Faculty of Pharmaceutical Science & Technology

Study and Evaluation Scheme

Of

Bachelor of Pharmacy
(B.Pharm.) (CBCS)

(Applicable w.e.f Academic Session 2016, till revised)

AKS UNIVERSITY, SATNA

Study and Evaluation Scheme

** The University Authorities reserve all the rights to make any additions / deletions or changes / modifications to this syllabus as deemed necessary.
### I Semester

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Name of Course</th>
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Choose any one as per group of 12th class

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*Applicable ONLY for the students studied Mathematics / Physics / Chemistry at HSC and appearing for Remedial Biology course.

$Applicable ONLY for the students studied Physics / Chemistry / Botany / Zoology at HSC and appearing for Remedial Mathematics course.

* Non University Examination (NUE)

### Semester-II

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* Non University Examination (NUE)
B.Pharm. (CBCS)  
Semester-I  
BP101T. HUMAN ANATOMY AND PHYSIOLOGY-I (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

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

Nervous system
Organization of nervous system, neuron, neuroglia, classification and properties of nerve fibre, 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 IV
Peripheral nervous system: 08 hours
Classification of peripheral nervous system
Origin and functions of spinal and cranial nervous reflex arc
Autonomic nervous system: structure and functions of sympathetic and parasympathetic nervous system.
Special senses
Structure and functions of eye, ear, nose and tongue and their disorders.

Unit V
Endocrine system 07 hours
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.

BP107P. HUMAN ANATOMY AND PHYSIOLOGY (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. To study the integumentary and special senses using specimen, models, etc.,
7. To study the nervous system using specimen, models, etc.,
8. To study the endocrine system using specimen, models, etc
9. To demonstrate the general neurological examination
10. To demonstrate the function of olfactory nerve
11. To examine the different types of taste.
12. To demonstrate the visual acuity
13. To demonstrate the reflex activity
14. Recording of body temperature
15. To demonstrate positive and negative feedback mechanism.

Recommended Books (Latest Editions)
2. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, Newyork
3. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA
4. Text book of Medical Physiology- Arthur C, Guyton and John E. Hall. Miamisburg, OH,
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 Tailor. Williams & Wilkins Co, Riverview, MI USA
   Human Physiology (vol 1 and 2) by Dr. C.C. Chatterje, Academic Publishers Kolkatta
B.Pharm. (CBCS)
Semester-I
BP102T. PHARMACEUTICAL ANALYSIS (Theory)

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

UNIT-I
(a) 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
(b) Errors: Sources of errors, types of errors, methods of minimizing errors, accuracy, precision and significant figures

UNIT-II
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
Precipitation titrations: Mohrs method, Volhard’s, Modified Volhard’s, Fajans method, estimation of sodium chloride.
Complexometric titration: Classification metalion indicators, masking and demasking reagents, estimation of Magnesium sulphate, and calcium gluconate.

UNIT-IV
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
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  Preparation and standardization of
(1) Sodium hydroxide
(2) Sulphuric acid
(3) Sodium thiosulfate
(4) Potassium permanganate
(5) Ceric ammonium sulphate

II 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 Permanganometry
(6) Sodium benzoate by non-aqueous titration
(7) Sodium Chloride by precipitation titration

III 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)**
2. A.I. Vogel, Text Book of Quantitative Inorganic analysis
4. Bentley and Driver's Textbook of Pharmaceutical Chemistry
5. John H. Kennedy, Analytical chemistry principles Indian Pharmacopoeia.
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

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 & Posology**: 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, alligation, 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.

UNIT – III 08 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.
- **Emulsions**: Definition, classification, emulsifying agent, test for the identification of type of Emulsion, Methods of preparation & stability problems.
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.

UNIV – 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) Simple syrup
   b) Ferrous phosphate syrup

2. **Elixirs**
   a) Piperazine citrate elixir
   b) Paracetamol pediatric elixir

3. **Solutions**
   a) Strong solution of ammonium acetate
   b) Cresol with soap solution

4. **Suspensions**
   a) Calamine lotion
   b) Aluminum hydroxide suspension

5. **Emulsions**
   a) Turpentine Liniment
   b) Liquid paraffin emulsion

6. **Powders and Granules**
   a) Eutectic powder
   b) Effervescent powder

7. **Suppositories**
   a) Boric acid suppository
   b) Zinc Oxide suppository

8. **Semisolids**
   a) Sulphur ointment
   b) Cold cream
   c) Vanishing cream
   d) Bentonite gel

9. **Gargles and Mouthwashes**
   a) Potassium chlorate gargoyle
   b) Iodine mouthwash
Recommended Books: (Latest Editions)

2. Carter S.J., Cooper and Gunn’s-Dispensing for Pharmaceutical Students, CBS publishers, New Delhi.
B.Pharm. (CBCS)
Semester-I
BP104T. 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

UNIT I
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
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
Gastrointestinal agents
Acidifies: 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, Kaoline and Bentonite
Antimicrobials: Mechanism, classification, Potassium permanganate, Boric acid, Hydrogen peroxide*, Chlorinated lime*, Iodine and its preparations

UNIT IV
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 nitrate
Astringents: Zinc Sulphate, Potash Alum

UNIT V
Radiopharmaceuticals: Radio activity, Measurement of radioactivity, Properties of α, β, γ radiations, Half life, radio isotopes and study of radio isotopes - Sodium iodide $^{121}$I, 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)
1. A.H. Beckett & J.B. Stenlake's, Practical Pharmaceutical Chemistry Vol I & II,
2. A.I. Vogel, Text Book of Quantitative Inorganic analysis
4. M.L Schroff, Inorganic Pharmaceutical Chemistry
5. Bentley and Driver's Textbook of Pharmaceutical Chemistry
7. Indian Pharmacopoeia
B.Pharm. (CBCS)
Semester-I
BP105T.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 Non Verbal)
3. Effectively manage the team as a team player
4. Develop interview skills
5. Develop Leadership qualities and essentials

UNIT – I  
07 Hours
• 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 Dont’s 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 Dont’s of group discussion

**BP111P.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)**
6. Developing your influencing skills, Deborah Dalley, Lois Burton, Margaret, Green hall, 1st Edition Universe of Learning LTD, 2010
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
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, Potista, 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 & Dicotylidones.

UNIT II
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
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
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
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.

Text Books
a. Text book of Biology by S. B. Gokhale

b. A Text book of Biology by Dr. Thulajappa and Dr. Seetaram.

Reference Books
a. A Text book of Biology by B.V. Sreenivasa Naidu
b. A Text book of Biology by Naidu and Murthy
c. Botany for Degree students By A.C.Dutta.
d. Outlines of Zoology by M. Ekambaranatha ayyer and T. N. Ananthakrishnan.
e. A manual for pharmaceutical biology practical by S.B. Gokhale and C. K. Kokate
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 and its modifications
4. Detailed study of frog by using computer models
5. Microscopic study and identification of tissues
6. Identification of bones
7. Determination of blood group
8. Determination of blood pressure
9. Determination of tidal volume

Reference Books
3. Biology practical manual according to National core curriculum .Biology forum of
   Karnataka. Prof .M.J.H.Shafi
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

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

\[
\lim_{x \to a} \frac{x^n - a^n}{x - a} = na^{n-1}, \quad \lim_{\theta \to 0} \frac{\sin \theta}{\theta} = 1,
\]

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 rules 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.
UNIT – IV  

• **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  

• **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)**

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
B.Pharm. (CBCS)
Semester-II
BP 201T. HUMAN ANATOMY AND PHYSIOLOGY-II (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 hematological tests like blood cell counts, haemoglobin estimation, bleeding/clotting time etc and also record blood pressure, heart rate, pulse and respiratory volume.
5. Appreciate coordinated working pattern of different organs of each system
6. Appreciate the interlinked mechanisms in the maintenance of normal functioning (homeostasis) of human body.

Unit I 10 hours
- **Body fluids and blood**
  - Body fluids, composition and functions of blood, hemopoeisis, formation of hemoglobin, anemia, mechanisms of coagulation, blood grouping, Rh factors, transfusion, its significance and disorders of blood.
- **Lymphatic system**
  - Lymphatic organs and tissues, lymphatic vessels, lymph circulation and functions of lymphatic system

Unit II 10 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 heart beat, its regulation by autonomic nervous system, cardiac output, cardiac cycle. Regulation of blood pressure, pulse, electrocardiogram and disorders of heart.

Unit III 08 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.
- **Respiratory system**
  - Anatomy of respiratory system with special reference to anatomy of lungs, mechanism of respiration, regulation of respiration,
Unit IV
hours
08

- **Respiratory system**
  Lung volumes and capacities, transport of respiratory gases, artificial respiration, resuscitation methods.
- **Urinary system**

Unit V
hours
09

- **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

**BP 207 P. HUMAN ANATOMY AND PHYSIOLOGY (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. Introduction to hemocytometry.
2. Enumeration of white blood cell (WBC) count
3. Enumeration of total red blood corpuscles (RBC) count
4. Determination of bleeding time and clotting time
5. Determination of clotting time
6. Estimation of hemoglobin content
7. Determination of blood group.
8. Determination of erythrocyte sedimentation rate (ESR).
10. Recording of blood pressure.
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
15. Demonstration of total blood count by cell analyser
16. Permanent slides of vital organs and gonads.
**Recommended Books (Latest Editions)**

2. Anatomy and Physiology in Health and Illness by Kathleen J.W. Wilson, Churchill Livingstone, Newyork
3. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA
8. Practical workbook of Human Physiology by K. Srinageswari and Rajeev Sharma, Jaypee brother’s medical publishers, New Delhi.

**Reference Books:**

1. Physiological basis of Medical Practice-Best and Tailor. Williams & Wilkins Co, Riverview, MI USA
3. Human Physiology (vol 1 and 2) by Dr. C.C. Chatterjee, Academic Publishers Kolkata
Scope: This subject deals with classification and nomenclature of simple organic compounds, structural isomerism, intermediates forming in reactions, important physical properties, reactions and methods of preparation of these compounds. The syllabus also emphasizes on mechanisms and orientation of reactions.

Objectives: Upon completion of the course the student shall be able to
1. write the structure, name and the type of isomerism of the organic compound
2. write the reaction, name the reaction and orientation of reactions
3. account for reactivity/stability of compounds,
4. identify/confirm the identification of organic compound

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
10 Hours
Alkanes*, Alkenes* and Conjugated dienes*
SP³ hybridization in alkanes, Halogenation of alkanes, uses of paraffins. Stabilities of alkenes, SP² hybridization in alkenes
E₁ and E₂ reactions – kinetics, order of reactivity of alkyl halides, rearrangement of carbocations, Saytzeff’s orientation and evidences. E₁ versus E₂ reactions, Factors affecting E₁ and E₂ 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-II
10 Hours
Alkyl halides*
SN₁ and SN₂ reactions - kinetics, order of reactivity of alkyl halides, stereochemistry and rearrangement of carbocations.
SN₁ versus SN₂ reactions, Factors affecting SN₁ and SN₂ reactions
Structure and uses of ethylchloride, Chloroform, trichloroethylene, tetrachloroethylene, dichloromethane, tetrachloromethane and iodoform.
Alcohols*- Qualitative tests, Structure and uses of Ethyl alcohol, chlorobutanol, Cetosteryl alcohol, Benzyl alcohol, Glycerol, Propylene glycol

UNIT-III
10 Hours
Carbonyl compounds* (Aldehydes and ketones)
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, Choral hydrate, Hexamine, Benzaldehyde, Vanilin, Cinnamaldehyde.
UNIT-IV 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

UNIT-V 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 isomerisms in organic compounds

BP208P. PHARMACEUTICAL ORGANIC CHEMISTRY -I (Practical) 4 Hours / week

1. Systematic qualitative analysis of unknown organic compound/s for preliminary tests
2. Systematic qualitative analysis of unknown organic compound/s for preliminary and Lassaigns tests.
   Following classes of compounds may be analyzed
   Phenols, amide/ urea, carbohydrate, amine, carboxylic acid, aldehyde, ketone, alcohol, carboxylic acid ester, hydrocarbon, halohydrocarbon, nitro compound and anilide
4. Determination of melting and boiling points of organic compounds
5. Systematic qualitative analysis of unknown organic compound for functional group and identification of the organic compound
6. Preparation of suitable solid derivatives from organic compounds
7. Systematic qualitative analysis of unknown organic compound for Functional group, its identification and confirmation of identification
8. Construction of molecular models

Recommended Books (Latest Editions)
1. Organic Chemistry by Morrison and Boyd
2. Organic Chemistry by I.L. Finar, Volume-I
4. Organic Chemistry by P.L. Soni
5. Practical Organic Chemistry by Mann and Saunders.
8. Introduction to Organic Laboratory techniques by Pavia, Lampman and Kriz.
B.Pharm. (CBCS)
Semester-II

BP203T. PHYSICAL PHARMACEUTICS-I (Theory)

Scope: The course deals with the various physical, physicochemical properties and principle involved in dosage forms, formulations. Theory and practical components of the subject help the student to get a better insight in to various areas of formulation research and development and stability studies of pharmaceuticals.

Objectives: Upon the completion of the course student shall be able to
1. Understand various physicochemical properties of drug molecules in the designing the dosage form
2. Know the principles of chemical kinetics & to use them in assigning expiry date for formulation
3. Demonstrate use of physicochemical properties in evaluation of dosage forms.
4. Appreciate physicochemical properties of drug molecules in formulation research and development

UNIT-I


UNIT-II


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

UNIT-III

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

UNIT-IV


UNIT-V

pH, buffers and Isotonic solutions: Sorensen’s pH scale, pH determination (electrometric and calorimetric), applications of buffers, buffer equation, buffer capacity, buffers in pharmaceutical and biological systems, buffered isotonic solutions.
BP209P. PHYSICAL PHARMACEUTICS – I (Practical) 4 Hrs/week

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

Recommended Books: (Latest Editions)
1. Physical pharmacy by Alfred Martin
2. Experimental pharmaceutics by Eugene, Parott.
3. Tutorial pharmacy by Cooper and Gunn.
5. Liberman H.A, Lachman C., Pharmaceutical Dosage forms, Tablets, Volume-1 to 3, MarcelDekkar Inc.
7. Physical pharmaceutics by Ramasamy C and ManavalanR.
8. Laboratory manual of physical pharmaceutics, C.V.S. Subramanyam, J. Thimma settee
Scope: Pathophysiology is the study of causes of diseases and reactions of the body to such disease producing causes. This course is designed to impart a thorough knowledge of the relevant aspects of pathology of various conditions with reference to its pharmacological applications, and understanding of basic pathophysiological mechanisms. Hence it will not only help to study the syllabus of pathology, but also to get baseline knowledge required to practice medicine safely, confidently, rationally and effectively.

Objectives: Upon completion of the subject student shall be able to –
1. Describe the etiology and pathogenesis of the selected disease states;
2. Name the signs and symptoms of the diseases; and
3. Mention the complications of the diseases.

Unit I
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
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
Haematological Diseases:
Iron deficiency, megaloblastic anemia (Vit B12 and folic acid), sickle cell anemia, thalasemia, 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

Diseases of bones and joints: Rheumatoid Arthritis, Osteoporosis,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)

1. Vinay Kumar, Abul K. Abas, Jon C. Aster; Robbins &Cotran Pathologic Basis of Disease; South Asia edition; India; Elsevier; 2014.
4. Best, Charles Herbert 1899-1978; Taylor, Norman Burke 1885-1972; West, John B (John Burnard); Best and Taylor’s Physiological basis of medical practice; 12th ed; united states;
5. William and Wilkins, Baltimore;c1991 [1990 printing].
9. V. Kumar, R. S. Cotran and S. L. Robbins; Basic Pathology; 6th edition; Philadelphia; WB Saunders Company; 1997.

Recommended Journals
1. The Journal of Pathology. ISSN: 1096-9896 (Online)
2. The American Journal of Pathology. ISSN: 0002-9440
3. Pathology. 1465-3931 (Online)
   4. International Journal of Physiology, Pathophysiology and Pharmacology. ISSN: 1944-8171 (Online)
5. Indian Journal of Pathology and Microbiology. ISSN-0377-4929.
B.Pharm. (CBCS)
Semester-II
BP205 T. COMPUTER APPLICATIONS IN PHARMACY (Theory)

30 Hrs (2 Hrs/Week)

Scope: This subject deals with the introduction Database, Database Management system, computer application in clinical studies and use of databases.

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

1. know the various types of application of computers in pharmacy
2. know the various types of databases
3. know the various applications of databases in pharmacy

UNIT – I  
Number system: Binary number system, Decimal number system, Octal number system, Hexadecimal number systems, conversion decimal to binary, binary to decimal, octal to binary etc, 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
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
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
Bioinformatics: Introduction, Objective of Bioinformatics, Bioinformatics Databases, Concept of Bioinformatics, Impact of Bioinformatics in Vaccine Discovery

UNIT-V
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):**

2. Computer Application in Pharmaceutical Research and Development – Sean Ekins – Wiley-Intescience, A John Willey and Sons, INC., Publication, USA
Scope: Environmental Sciences is the scientific study of the environmental system and the status of its inherent or induced changes on organisms. It includes not only the study of physical and biological characters of the environment but also the social and cultural factors and the impact of man on environment.

Objectives: Upon completion of the course the student shall be able to:
1. Create the awareness about environmental problems among learners.
2. Impart basic knowledge about the environment and its allied problems.
3. Develop an attitude of concern for the environment.
4. Motivate learner to participate in environment protection and environment improvement.
5. Acquire skills to help the concerned individuals in identifying and solving environmental problems.

Unit-I
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
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
Environmental Pollution: Air pollution; Water pollution; Soil pollution
Recommended Books (Latest edition):

1. Y.K. Sing, Environmental Science, New Age International Pvt, Publishers, Bangalore
5. Clark R.S., Marine Pollution, Clanderson Press Oxford
8. Down of Earth, Centre for Science and Environment