

MAULANA ABUL KALAM AZAD UNIVERSITY OF
TECHNOLOGY
KOLKATA (Formerly known as WBUT, Kolkata)

Syllabus for the Bachelor of Pharmacy (B. Pharm) Course

Draft

[Framed under Regulation 6, 7 & 8 of the Bachelor of Pharmacy
(B. Pharm) course regulations 2014]

1. Course of study (Presently it is for B.Pharm. 1st year only)

The course of study for B. Pharm.1st year shall include Semester Wise Theory & Practical as given in Table – I to II. The number of hours to be devoted to each theory, tutorial and practical course in any semester shall not be less than that shown in Table-I to II.

Table-I: Course of study for semester I

Course code	Name of the course	No. of hours	Tutorial	Full Marks	Credit points
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THEORY

PT105	Human Anatomy and Physiology I– Theory	3	1	100	4
PT101	Pharmaceutical Analysis I – Theory	3	1	100	4
PT106	Pharmaceutics I – Theory	3	1	100	4
PT103	Pharmaceutical Inorganic Chemistry – Theory	3	1	100	4

PRACTICAL

PT191	Pharmaceutical Analysis I – Practical	4	-	100	2
PT196	Pharmaceutics I – Practical	4	-	100	2
PT193	Pharmaceutical Inorganic Chemistry – Practical	4	-	100	2
PT103	Pharmaceutical Inorganic Chemistry – Theory	4	-	100	2

SESSIONAL

HU181	Communication skills – Theory	2	-	100	2
PTB184/ M183	Remedial Biology/ Remedial Mathematics – Theory	2	-	100	2
HU182	Communication skills – Practical	2	-	100	1
PTB185	Remedial Biology – Practical	2	-	100	1
	TOTAL	36	4		30

The students who have studied Mathematics / Physics / Chemistry at HSC will be appearing for Remedial Biology course.

The students who have studied Physics / Chemistry / Biology (Botany / Zoology) at HSC will be appearing for Remedial Mathematics course.

* Non University Exam

SYLLABUS

Semester I

PT105. HUMAN ANATOMY AND PHYSIOLOGY-I (Theory)

Theory

45 Hours

Scope: This subject is designed to impart fundamental knowledge on the structure and functions of the various systems of the human body. It also helps in understanding both homeostatic mechanisms. The subject provides the basic knowledge required to understand the various disciplines of pharmacy.

Objectives: Upon completion of this course the student should be able to

1. Explain the gross morphology, structure and functions of various organs of the human body.
2. Describe the various homeostatic mechanisms and their imbalances.
3. Identify the various tissues and organs of different systems of human body.
4. Perform the various experiments related to special senses and nervous system.
5. Appreciate coordinated working pattern of different organs of each system

Course Content

UNIT-I

10hours

1. 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.

2. 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

3. Tissue level of organization

Classification of tissues, structure, location and functions of epithelial, muscular and nervous and connective tissues.

UNIT II

10 hours

4. Integumentary system

Structure and functions of skin

5. 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

6. Joints

Structural and functional classification, types of joints movements and its articulation

UNIT III

10 hours

7. 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, Reticuloendothelial system.

8. Lymphatic system

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

UNIT IV

8 hours

9. 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.

10. Special senses

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

UNIT-V

7 hours

11. 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 heart beat, its regulation by autonomic nervous system, cardiac output, cardiac cycle. Regulation of blood pressure, pulse, electrocardiogram and disorders of heart.

PT195. HUMAN ANATOMY AND PHYSIOLOGY (Practical)

Practical

4 Hours/week

Practical physiology is complimentary to the theoretical discussions in physiology. Practicals allow the verification of physiological processes discussed in theory classes through experiments on living tissue, intact animals or normal human beings. This is helpful for developing an insight on the subject.

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)

1. Essentials of Medical Physiology by K. Sembulingam and P. Sembulingam. Jaypee brothers medical publishers, New Delhi.
2. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, New York
3. Physiological basis of Medical Practice-Best and Taylor. Williams & Wilkins Co, Riverview, MIUSA
4. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.
5. Principles of Anatomy and Physiology by Tortora Grabowski. Palmetto, GA, U.S.A.
6. Textbook of Human Histology by Inderbir Singh, Jaypee brother's medical publishers, New Delhi.
7. Textbook of Practical Physiology by C.L. Ghai, Jaypee brother's medical publishers, New Delhi.
8. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother's medical publishers, New Delhi.

Reference Books (Latest Editions)

1. Physiological basis of Medical Practice-Best and Taylor. Williams & Wilkins Co, Riverview, MI USA
2. Text book of Medical Physiology- Arthur C, Guyton and John. E. Hall. Miamisburg, OH, U.S.A.
3. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterjee, Academic Publishers Kolkata

PT101. PHARMACEUTICAL ANALYSIS (Theory)

45 Hours

Scope: This course deals with the fundamentals of analytical chemistry and principles of electrochemical analysis of drugs

Objectives: Upon completion of the course student shall be able to

- understand the principles of volumetric and electro chemical analysis
- carryout various volumetric and electrochemical titrations
- develop analytical skills

Course Content

UNIT-I

10Hours

1(a) Pharmaceutical analysis

- (i) Definition and scope;
- (ii) Different techniques of analysis;
- (iii) Methods of expressing concentration;
- (iv) Primary and secondary standards;
- (v) 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.

1(b) Errors: Sources of errors, types of errors, methods of minimizing errors, accuracy, precision and significant figures

1(c) Pharmacopoeia, Sources of impurities in medicinal agents, limit tests.

UNIT-II

10Hours

2. 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

3. Non aqueous titration

Solvents, acidimetry and alkalimetry titration and estimation of Sodium benzoate and Ephedrine HCl

UNIT-III

10Hours

4. Precipitation titrations

Mohr's method, Volhard's, Modified Volhard's, Fajans method, estimation of sodium chloride.

5. Complexometric titration

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

6. Gravimetry

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

7. Diazotization titration

Basic principles, methods and application of diazotization titration.

UNIT-IV

08 Hours

8. Redox titrations

- (a) Concepts of oxidation and reduction,
- (b) Types of redox titrations (Principles and applications): Cerimetry, Iodimetry, Iodometry, Bromatometry, Dichrometry, Titration with potassium iodate.

UNIT-V

07Hours

Electrochemical methods of analysis

9. Conductometry

Introduction, Conductivity cell, Conductometric titrations, applications.

10. 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.

11. Polarography

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

PT191. PHARMACEUTICAL ANALYSIS (Practical)

4 Hours / Week

1. Limit Test of the following: (i) Chloride, (ii) Sulphate, (iii) Iron, (iv) Arsenic

2. Preparation and standardization of: (i) Sodium hydroxide, (ii) Sulphuric acid, (iii) Sodium thiosulfate, (iv) Potassium permanganate, (v) Ceric ammonium sulphate

3. Assay of the following compounds along with Standardization of Titrant

- (i) Ammonium chloride by acid base titration
- (ii) Ferrous sulphate by Cerimetry
- (iii) Copper sulphate by Iodometry
- (iv) Calcium gluconate by complexometry
- (v) Hydrogen peroxide by Permanganometry
- (vi) Sodium benzoate by non-aqueous titration
- (vii) Sodium Chloride by precipitation titration

4. Determination of Normality by electro-analytical methods

- (i) Conductometric titration of strong acid against strong base
- (ii) Conductometric titration of strong acid and weak acid against strongbase
- (iii) Potentiometric titration of strong acid against strongbase

Recommended Books: (Latest Editions)

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. John H. Kennedy, Analytical chemistry principles
6. Indian Pharmacopoeia.

PT106. PHARMACEUTICS - I (Theory)

45 Hours

Scope: This course is designed to impart a fundamental knowledge on the preparatory pharmacy with arts and science of preparing the different conventional dosage forms.

Objectives: Upon completion of this course the student should be able to:

- Know the history of profession of pharmacy
- Understand the basics of different dosage forms, pharmaceutical incompatibilities and pharmaceutical calculations
- Understand the professional way of handling the prescription
- Preparation of various conventional dosage forms

Course Content

UNIT-I

10Hours

1. 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.

2. Dosage forms

Introduction to dosage forms, classification and definitions

3. Prescription

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

4. Posology

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

UNIT-II

10Hours

5. Pharmaceutical calculations

Weights and measures – Imperial & Metric system, Calculations involving percentage solutions, alligation, proof spirit and isotonic solutions based on freezing point depression and molecular weight method.

6. Powders

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

7. Liquid dosage forms

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

UNIT-III

08Hours

8. Monophasic liquids

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

9. Biphasic liquids: Suspensions

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

10. Biphasic liquids: Emulsions

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

UNIT-IV

08Hours

11. Suppositories

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

12. Pharmaceutical incompatibilities

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

UNIT-V

07Hours

13. 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 dosage forms

PT196 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) Terpin Hydrate Linctus IP'66, (b) Iodine Throat Paint (Mandles 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) Aluminium 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 methylsalicylate, (c) Carbopol gel
10. **Gargles and Mouthwashes:** (a) Iodine gargle, (b) Chlorhexidine mouthwash

Recommended Books: (Latest Editions)

1. H.C. Ansel et al., Pharmaceutical Dosage Form and Drug Delivery System, Lippincott Williams and Walkins, New Delhi.
2. Carter S.J., Cooper and Gunn's-Dispensing for Pharmaceutical Students, CBS publishers, New Delhi.
3. M.E. Aulton, Pharmaceutics, The Science & Dosage Form Design, Churchill Livingstone, Edinburgh.
4. Indian pharmacopoeia.
5. British pharmacopoeia.
6. Lachmann. Theory and Practice of Industrial Pharmacy, Lea & Febiger Publisher, The University of Michigan.
7. Alfonso R. Gennaro Remington. The Science and Practice of Pharmacy, Lippincott Williams, New Delhi.
8. Carter S.J., Cooper and Gunn's. Tutorial Pharmacy, CBS Publications, New Delhi.
9. E.A. Rawlins, Bentley's Text Book of Pharmaceutics, English Language Book Society, Elsevier Health Sciences, USA.
10. Isaac Ghebre Sellassie: Pharmaceutical Pelletization Technology, Marcel Dekker, INC, New York.
11. Dilip M. Parikh: Handbook of Pharmaceutical Granulation Technology, Marcel Dekker, INC, New York.
12. Francoise Nieloudand Gilberte Marti-Mestres: Pharmaceutical Emulsions and Suspensions, Marcel Dekker, INC, New York.

PT 103 PHARMACEUTICAL INORGANIC CHEMISTRY (Theory)

45 Hours

Scope: This subject deals with the monographs of inorganic drugs and pharmaceuticals.

Objectives: Upon completion of course student shall be able to know the sources of impurities and methods to determine the impurities in inorganic drugs and pharmaceuticals understand the medicinal and pharmaceutical importance of inorganic compounds

Course Content

UNIT I

10Hours

1. 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

2. General methods of preparation and assay

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

10Hours

3. 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.

4. 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.

5. Dental products

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

UNIT III

10Hours

6. 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

08Hours

7. Miscellaneous compounds

- **Expectorants:** Potassium iodide, Ammonium chloride*.
- **Emetics:** Copper sulphate*, Sodium potassium tartarate
- **Haematinics:** Ferrous sulphate*, Ferrous gluconate
- **Poison and Antidote:** Sodium thiosulphate*, Activated charcoal, Sodium nitrite³³³
- **Astringents:** Zinc Sulphate, Potash Alum

UNITV

07Hours

8. 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.

PT193 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

II. Identification test

- Magnesium hydroxide
- Ferrous sulphate
- Sodium bicarbonate
- Calcium gluconate
- Copper sulphate

III Test forpurity

- 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)

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 Inorganicanalysis
3. P. Gundu Rao, Inorganic Pharmaceutical Chemistry, 3rd Edition
4. M.L Schroff, Inorganic PharmaceuticalChemistry
5. Bentley and Driver's Textbook of PharmaceuticalChemistry
6. Anand & Chatwal, Inorganic PharmaceuticalChemistry
7. Indian Pharmacopoeia

HU 181 COMMUNICATION SKILLS (Theory)

30 Hours

Scope: This course will prepare the young pharmacy student to interact effectively with doctors, nurses, dentists, physiotherapists and other health workers. At the end of this course the student will get the soft skills set to work cohesively with the team as a team player and will add value to the pharmaceutical business.

Objectives: Upon completion of the course the student shall be able to

1. Understand the behavioral needs for a Pharmacist to function effectively in the areas of pharmaceutical operation
2. Communicate effectively (Verbal and NonVerbal)
3. Effectively manage the team as a teamplayer
4. Develop interviewskills
5. Develop Leadership qualities andessentials

Course content

UNIT-I

07Hours

1. Communication Skills

Introduction, Definition, The Importance of Communication, The Communication Process – Source, Message, Encoding, Channel, Decoding, Receiver, Feedback,Context

2. Barriers to communication

Physiological Barriers, Physical Barriers, Cultural Barriers, Language Barriers, Gender Barriers, Interpersonal Barriers, Psychological Barriers, Emotionalbarriers

3. Perspectives in Communication

Introduction, Visual Perception, Language, Other factors affecting our perspective - Past Experiences, Prejudices, Feelings,Environment

UNIT-II

07Hours

4. Elements of Communication

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

5. 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

07Hours

6. Basic Listening Skills

Introduction, Self-Awareness, Active Listening, Becoming an Active Listener, Listening in Difficult Situations

7. 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

8. Writing Effectively

Subject Lines, Put the Main Point First, Know Your Audience, Organization of the Message

UNIT-IV

05Hours

9. Interview Skills

Purpose of an interview, Do's and Don't's of an interview

10. Giving Presentations

Dealing with Fears, Planning your Presentation, Structuring Your Presentation, Delivering Your Presentation, Techniques of Delivery

UNIT-V 04Hours

11. Group Discussion:

Introduction, Communication skills in group discussion, Do's and Don't's of group discussion

HU182 COMMUNICATION SKILLS (Practical)

2 Hours / week

The following learning modules are to be conducted using Wordsworth® English language lab software

Basic communication covering the following topics

- Meeting People
- Asking Questions
- Making Friends

- What did you do?
- Do's and Dont's

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)

1. Basic communication skills for Technology, Andreja. J. Ruther Ford, 2nd Edition, Pearson Education,2011
2. Communication skills, Sanjay Kumar, Pushpalata, 1stEdition, Oxford Press,2011
3. Organizational Behaviour, Stephen .P. Robbins, 1stEdition, Pearson,2013
4. Brilliant- Communication skills, Gill Hasson, 1stEdition, Pearson Life,2011
5. The Ace of Soft Skills: Attitude, Communication and Etiquette for success, Gopala Swamy Ramesh, 5thEdition, Pearson,2013
6. Developing your influencing skills, Deborah Dalley, Lois Burton, Margaret, Green hall, 1st Edition Universe of Learning LTD,2010
7. Communication skills for professionals, Konar nira, 2ndEdition, New arrivals – PHI, 2011
8. Personality development and soft skills, Barun K Mitra, 1stEdition, Oxford Press, 2011
9. Soft skill for everyone, Butter Field, 1st Edition, Cengage Learning india pvt.ltd, 2011
10. Soft skills and professional communication, Francis Peters SJ, 1stEdition, McGraw Hill Education, 2011
11. Effective communication, John Adair, 4thEdition, Pan MacMillan, 2009.
12. Bringing out the best in people, Aubrey Daniels, 2ndEdition, Mc Graw Hill,1999.

PTB 184 REMEDIAL BIOLOGY (Theory)

30 Hours

Scope: To learn and understand the components of living world, structure and functional system of plant and animal kingdom.

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

- know the classification and salient features of five kingdoms of life
- understand the basic components of anatomy & physiology of plant
- know understand the basic components of anatomy & physiology animal with special reference to human

UNIT I

07Hours

1. 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,

2. 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

07Hours

3. 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

4. Digestion and Absorption

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

5. 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

07Hours

6. Excretory products and their elimination

- Modes of excretion
- Human excretory system- structure and function
- Urine formation
- Rennin angiotensin system

7. 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

8. Human reproduction

- Parts of female reproductive system
- Parts of male reproductive system
- Spermatogenesis and Oogenesis
- Menstrual cycle

UNIT IV

05Hours

9. Plants and mineral nutrition:

- Essential mineral, macro and micronutrients
- Nitrogen metabolism, Nitrogen cycle, biological nitrogen fixation

10. Photosynthesis

- Autotrophic nutrition, photosynthesis, Photosynthetic pigments, Factors affecting photosynthesis.

UNITV

04 Hours

11. Plant respiration

- Respiration, glycolysis, fermentation (anaerobic).

12. Plant growth and development

- Phases and rate of plant growth, Condition of growth, Introduction to plant growth regulators

13. Cell - The unit of life

- Structure and functions of cell and cell organelles. Cell division

14. Tissues

- Definition, types of tissues, location and functions.

Text Books

1. Text book of Biology by S. B.Gokhale
2. A Text book of Biology by Dr. Thulajappa and Dr. Seetaram.

Reference Books

1. A Text book of Biology by B.V. Sreenivasa Naidu
2. A Text book of Biology by Naidu and Murthy
3. Botany for Degree students By A.C. Dutta.
4. Outlines of Zoology by M. Ekambaranatha ayyer and T. N. Ananthkrishnan.
5. A manual for pharmaceutical biology practical by S.B. Gokhale and C. K. Kokate

PTB 185 REMEDIAL BIOLOGY (Practical)

30 Hours

1. Introduction to experiments in biology
 - Study of Microscope
 - Section cutting techniques
 - Mounting and staining
 - 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

Reference Books

1. Practical human anatomy and physiology. by S.R.Kale and R.R.Kale.
2. A Manual of pharmaceutical biology practical by S.B.Gokhale, C.K.Kokate and S.P.Shriwastava.
3. Biology practical manual according to National core curriculum .Biology forum of Karnataka. Prof.M.J.H.Shafi

M 183 REMEDIAL MATHEMATICS (Theory)

30 Hours

Scope: This is an introductory course in mathematics. This subject deals with the introduction to Partial fraction, Logarithm, matrices and Determinant, Analytical geometry, Calculus, differential equation and Laplace transform.

Objectives: Upon completion of the course the student shall be able to:-

1. Know the theory and their application in Pharmacy
2. Solve the different types of problems by applying theory
3. Appreciate the important application of mathematics in Pharmacy

Course Content

UNIT-I

06Hours

1. 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

2. Logarithms

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

3. Function

Real Valued function, Classification of real valued functions,

4. Limits and continuity

Introduction , Limit of a function, Definition of limit of a function (ϵ - δ definition) ,

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

UNIT-II

06Hours

5. 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 of equations using matrix method, Cramer's rule, Characteristic

equation and roots of a square matrix, Cayley–Hamilton theorem, Application of Matrices insolving Pharmacokinetic equations

UNIT–III

06Hours

6. 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

06Hours

7. 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

8. Integration

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

UNIT-V

06Hours

9. Differential Equations

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

10. 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)

1. Differential Calculus by Shanthinarayan
2. Pharmaceutical Mathematics with application to Pharmacy by Panchaksharappa Gowda D.H.
3. Integral Calculus by Shanthinarayan
4. Higher Engineering Mathematics by Dr.B.S.Grewal

--- End of Semester 1 ---