BP 201 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.

Course Content:

Unit I

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 II

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

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

Unit IV

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.
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 201 HUMAN ANATOMY AND PHYSIOLOGY-II (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. 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
15. Demonstration of total blood count by cell analyser
16. Permanent slides of vital organs and gonads.

Recommended Books (Latest Editions)

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
BP202 PHARMACEUTICAL ORGANIC CHEMISTRY–I (Theory)  
(45 Hours)

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, identify/confirm the identification of organic compound.

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  
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.
Structural isomerism in organic compounds.

UNIT-II  
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\(_1\) verses 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  
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 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-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, Vanilin, 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.
BP 202 PHARMACEUTICAL ORGANIC CHEMISTRY -I (Practical)
(4 hours / week)

1. Systematic qualitative analysis of unknown organic compounds like
   a) Preliminary test: Color, odour, aliphatic/aromatic compounds, saturation and unsaturation, etc.
   b) Detection of elements like Nitrogen, Sulphur and Halogen by Lassaigne’s test
   c) Solubility test
   d) Functional group test like Phenols, Amides/ Urea, Carbohydrates, Amines, Carboxylic acids,
      Aldehydes and Ketones, Alcohols, Esters, Aromatic and Halogenated Hydrocarbons, Nitro
      compounds and Anilides.
   e) Melting point/Boiling point of organic compounds
   f) Identification of the unknown compound from the literature using melting point/ boiling point.
   g) Preparation of the derivatives and confirmation of the unknown compound by melting point/ boiling
      point.
   h) Minimum 5 unknown organic compounds to be analysed systematically.

2. Preparation of suitable solid derivatives from organic compounds
3. 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.
9. Reaction and reaction mechanism by Ahluwaliah/Chatwal.
BP 203 BIOCHEMISTRY (Theory)

(45 Hours)

**Scope**: Biochemistry deals with complete understanding of the molecular levels of the chemical process associated with living cells. The scope of the subject is providing biochemical facts and the principles to understand metabolism of nutrient molecules in physiological and pathological conditions. It is also emphasizing on genetic organization of mammalian genome and hetero & autocatalytic functions of DNA.

**Objectives**: Upon completion of course student shell able to

1. Understand the catalytic role of enzymes, importance of enzyme inhibitors in design of new drugs, therapeutic and diagnostic applications of enzymes.
2. Understand the metabolism of nutrient molecules in physiological and pathological conditions.
3. Understand the genetic organization of mammalian genome and functions of DNA in the synthesis of RNAs and proteins.

**Course Content**:

**UNIT I**

**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**

**Carbohydrate metabolism**
Glycolysis – Pathway, energetics and 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)
Gluconeogenesis- Pathway and its significance
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**

**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 & decarboxylation, urea cycle and its disorders
Catabolism of phenylalanine and tyrosine and their metabolic disorders (Phenyketonuria, Albinism, alkeptonuria, tyrosinemia)
Synthesis and significance of biological substances; 5-HT, melatonin, dopamine, noradrenaline, adrenaline
Catabolism of heme; hyperbilirubinemia and jaundice.

UNIT IV

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

UNIT V

Enzymes
Introduction, properties, nomenclature and IUB classification of enzymes
Enzyme kinetics (Michaelis plot, Line Weaver Burke plot).
Enzyme inhibitors with examples.
Regulation of enzymes: enzyme induction and repression, allosteric enzymes regulation.
Therapeutic and diagnostic applications of enzymes and isoenzymes
Coenzymes – Structure and biochemical functions.
BP 203 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)

4. Biochemistry by D. Satyanarayan and U. Chakrapani
7. Outlines of Biochemistry by Conn and Stumpf
10. Practical Biochemistry for Medical students by Rajagopal and Ramakrishna.
11. Practical Biochemistry by Harold Varley.
BP 204 PATHOPHYSIOLOGY (THEORY)  

(45 Hours)

**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 – Describe the etiology and pathogenesis of the selected disease states; Name the signs and symptoms of the diseases; and Mention the complications of the diseases.

**Course content:**

**Unit I**  
10 Hours

**Basic principles of Cell injury and Adaptation:**

**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**  
10 Hours

**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**  
10 Hours

**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 infection.

**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;1991 [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.
BP205 COMPUTER APPLICATIONS IN PHARMACY (Theory)

30Hrs (2hrs/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.

Course content:

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.


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).
BP 205. 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.
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):

BP 206 ENVIRONMENTAL SCIENCES (Theory)
(30 hours)

**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.

**Course content:**

Unit-I  
10 hours

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  
10 hours

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  
10 hours

Environmental Pollution: Air pollution; Water pollution; Soil pollution

**Recommended Books (Latest edition):**

1. Y.K. Sing, Environmental Science, New Age International Pvt, Publishers, Bangalore
3. Bharucha Erach, The Biodiversity of India, Mapin Pu blishing Pvt. Ltd., Ahmedabad – 380 013, India,
5. Clark R.S., Marine Pollution, Clanderson Press Oxford
8. Down of Earth, Centre for Science and Environment