Press, 2011.
- Soft Skill for Everyone, Butter Field, 1st Edition, Cengage Learning India Pvt. Ltd., 2011.
- Soft Skills and Professional Communication, Francis Peters S.J., 1st Edition, McGraw Hill Education, 2011.
- Effective Communication, John Adair, 4th Edition, Pan MacMillan, 2009.
- Bringing Out the Best in People, Aubrey Daniels, 2nd Edition, McGraw Hill, 1999.

BP106RBT. REMEDIAL BIOLOGY (Theory)

30 Hours

Course content:

Unit-I

07 Hours

Living world:

Definition and characters of living organisms.

Diversity in the living world.

Binomial nomenclature.

Five kingdoms of life and basis of classification. Salient features of Monera, Protista, Fungi, Animalia and Plantae, Virus.

Morphology of flowering plants

Morphology of different parts of flowering plants- Root, stem, inflorescence, flower, leaf, fruit, seed.

General Anatomy of Root, stem, leaf of monocotyledons & Dicotyledons.

Unit-II

07 Hours

Body fluids and circulation: Composition of blood, blood groups, coagulation of blood, Composition and functions of lymph, Human circulatory system, Structure of human heart and blood vessels, Cardiac cycle, cardiac output and ECG.

Digestion and absorption: Human alimentary canal and digestive glands, Role of digestive enzymes, Digestion, absorption and assimilation of digested food.

Breathing and respiration: Human respiratory system, Mechanism of breathing and its regulation, Exchange of gases, transport of gases and regulation of respiration, Respiratory volumes.

Unit-III

07 Hours

Excretory products and their elimination: Modes of excretion, Human excretory system-structure and function, Urine formation, Rennin angiotensin system.

Neural control and coordination: Definition and classification of nervous system, Structure of a neuron, Generation and conduction of nerve impulse, Structure of brain and spinal cord, Functions of cerebrum, cerebellum, hypothalamus and medulla oblongata.

Chemical coordination and regulation: Endocrine glands and their secretions, Functions of hormones secreted by endocrine glands

Human reproduction: Parts of female reproductive system, Parts of male reproductive system, Spermatogenesis and Oogenesis, Menstrual cycle.

Unit-IV

05 Hours

Plants and mineral nutrition: Essential mineral, macro and micronutrients, Nitrogen metabolism, Nitrogen cycle, biological nitrogen fixation

Photosynthesis: Autotrophic nutrition, photosynthesis, Photosynthetic pigments, Factors affecting photosynthesis.

Unit-V

04 Hours

Plant respiration: Respiration, glycolysis, fermentation (anaerobic).

Plant growth and development: Phases and rate of plant growth, Condition of growth, Introduction to plant growth regulators

Cell - The unit of life: Structure and functions of cell and cell organelles. Cell division

Tissues: Definition, types of tissues, location and functions.

BP112RBP. REMEDIAL BIOLOGY (Practical)

30 Hours

1. Introduction to experiments in biology.
 - a) Study of Microscope.
 - b) Section cutting techniques.
 - c) Mounting and staining.
 - d) Permanent slide preparation.
2. Study of cell and its inclusions.
3. Study of Stem, Root, Leaf, seed, fruit, flower and their modifications.
4. Detailed study of frog by using computer models.
5. Microscopic study and identification of tissues pertinent to Stem, Root, Leaf, seed, fruit and flower.
6. Identification of bones.
7. Determination of blood group.
8. Determination of blood pressure.
9. Determination of tidal volume.

Textbooks:

- Textbook of Biology by S. B. Gokhale.
- A Textbook of Biology by Dr. Thulajappa and Dr. Seetaram.

Reference Books:

- A Textbook of Biology by B.V. Sreenivasa Naidu.
- A Textbook of Biology by Naidu and Murthy.
- Botany for Degree Students by A.C. Dutta.
- Outlines of Zoology by M. Ekambaranatha Ayyer and T.N. Ananthakrishnan.
- A Manual for Pharmaceutical Biology Practical by S.B. Gokhale and C.K. Kokate.

Recommended Books (Latest Edition):

- Practical Human Anatomy and Physiology by S.R. Kale and R.R. Kale.
- A Manual of Pharmaceutical Biology Practical by S.B. Gokhale, C.K. Kokate and S.P. Shrivastava.
- Biology Practical Manual According to National Core Curriculum Biology Forum of Karnataka by Prof. M.J.H. Shafi.

BP106RMT. REMEDIAL MATHEMATICS (Theory)

30 Hours

Course Content:

Unit-I

06 Hours

Partial fraction: Introduction, Polynomial, Rational fractions, Proper and Improper fractions, Partial fraction, Resolving into Partial fraction, Application of Partial Fraction in Chemical Kinetics and Pharmacokinetics.

Logarithms: Introduction, Definition, Theorems/Properties of logarithms, Common logarithms, Characteristic and Mantissa, worked examples, application of logarithm to solve pharmaceutical problems.

Function: Real Valued function, Classification of real valued functions.

Limits and continuity: Introduction, Limit of a function, Definition of limit of a function ($\epsilon - \delta$

definition), $\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a} = na^{n-1}$, $\lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} = 1$,

$$\lim_{x \rightarrow a} \frac{x^n - a^n}{x - a} = na^{n-1}$$

$$\lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta} = 1$$

Unit-II

06 Hours

Matrices and Determinant:

Introduction matrices, Types of matrices, Operation on matrices, Transpose of a matrix, Matrix Multiplication, Determinants, Properties of determinants, Product of determinants, Minors and co-Factors, Adjoint or adjugate of a square matrix, Singular and non-singular matrices, Inverse of a matrix, Solution of system of linear equations using matrix method, Cramer's rule, Characteristic equation and roots of a square matrix, Cayley-Hamilton theorem, Application of Matrices in solving Pharmacokinetic equations.

Unit-III

06 Hours

Calculus Differentiation : Introductions, Derivative of a function, Derivative of a constant, Derivative of a product of a constant and a function, Derivative of the sum or difference of two functions, Derivative of the product of two functions (product formula), Derivative of the quotient of two functions (Quotient formula) – **Without Proof**, Derivative of x^n w.r.t.x, where n is any rational number, Derivative of e^x , Derivative of $\log_e x$, Derivative of a^x , Derivative of trigonometric functions from first principles (**without Proof**), Successive Differentiation, Conditions for a function to be a maximum or a minimum at a point. Application.

Unit-IV

06 Hours

Analytical Geometry

Introduction: Signs of the Coordinates, Distance formula.

Straight Line: Slope or gradient of a straight line, Conditions for parallelism and perpendicularity of two lines, Slope of a line joining two points, Slope – intercept form of a straight line.

Integration: Introduction, Definition, Standard formulae, Rules of integration, Method of substitution, Method of Partial fractions, Integration by parts, definite integrals, application.

Unit-V

06 Hours

Differential Equations: Some basic definitions, Order and degree, Equations in separable form, Homogeneous equations, Linear Differential equations, Exact equations, Application in solving Pharmacokinetic equations.

Laplace Transform: Introduction, Definition, Properties of Laplace transform, Laplace Transforms of elementary functions, Inverse Laplace transforms, Laplace transform of derivatives, Application to solve Linear differential equations, Application in solving chemical kinetics and Pharmacokinetics equations.

Recommended Books (Latest Edition)

- Differential Calculus by Shanthinarayan.
- Pharmaceutical Mathematics with Application to Pharmacy by Panchaksharappa Gowda D.H.
- Integral Calculus by Shanthinarayan.
- Higher Engineering Mathematics by Dr. B.S. Grewal.

Semester II

BP201T. HUMAN ANATOMY AND PHYSIOLOGY-II (Theory)

45 Hours

Course Content:

Unit-I

10 hours

Nervous system

Organization of nervous system, neuron, neuroglia, classification and properties of nerve fiber, electrophysiology, action potential, nerve impulse, receptors, synapse, neurotransmitters.

Central nervous system: Meninges, ventricles of brain and cerebrospinal fluid. Structure and functions of brain (cerebrum, brain stem, cerebellum), spinal cord (gross structure, functions of afferent and efferent nerve tracts, reflex activity).

Unit II

06 hours

Digestive system: Anatomy of GI Tract with special reference to anatomy and functions of stomach, (Acid production in the stomach, regulation of acid production through parasympathetic nervous system, pepsin role in protein digestion) small intestine and large intestine, anatomy and functions of salivary glands, pancreas and liver, movements of GIT, digestion and absorption of nutrients and disorders of GIT.

Energetics: Formation and role of ATP, Creatinine Phosphate and BMR.

Unit-III

10 hours

Respiratory system

Anatomy of respiratory system with special reference to anatomy of lungs, mechanism of respiration, regulation of respiration.

Lung Volumes and capacities transport of respiratory gases, artificial respiration, and resuscitation methods.

Urinary system: Anatomy of urinary tract with special reference to anatomy of kidney and nephrons, functions of kidney and urinary tract, physiology of urine formation, micturition reflex and role of kidneys in acid base balance, role of RAS in kidney and disorders of kidney.

Unit-IV

10 hours

Endocrine system: Classification of hormones, mechanism of hormone action, structure and functions of pituitary gland, thyroid gland, parathyroid gland, adrenal gland, pancreas, pineal gland, thymus and their disorders.

Unit-V

09 hours

Reproductive system: Anatomy of male and female reproductive system, Functions of male and female reproductive system, sex hormones, physiology of menstruation, fertilization, spermatogenesis, oogenesis, pregnancy and parturition.

Introduction to genetics: Chromosomes, genes and DNA, protein synthesis, genetic pattern of inheritance.

BP207P. HUMAN ANATOMY AND PHYSIOLOGY-II (Practical)

4 Hours/week

1. To study the integumentary and special senses using specimen, models, etc.
2. To study the nervous system using specimen, models, etc.
3. To study the endocrine system using specimen, models, etc.
4. To demonstrate the general neurological examination.
5. To demonstrate the function of olfactory nerve.
6. To examine the different types of taste.
7. To demonstrate the visual acuity.
8. To demonstrate the reflex activity.
9. Recording of body temperature.
10. To demonstrate positive and negative feedback mechanism.
11. Determination of tidal volume and vital capacity.
12. Study of digestive, respiratory, cardiovascular systems, urinary and reproductive systems with the help of models, charts and specimens.
13. Recording of basal mass index.
14. Study of family planning devices and pregnancy diagnosis test.
15. Demonstration of total blood count by cell analyzer.
16. Permanent slides of vital organs and gonads.

Recommended Books (Latest Editions)

- Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York.
- Best and Taylor's Physiological Basis of Medical Practice by Best, Charles Herbert, Taylor, Norman Burke, John Bernard, 12th edition; William and Wilkins, Baltimore.
- Textbook of Medical Physiology by Arthur C, Guyton and John. E. Hall. Miamisburg, Ohio, U.S.A.
- Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.
- Pharmacotherapy- A Pathophysiological Approach by Dipiro J.L., Elsevier, Amsterdam.
- Human Anatomy, Regional & Applied Part I, II & III by Chaurasia B.D, CBS Publishers & Distributors, New Delhi.
- Anatomy and Physiology in Health and Illness by Ross and Wilson, Churchill Livingstone, London.
- Essentials of Anatomy and Physiology by Seeley R.R., Stephens T.D. and Tate, P., McGraw-Hill, New York.
- Human Physiology, Volume 1 and 2 by Dr. C.C. Chatterjee, Academic Publishers Kolkata.

BP202T. PHARMACEUTICAL ORGANIC CHEMISTRY-I (Theory)

45 Hours

Course Content:

General methods of preparation and reactions of compounds superscripted with asterisk (*) to be explained. To emphasize on definition, types, classification, principles/mechanisms, applications, examples and differences.

Unit-I

07 Hours

Classification, Nomenclature and Isomerism: Classification of Organic Compounds, Common and IUPAC systems of nomenclature of organic compounds (up to 10 Carbons open chain and carbocyclic compounds). Structural isomerism in organic compounds.

Unit II

10 Hours

Alkanes*, Alkenes* and Conjugated dienes*

sp^3 hybridization in alkanes, Halogenation of alkanes, uses of paraffins. Stabilities of alkenes, sp^2 hybridization in alkenes.

E_1 and E_2 reactions – Kinetics, order of reactivity of alkyl halides, rearrangement of carbocations, Saytzeff's orientation and evidences. E_1 versus E_2 reactions, Factors affecting E_1 and E_2 reactions. Ozonolysis, electrophilic addition reactions of alkenes, Markownikoff's orientation, free radical addition reactions of alkenes, Anti-Markownikoff's orientation.

Stability of conjugated dienes, Diel-Alder, electrophilic addition, free radical addition reactions of conjugated dienes, allylic rearrangement.

Unit III

10 Hours

Alkyl halides*

SN_1 and SN_2 reactions - kinetics, order of reactivity of alkyl halides, stereochemistry and rearrangement of carbocations. SN_1 versus SN_2 reactions, Factors affecting SN_1 and SN_2 reactions.

Structure and uses of ethyl chloride, chloroform, trichloroethylene, tetrachloroethylene, dichloromethane, tetrachloromethane and iodoform.

Alcohols*- Qualitative tests, Structure and uses of Ethyl alcohol, Methyl alcohol, chlorobutanol, Cetosteryl alcohol, Benzyl alcohol, Glycerol, Propylene glycol.

Unit-IV**10 Hours****Carbonyl compounds* (Aldehydes and ketones)**

Nucleophilic addition, Electromeric effect, aldol condensation, Crossed Aldol condensation, Cannizzaro reaction, Crossed Cannizzaro reaction, Benzoin condensation, Perkin condensation, qualitative tests, Structure and uses of Formaldehyde, Paraldehyde, Acetone, Chloral hydrate, Hexamine, Benzaldehyde, Vanillin, Cinnamaldehyde.

Unit-V**08 Hours**

Carboxylic acids*: Acidity of carboxylic acids, effect of substituents on acidity, inductive effect and qualitative tests for carboxylic acids, amide and ester. Structure and Uses of Acetic acid, Lactic acid, Tartaric acid, Citric acid, Succinic acid. Oxalic acid, Salicylic acid, Benzoic acid, Benzyl benzoate, Dimethyl phthalate, Methyl salicylate and Acetyl salicylic acid.

Aliphatic amines*: Basicity, effect of substituent on Basicity. Qualitative test, Structure and uses of Ethanolamine, Ethylenediamine, Amphetamine.

BP208P. PHARMACEUTICAL ORGANIC CHEMISTRY-I (Practical)

4 Hours / week

- A. Systematic qualitative analysis of unknown organic compounds like
1. Preliminary test: Color, odor, aliphatic/aromatic compounds, saturation and unsaturation, etc.
 2. Detection of elements like Nitrogen, Sulphur and Halogen by Lassaigne's test.
 3. Solubility test.
 4. Functional group test like Phenols, Amides/Urea, Carbohydrates, Amines, Carboxylic acids, Aldehydes and Ketones, Alcohols, Esters, Aromatic and Halogenated Hydrocarbons, Nitro compounds and Anilides.
 5. Melting point/Boiling point of organic compounds.
 6. Identification of the unknown compound from the literature using melting point/boiling point.
 7. Preparation of the derivatives and confirmation of the unknown compound by melting point/boiling point.
 8. Minimum 5 unknown organic compounds to be analyzed systematically.
- B. Preparation of suitable solid derivatives from organic compounds.
- C. Construction of molecular models.

Recommended Books (Latest Editions)

- Organic Chemistry by Morrison R.T., Boyd R.N. and Bhattacharjee, S.K., Dorling Kindersley (India) Pvt. Ltd. (Pearson Education Ltd.), New Delhi.
- Organic Chemistry by I.L. Finar, Volume-I, Pearson Education Ltd, New Delhi.
- Organic Chemistry by Bruice P.Y. and Prasad, K.J.R., Dorling Kindersley (India) Pvt. Ltd, New Delhi.
- A Guidebook to Mechanism in Organic Chemistry by Peter Sykes, Longman Group Ltd., Noida.
- Strategic Applications of Named Reactions in Organic Chemistry by Laszlo Kurti and Barbara Czako, Elsevier Academic Press.
- Reaction and Reaction Mechanism by Ahluwalia/Chatwal, Narosa Publishing House, New Delhi.
- Organic Chemistry by Jain M.K., Sohan Lal Nagin Chand & Co, New Delhi.
- Elementary Practical Organic Chemistry by Vogel A.I., Dorling Kindersley (India) Pvt. Ltd. (Pearson Education Ltd.), New Delhi.
- Practical Organic Chemistry by Mann F.G, and Saunders, B.C., Dorling Kindersley (India) Pvt. Ltd. (Pearson Education Ltd.), New Delhi.
- Advanced Practical Organic Chemistry by N.K. Vishnoi, Vikas Publishing House Pvt. Ltd., Noida.
- Introduction to Organic Laboratory Techniques by Pavia, Lampman and Kriz, Cengage Learning, Delhi.

BP203T. BIOCHEMISTRY (Theory)

45 Hours

Course Content:

Unit-I

08 Hours

Biomolecules: Introduction, classification, chemical nature and biological role of carbohydrate, lipids, nucleic acids, amino acids and proteins.

Bioenergetics: Concept of free energy, endergonic and exergonic reaction, Relationship between free energy, enthalpy and entropy; Redox potential.

Energy rich compounds; classification; biological significances of ATP and cyclic AMP.

Unit-II

10 Hours

Carbohydrate metabolism:

Glycolysis- Pathway, energetics and significance.

Gluconeogenesis- Pathway and its significance.

Citric acid cycle- Pathway, energetics and significance.

HMP shunt and its significance- Glucose-6-Phosphate dehydrogenase (G6PD) deficiency.

Glycogen metabolism Pathways and glycogen storage diseases (GSD).

Hormonal regulation of blood glucose level and Diabetes mellitus.

Biological oxidation:

Electron transport chain (ETC) and its mechanism.

Oxidative phosphorylation & its mechanism and substrate level phosphorylation.

Inhibitors ETC and oxidative phosphorylation/Uncouplers.

Unit-III

10 Hours

Lipid metabolism: β -Oxidation of saturated fatty acid (Palmitic acid). Formation and utilization of ketone bodies; ketoacidosis. De novo synthesis of fatty acids (Palmitic acid).

Biological significance of cholesterol and conversion of cholesterol into bile acids, steroid hormone and vitamin D.

Disorders of lipid metabolism: Hypercholesterolemia, atherosclerosis, fatty liver and obesity.

Amino acid metabolism: General reactions of amino acid metabolism.

Transamination, deamination and decarboxylation, Urea cycle and its disorders.

Catabolism of phenylalanine and tyrosine and their metabolic disorders (Phenylketonuria, Albinism, Alkaptonuria, Tyrosinemia).

Synthesis and significance of biological substances: 5-HT, melatonin, dopamine, noradrenaline, adrenaline.

Catabolism of heme; hyperbilirubinemia and jaundice.

Unit-IV**10 Hours****Nucleic acid metabolism and genetic information transfer**

Biosynthesis of purine and pyrimidine nucleotides.

Catabolism of purine nucleotides and Hyperuricemia and Gout disease.

Organization of mammalian genome.

Structure of DNA and RNA and their functions DNA replication (semi conservative model)

Transcription or RNA synthesis.

Genetic code, Translation or Protein synthesis and inhibitors.

07 Hours**Enzymes**

Introduction, properties, nomenclature and IUBMB classification of enzymes.

Enzyme kinetics (Michaelis-Menten plot, Line-Weaver Burke plot) Enzyme inhibitors with examples.

Regulation of enzymes: enzyme induction and repression, allosteric enzymes regulation.

Coenzymes: Structure and biochemical functions.

Therapeutic and diagnostic applications of enzymes and isoenzymes.

BP209P. BIOCHEMISTRY (Practical)

4 Hours / Week

1. Qualitative analysis of carbohydrates (Glucose, Fructose, Lactose, Maltose, Sucrose and starch).
2. Identification tests for Proteins (Albumin and Casein).
3. Quantitative analysis of reducing sugars (DNSA method) and Proteins (Biuret method).
4. Qualitative analysis of urine for abnormal constituents.
5. Determination of blood creatinine.
6. Determination of blood sugar.
7. Determination of serum total cholesterol.
8. Preparation of buffer solution and measurement of pH.
9. Study of enzymatic hydrolysis of starch.
10. Determination of Salivary amylase activity.
11. Study the effect of Temperature on Salivary amylase activity.
12. Study the effect of substrate concentration on salivary amylase activity.

Recommended Books (Latest Editions)

- Harper's Illustrated Biochemistry by Murray R.K. and Granner D.K., Lange Medical Publication.
- Lehninger Principles of Biochemistry by Nelson D.L. and Cox M.M., Macmillan Worth Publishers.
- Fundamentals of Biochemistry by Voet D., Voet J.G., Pratt C.W., John Wiley and Sons Inc.
- Lippincott's Illustrative Reviews: Biochemistry by Champe P.C., Harvey R.A., Ferrier D.R., Lippincott Williams and Wilkins.
- Principles and Techniques of Biochemistry and Molecular Biology- by Wilson K. and Walker J., Cambridge University Press.
- Bioorganic Chemistry: A Chemical Approach to Enzyme Action by Dugas H., Springer (India) Private Limited, New Delhi.
- Molecular Cell Biology by Lodish H., Berk A., Matsudaira P., Kaiser C.A., Krieger M. and Scott M.P., W. H. Freeman and Company, New York.
- Introduction of Practical Biochemistry by David T. Plummer. (3rd Edition), McGraw Hill, New Delhi.
- Outline of Biochemistry by Conn E.E. and Stumph P.K., John Wiley & Sons, New York.

- Biochemistry by Stryer L. and Berg J.M., W.H. Freeman and Company, New York.
- Textbook of Biochemistry by Harrow B. and Mazur A., W.B. Saunders Co., Philadelphia.
- Practical Biochemistry by Harold Varley. CBS Publishers and Distributors. New Delhi.
- Practical Biochemistry for Medical students by Rajagopal and Ramakrishna.
- Laboratory Manual in Biochemistry by Jayaraman J., Wiley Eastern Limited.
- Practical Manual to Biochemistry by Singh S.P., CBS Publisher, New Delhi.
- Modern Experimental Biochemistry by Boyer R.F., Dorling Kindersley (India) Pvt. Ltd.
- Comprehensive Viva and Practical Biochemistry by Deb A.C., New Centre Book Agency (P.) Ltd. London.
- Pharmaceutical Biochemistry by Vyas S.P. and Kohli D.V., CBS Publishers & Distributors, New Delhi.

BP204T. PATHOPHYSIOLOGY (THEORY)

45Hours

Course content:

Unit-I

10 Hours

Basic principles of Cell injury and Adaptation:

Introduction, definitions, Homeostasis, Components and Types of Feedback systems, Causes of cellular injury, Pathogenesis (Cell membrane damage, Mitochondrial damage, Ribosome damage, Nuclear damage), Morphology of cell injury – Adaptive changes (Atrophy, Hypertrophy, hyperplasia, Metaplasia, Dysplasia), Cell swelling, Intra cellular accumulation, Calcification, Enzyme leakage and Cell Death Acidosis & Alkalosis, Electrolyte imbalance.

Basic mechanism involved in the process of inflammation and repair:

Introduction, Clinical signs of inflammation, Different types of Inflammation, Mechanism of Inflammation – Alteration in vascular permeability and blood flow, migration of WBC's, Mediators of inflammation, Basic principles of wound healing in the skin, Pathophysiology of Atherosclerosis.

Unit-II

10Hours

Cardiovascular System:

Hypertension, congestive heart failure, ischemic heart disease (angina, myocardial infarction, atherosclerosis and arteriosclerosis)

Respiratory system: Asthma, Chronic obstructive airways diseases.

Renal system: Acute and chronic renal failure.

Unit-III

10Hours

Hematological Diseases:

Iron deficiency, megaloblastic anemia (Vitamin B12 and folic acid), sickle cell anemia, thalassemia, hereditary acquired anemia, hemophilia.

Endocrine system: Diabetes, thyroid diseases, disorders of sex hormones.

Nervous system: Epilepsy, Parkinson's disease, stroke, psychiatric disorders: depression, schizophrenia and Alzheimer's disease.

Gastrointestinal system: Peptic Ulcer.

Unit-IV

8 Hours

Inflammatory bowel diseases, jaundice, hepatitis (A, B, C, D, E, F) alcoholic liver disease.

Disease of bones and joints: Rheumatoid arthritis, osteoporosis and gout.

Principles of cancer: classification, etiology and pathogenesis of cancer.

Unit-V**7 Hours****Infectious diseases:** Meningitis, Typhoid, Leprosy, Tuberculosis, Urinary tract infections.**Sexually transmitted diseases:** AIDS, Syphilis, Gonorrhea.**Recommended Books (Latest Editions)**

- Robbins & Cotran Pathologic Basis of Disease by Vinay Kumar, Abul K. Abas, Jon C. Aster; South Asia edition; India; Elsevier.
- Text book of Pathology by Harsh Mohan; 6th edition; India; Jaypee Publications.
- Goodman Gilman's The Pharmacological Basis of Therapeutics by Laurence B, Bruce C., Bjorn K. 12th edition; McGraw-Hill, New York.
- Best and Taylor's Physiological Basis of Medical Practice by Best, Charles Herbert, Taylor, Norman Burke, John Bernard, 12th edition; United States; William and Wilkins, Baltimore.
- Davidson's Principles and Practice of Medicine by Nicki R. College, Brian R. Walker, Stuart H. Ralston, 21st edition; London; ELBS/Churchill Livingstone.
- Textbook of Medical Physiology by Guyton A, John. E Hall; 12th edition; WB Saunders Company.
- Pharmacotherapy by Joseph DiPiro, Robert L. Talbert, Gary Yee, Barbara Wells, L. Michael Posey, A Pathophysiological Approach; 9th edition; London; McGraw Hill Medical.
- Basic Pathology by V. Kumar, R. S. Cotran and S. L. Robbins, 6th edition; Philadelphia; WB Saunders Company.
- Clinical Pharmacy and Therapeutics by Roger Walker, Clive Edwards, 3rd edition; London; Churchill Livingstone Publication.

Recommended Journals

- The Journal of Pathology. ISSN: 1096-9896 (Online).
- The American Journal of Pathology. ISSN: 0002-9440.
- Pathology. 1465-3931 (Online).
- International Journal of Physiology, Pathophysiology and Pharmacology, ISSN: 1944-8171.
- Indian Journal of Pathology and Microbiology. ISSN-0377-4929.

BP205T. COMPUTER APPLICATIONS IN PHARMACY (Theory)

30 Hours (2 Hours/Week)

Course content:

Unit-I

06 hours

Number system: Binary number system, Decimal number system, Octal number system, Hexadecimal number systems, conversion decimal to binary, binary to decimal, octal to binary, binary addition, binary subtraction – One's complement, Two's complement method, binary multiplication, binary division.

Concept of Information Systems and Software: Information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project.

Unit-II

06 hours

Web technologies: Introduction to HTML, XML, CSS and Programming languages, introduction to web servers and Server Products.

Introduction to databases, MYSQL, MS ACCESS, Pharmacy Drug database.

Unit-III

06 hours

Application of computers in Pharmacy – Drug information storage and retrieval, Pharmacokinetics, Mathematical model in Drug design, Hospital and Clinical Pharmacy, Electronic Prescribing and discharge (EP) systems, barcode medicine identification and automated dispensing of drugs, mobile technology and adherence monitoring.

Diagnostic system. Lab-diagnostic System, Patient Monitoring System, Pharma Information System.

Unit-IV

06 hours

Bioinformatics: Introduction, Objective of Bioinformatics, Bioinformatics Databases, Concept of Bioinformatics, Impact of Bioinformatics in Vaccine Discovery.

Unit-V

06 hours

Computers as data analysis in Preclinical development:

Chromatographic data analysis (CDS), Laboratory Information management System (LIMS) and Text Information Management System (TIMS).

BP210P. COMPUTER APPLICATIONS IN PHARMACY (Practical)

1. Design a questionnaire using a word processing package to gather information about a particular disease.
2. Create a HTML web page to show personal information.
3. Retrieve the information of a drug and its adverse effects using online tools.
4. Creating mailing labels Using Label Wizard, generating label in MS WORD.
5. Create a database in MS Access to store the patient information with the required fields using access.
6. Design a form in MS Access to view, add, delete and modify the patient record in the database.
7. Generating report and printing the report from patient database.
8. Creating invoice table using – MS Access.
9. Drug information storage and retrieval using MS Access.
10. Creating and working with queries in MS Access.
11. Exporting Tables, Queries, Forms and Reports to web pages.
12. Exporting Tables, Queries, Forms and Reports to XML pages.

Recommended books (Latest edition):

- Computer Application in Pharmacy by William E. Fassett, Lea and Febiger, South Washington Square, USA, (215) 922-1330.
- Computer Application in Pharmaceutical Research and Development by Sean Ekins, Wiley-Interscience, A John Willey and Sons, INC., Publication, USA.
- Bioinformatics (Concept, Skills and Applications) by S.C. Rastogi, CBS Publishers and Distributors, 4596/1- A, 11 Darya Gani, New Delhi.
- Microsoft office Access - 2003, Application Development Using VBA, SQL Server, DAP and Infopath by Cary N. Prague – Wiley Dreamtech India (P) Ltd., New Delhi.

BP206T. ENVIRONMENTAL SCIENCES (Theory)

30 hours

Course content:

Unit-I

10hours

The multidisciplinary nature of environmental studies.

Natural Resources.

Renewable and non-renewable resources: Natural resources and associated problems

a) Forest resources; b) Water resources; c) Mineral resources; d) Food resources; e) Energy resources; f) Land resources: Role of an individual in conservation of natural resources.

Unit-II

10hours

Ecosystems

Concept of an ecosystem.

Structure and function of an ecosystem.

Introduction, types, characteristic features, structure and function of the ecosystems: Forest ecosystem; Grassland ecosystem; Desert ecosystem; Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

Unit-III

10hours

Environmental Pollution: Air pollution; Water pollution; Soil pollution

Recommended Books (Latest edition):

- Environmental Science by Singh, Y.K., New Age International Pvt. Publishers, Bangalore.
- Environmental Biology by Agarwal, K.C., 2001, Nidi Publ. Ltd. Bikaner.
- The Biodiversity of India by Bharucha Erach, Mapin Publishing Pvt. Ltd., Ahmedabad, India.
- Hazardous Waste Incineration by Brunner R.C., 1989, McGraw Hill Inc.
- Marine Pollution by Clark R.S., Clanderson Press Oxford.
- Environmental Encyclopedia, by Cunningham, W.P. Cooper, T.H., Gorhani, E. & Hepworth, M.T., Jaico Pub. House, Mumbai.
- Environmental Chemistry by De A.K., Wiley Eastern Ltd.
- Down of Earth, Centre for Science and Environment, Editor Sunita Narain.