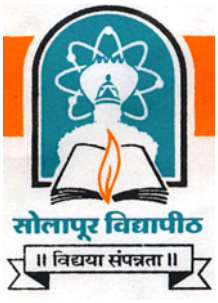

SOLAPUR UNIVERSITY, SOLAPUR

FACULTY OF ENGINEERING & TECHNOLOGY

Bachelor of Pharmacy

First Year B. Pharmacy (2016-17)

CBCS Syllabus

SOLAPUR UNIVERSITY, SOLAPUR

Faculty of Engineering & Technology

Bachelor of Pharmacy

Choice Based Credit System Structure of Teaching & Examination w.e.f. 2016-17

First Year B. Pharmacy (Semester-I)

Code	Course	Hrs./Week			Credits	Examination Scheme			
		L	T	P		ISE	ESE	ICA	Total
1.1.1	Pharmaceutics-I	3	-	-	3	30	70	-	100
1.1.2	Pharmaceutical Inorganic Chemistry	3	-	-	3	30	70	-	100
1.1.3	Biochemistry-I	3	-	-	3	30	70	-	100
1.1.4	Anatomy, Physiology & Health Education-I	3	-	-	3	30	70	-	100
1.1.5	Pharmacognosy-I	3	-	-	3	30	70	-	100
	Total	**15**	**-**	**-**	**15**	**150**	**350**	**-**	**500**
	Practical								
1.1.6	Pharmaceutics-I	-	-	3	1.5	-	70	30	100
1.1.7	Pharmaceutical Inorganic Chemistry	-	-	3	1.5	-	70	30	100
1.1.8	Biochemistry-I	-	-	3	1.5	-	70	30	100
1.1.9	Anatomy, Physiology & Health Education-I	-	-	2	1.0	-	70	30	100
1.1.10	Pharmacognosy-I	-	-	3	1.5	-	70	30	100
	Total	**-**	**-**	**14**	**7.0**	**-**	**350**	**150**	**500**
	Grand Total	**15**		**14**	**22**	**150**	**700**	**150**	**1000**

L- Lectures, **T**- Tutorials, **P**-Practicals, **ISE** - In Semester Exam.**, ESE** - End Semester Exam, **ICA**- Internal Continuous Assessment

Note : ISE -Three Tests , **ESE** - University Theory paper shall be of 70 marks of 3 hrs.

SOLAPUR UNIVERSITY, SOLAPUR

Faculty of Engineering & Technology

Bachelor of Pharmacy

Choice Based Credit System Structure of Teaching & Examination w.e.f. 2016-17

First Year B. Pharmacy (Semester-II)

Code	Course	Hrs./Week			Credits	Examination Scheme			
		L	T	P		ISE	ESE	ICA	Total
1.2.1	Pharmaceutics-II	3	-	-	3	30	70	-	100
1.2.2	Modern Dispensing & Hospital Pharmacy	3	-	-	3	30	70	-	100
1.2.3	Organic Chemistry-I	3	-	-	3	30	70	-	100
1.2.4	Biochemistry-II	3	-	-	3	30	70	-	100
1.2.5	Anatomy, Physiology & Health Education-II	3	-	-	3	30	70	-	100
1.2.6	Communicative Skills In English	2	1		3	100	-	-	100
	Total	**17**	**-**	**-**	**18**	**250**	**350**	**-**	**600**
Practical									
1.2.7	Pharmaceutics-II	-	-	3	1.5	-	70	30	100
1.2.8	Modern Dispensing & Hospital Pharmacy	-	-	3	1.5	-	70	30	100
1.2.9	Organic Chemistry-I	-	-	3	1.5	-	70	30	100
1.2.10	Biochemistry-II	-	-	3	1.5	-	70	30	100
1.2.11	Anatomy, Physiology & Health Education-II	-	-	2	1.0	-	70	30	100
	Total	**-**	**-**	**14**	**7.0**	**-**	**350**	**150**	**500**
	Grand Total	**17**	-	**14**	**25**	**250**	**700**	**150**	**1100**

1.1.1 Pharmaceutics-I (Theory)

1. **Introduction to Pharmaceutics**: Definition and Scope, Career in Pharmacy, Development of Pharmacy profession and Pharmaceutical Industry in India.
2. **Introduction to Pharmacopoeia**:
   IP, BP, USP, International and Extra Pharmacopoeia.
3. **Metrology:** Imperial, Metric and SI. Weights and measures. Inter conversions.
4. **Introduction to Pre-formulation studies**
5. **Introduction to Dosage Forms**
   Classification, Advantages and disadvantages of Solid, Semi-solid, Liquid and Gaseous dosage form.
6. **Pharmaceutical additives:** Limits, uses and applications.

1.1.6 Pharmaceutics-I (Practical)

Preparation of Monophasic Liquid dosage form

1. Study of various types of waters used in formulation
2. **Solutions:** 6 different types by referring to IP, BPC, NF.
3. **Aromatic Waters**: 5 different types by referring IP and BPC.
4. **Glycerites**: 3 Preparations.
5. **Linctus**: Simple Linctus BPC

References:

1. *Pharmaceutical Dosage and Drug Delivery System -Ansel - Popovich & Allen - (Williams & Wilkins}*
2. *American Pharmacy -Dittert (J.B. Lipincott)*
3. *Remington: The Science and practice of Pharmacy– A.R. Gennaro (Mack Publishing Co)*
4. *Bentleys Text Book of Pharmaceutics -Rawlins (ELBS)*
5. *Banker and Rhodes -Modern Pharmaceutics -(Dekkar)*
6. *Groves - Parenteral Products -(William Heinemann Medical Books Ltd*
7. *Hanlon -Hand Book of Package Engg. (McGraw Hill)*
8. *Swarbrick & Boytan -Encyclopedia of Pharmaceutical technology (Dekker).*
9. *David Ganderton -Unit Processes in Pharmacy (William Heinernan)*
10. *Herbal Pharmacopoeia of India*

1.1.2 Pharmaceutical Inorganic Chemistry (Theory)

1. Introduction to monographs.
2. Sources of impurities in pharmaceuticals and methods to control impurities.
   Limit test for Chloride, Sulphate, Iron, Arsenic, Lead, Heavy metals.
   Limits of insoluble matter, soluble matter, non-volatile matter, moisture, volatile matter, residual solvent, loss on drying, loss on ignition and ash value.
3. Method of preparation, physical and chemical properties, test for identity and purity, uses, special storage condition if any of the following classes of inorganic pharmaceuticals included in Indian Pharmacopoeia.

a. Major intra and extra cellular electrolytes

i. Electrolytes used for replacement therapy-
Sodium chloride, potassium chloride, calcium gluconate.

ii. Electrolytes used in acid base balance-
Potassium acetate, sodium bicarbonate, ammonium chloride.

iii. Electrolytes used for combination therapy- ORS

b. Essential and trace elements- Iron, cupper, iodine.

c. Gastrointestinal agents

i. Acidifying agents- Dilute hydrochloric acid.
ii. Antacids- Aluminum hydroxide gel, calcium carbonate, light & heavy magnesium carbonate, magnesium trisilicate, sodium bicarbonate.
iii. Protectives and adsorbents- Bismuth subcarbonate.
iv. Cathartics- Magnesium sulphate

d. Expectorants and emetics- Ammonium chloride, potassium iodide, copper sulphate.

e. Dental products- Sodium fluoride, zinc chloride.

f. Antidotes- Sodium nitrite, sodium thiosulphate

g. Official gases- oxygen, carbon dioxide, nitrous oxide.

h. Topical agent-

i. Protectives- Talc, titanium dioxide, zinc oxide
ii. Anti Microbial- Hydrogen peroxide, potassium permanganate, iodine.
iii. Astringents- Boric acid, silver nitrate, alum

1.1.7 Pharmaceutical Inorganic Chemistry (Practical)

1. Limit test for Chloride, Sulphate, Iron, Arsenic.
2. Preparation of inorganic compounds (at least four).
3. Qualitative analysis of inorganic compound. (At least four)
4. Identification of inorganic compounds. (At least two)

References:

1. *Vogel's Textbook of qualitative Inorganic Analysis; By Denny, Jeffery.*
2. *Practical Pharmaceutical inorganic chemistry, By Beckett & Stenlake.*
3. *Inorganic Medicinal & Pharmaceutical Chemistry By Block & Roche.*
4. *Text book of Pharmaceutical Chemistry, By Chatten L.G.(Dekker series)*
5. *Textbook of Pharmaceutical analysis By Connors K.A.*
6. *Text book of Pharmaceutical Analysis by Dr. H. N. More*
7. *Indian Pharmacopoeia*
8. *Remington's Pharmaceutical Sciences.*

1.1.3 Biochemistry-I (Theory)

1. **Structure & functions of cell components of eukaryotes**

   Plasma membrane, cytoplasm, nucleus, mitochondria, endoplasmic reticulum, Golgi apparatus, ribosomes, lysozomes, peroxisomes.

2. **Cell membrane & transport mechanisms**

   Structure, composition, functions of membrane. Transport processes- Active, passive, facilitated transport.

3. **Carbohydrates**

   Definition, classification, functions, fundamental chemistry of carbohydrates, concept of ring structure & straight chain structure of common carbohydrates- Glucose, fructose, galactose, lactose, maltose, sucrose, starch, glycogen, cellulose, hyaluronic acid, heparin.

   Metabolic pathways- Glycolysis, TCA cycle, glucogenesis, glycogenolysis, pentose phosphate pathway, gluconeogenesis.

4. **Lipids**

   Definition, classification, structures, functions of lipids. Types of fatty acids and its biological role. Lipid metabolism- β-Oxidation of fatty acids, oxidation of unsaturated fatty acids. Biosynthesis of fatty acids (Arachidonic acid) & cholesterol.

5. **Election transport chain**

   Biological oxidation, redox potential, energy rich compounds, respiratory chain & oxidative phosphorylation

1.1.8 Biochemistry-I (Practical)

1. Qualitative tests for carbohydrates (6 samples)
2. Qualitative tests for lipids (4 samples).

References:

1. *Textbook of Medical biochemistry, By Dr. Rana Shinde.*
2. *Outlines of Biochemistry, E.E.Cohn and P.K.Stumpf*
3. *Biochemistry by Albert Lehninger*
4. *Harper's Biochemistry, By R.K.Murry.*
5. *Practical Biochemistry by David T. Plummer*
6. *Jayaraman J, Laboratory mannual in Biochemistry, Wiley Eastern Ltd.New Delhi.*

1.1.4 Anatomy Physiology & Health Education-I (Theory)

1. **Blood**

   Haemopoietic system, Composition and functions of blood, Blood groups and Hemolytic Disorder of Newborn, Haemoglobin and factors affecting Hb-Count, Mechanism of Hemostasis

2. **Lymph and Lymphatic system**

   Composition, formation and circulation of lymph, Anatomy of Lymph Node, Anatomy and Physiology of Spleen

3. **Cardiovascular system**

   Anatomy of heart, Anatomy of blood vessels, Conduction system and ECG, Cardiac cycle and Heart Sounds, Pulmonary and systemic circulation, Blood pressure and its regulation, Cardiac output and its regulation

4. **Respiratory System**

   Anatomy of respiratory organs and functions, Mechanism of pulmonary ventilation, Physiology of internal and external respiration, Regulation of Respiration, Respiratory volumes and vital capacity

5. **Digestive System**

   Anatomy and Functions of Gastro Intestinal Tract: Mouth, Esophagus, Stomach, Small intestine, Large Intestine, Rectum

   Anatomy and functions of Accessory organs: Salivary glands, Liver, Pancreas

   Digestion and absorption

6. **Health Education**

   Definition of Health and Health Education, Objectives of Health Education

1.1.9 Anatomy Physiology & Health Education-I (Practical)

1. **Microscopic study of permanent slides**
   - **a.** Epithelial tissue, connective, nervous and muscular tissue.
   - **b.** Blood smear, Blood vessels, spleen, pancreas, lungs, liver, stomach, intestine.
2. **Study of Models**

   Lymphatic system, Circulatory system, Respiratory system, Digestive system
3. Determination of total leukocyte count
4. Determination of total RBC count
5. Determination of differential leukocyte count

6. Estimation of hemoglobin content

7. Determination of bleeding time

8. Determination of clotting time

9. Determination of blood group

10. Study of Electrocardiogram

References:

1. *AB Mc Naught and Callander R., " Illustrated Physiology", B.I. Churchill Living Stone, New Delhi.*
2. *Anne Waugh and Allison Grant, "Ross and Wilson Anatomy and Physiology in Health and Illness", Churchill Living Stone, Edinburgh.*
3. *Arthur C. Guyton and John E. Hall, "Text book of Medical Physiology" W.B. Saunders Company.*
4. *Bhise S.B. and Yadav "Human Anatomy and Physiology", Nirali Prakashan, Pune (India).*
5. *C.C. Chatterjee, "Human Physiology" (Vol. I & Vol. II), Medical Allied Agency, Calcutta.*
6. *Chaudhry Sujit K., "Consise Medical Physiology", New Cenrtal Book Agency, Calcutta.*
7. *De Gruchy`s Clinical Haematology, "Clinical Haematology in Medical Practice, Blackwell Science publishers.*
8. *Elaine N. Marieb, "Human Anatomy and Physiology", Addison Wesley, New York.*
9. *Elaine N. Marieb, "Human Anatomy and Physiology", Benjamin / Cumings publishing company.*
10. *Gerard J. Torotora, "Principles of Anatomy and Physiology", John-Wiley & sons NewYork.*
11. *Inderbir Singh, "Text Book of Human Histology with Colour Atlas, Jaypee Brothers, New Delhi.*
12. *Park J.E. and Park K., "Preventive and Social Medicine", Banarasidas Bhanot, India.*
13. *Thakaore Bhai, P. Gandhi and Harit R., Derasari, " Elements of Human Anatomy Physiology and Health Education" B.S. Shah Publishers, Ahmedabad.*

.

1.1.5 Pharmacognosy-I (Theory)

1. Introduction, Definition, History, Scope of Pharmacognosy including Indigenous system of Medicine.
2. Study of different plant tissues- Parenchyma, Collenchyma, Sclerenchyma, Xylem, Phloem.
3. Morphology of Roots, Rhizomes, Barks, Woods, Leaf, Flowers, Seeds and Fruits.
4. Sources of crude drugs- Plant, Animal, Mineral and Marine.
5. Various system of classification of crude drugs.
6. Adulteration and Drug Evaluation by Pharmacopoeial Methods.
7. Cultivation, Collection, Processing and Storage of crude drugs.
8. Preparation of Herbarium sheets and its importance.

1.1.10 Pharmacognosy-I (Practical)

1. Study of Microscope.
2. Study of Morphological characters of crude drugs of plant, animal, mineral and marine sources. (Any two example for each source).
3. Study of plant tissues.
4. Study of Morphological and Histological characters of Ginger and Vasaka.
5. Drug evaluation experiments as per I.P./H.P. (Moisture content, Swelling factor, Ash value, Extractive value and Foreign Organic Matter)
6. Preparation of Herbarium sheet and visit to Botany Department in Herbarium section.

References:

1. *Indian Pharmacopoeia*
2. *Pharmacognosy: Tyler, Brady and Roberts (Lea Febiger)*
3. *Text Book of Pharmacognosy T.E. Wallis (CBS Pub. Delhi)*
4. *Text Book of Pharmacognosy, Trease & Evans (ELBS).*
5. *Text Book of Pharmacognosy - Kokate & Purohit - Pharmacognosy, (Nirali Publ).*
6. *Herbal pharmacopoeia – IDMA publication.*
7. *Ayurvedic formulary of India- Govt. of India publication.*
8. *Practical Pharmacognosy– C.K. Kokate.*
9. *Powdered Crude Drugs.– M. A. Iyengar.*
10. *Practical evaluation of Phytopharmaceuticals – Brain and Turner.*
11. *Anatomy of crude drugs- M. A. Iyengar.*

1.2.1 Pharmaceutics-II (Theory)

1. **Mixing and Homogenization**

   Mechanism of mixing, solid, semisolid and fluid mixing. Study of different type of mixers, Prevention of aeration and foams.

2. **Clarification and Filtration**

   Definitions, theory and factors influencing filtration rate, types of filter media, filter aids and selection of filters. Study of different types of filters: filter press, plate and frame filter, disc filter, edge filter, drum vacuum filter, precoat pressure filter, cartridge filter, Hydro extractors (Basket centrifuge).

3. **Powders and Granules**

   Formulation and evaluation of various powders and granular products like dusting powder, oral rehydration and dry syrup formulations, talcum powder, tooth powders. Methods of granulation

4. **Size reduction**

   Factors influencing size reduction, Study of different types of mills: cutting mill, Ball mill, hammer mill, roller mill, fluid energy mill, colloid mill, selection of mill.

5. **Equipments used for manufacturing of liquids.**

6. **Surgicals**

   Introduction, types of surgical ligatures and sutures, preparation, sterilization, standards and quality control tests. Introduction to surgical dressings and bandages

1.2.7 Pharmaceutics-II (Practical)

1. **Powder preparations:**
   a) Oral rehydration powder
   b) Dry syrup for reconstitution
   c) Talcum powder
   d) Tooth powder
   e) Effervescent granules
   f) Eutectic mixture
2. **Liquid preparations**
   a) Syrups: simple and artificial.
   b) Elixirs
3. **Semisolid preparations:** any two preparations

4. Demonstration of equipments

a) Size reduction

b) Mixing and homogenization

c) Clarification and Filtration

References:

1. *B.M. Mittal: Textbook of Pharmaceutical Formulation, 4th Edition, Vallabh Prakashan, Delhi.*
2. *Banker and Rhodes. Modern Pharmaceutics, 4th ed 2002 Marcel Dekker Inc.*
3. *Disperse Systems, Vol. I, II, III, M. Decker.*
4. *E.A.Rawlins: Bentley's Textbook of Pharmaceutics, University Printing House, Oxford, 1988.*
5. *James Swarbrick and James C. Boylan: Encyclopedia of pharmaceutical Technology, Marcel Dekker Inc. New York.*
6. *L. Lachman, H. A. Lieberman and J. L. Kaing: The Theory and practice of Industrial Pharmacy, Vargheese Publishing House, Mumbai, 1987.*
7. *M. E. Aulton: Pharmaceutics, Science of Dosage Form Design.*
8. *Martin: Physical Pharmacy, Varghese Publishing House, Mumbai, 1991.*
9. *Pharmaceutical Dosage Forms and Drug delivery systems 7th Ed. Ansel, Lippincott Williams and Wilkins, PA, 1999.*
10. *Remington's "The Science and Practice of Pharmacy", 20th Ed; 2000, Lippincott. Williams and Wilkins.*

1.2.2 Modern Dispensing & Hospital Pharmacy Theory

1. **Prescription**

   Definition, Parts and types of prescription, Handling of Prescription, Source of errors, Introduction to commonly practiced Latin terms in Prescription, overview of Incompatibilities in Prescription.

2. **Pharmaceutical Calculations**

   Posology; Factors influencing dose, calculation of child dose, Proportional calculations, Percentage calculations, allegation method, Isotonic solutions, Proof spirit, Displacement value.

3. **Compounding and Dispensing**

   Solution, Suspension, Emulsion, Lotion, Liniment, Cream, Ointment and Powder

4. **Hospital Pharmacy**

   Organisation of Hospital and Hospital Pharmacy, Hospital Pharmacist, Pharmacy Therapeutic Committee, Hospital Formulary, Purchase and inventory control, Drug distribution in hospital and OTC counter, Drug Information Services and Bulletin

1.2.8 Modern Dispensing & Hospital Pharmacy (Practical)

1. **Orientation of dispensing and compounding**

   Introduction to the laboratory equipment, weighing methodology precision of weighing and error evaluation, mixing, filtration, various devices used for accurate dosage measurements, general instructions.

2. **Concept of modern dispensing practice**

   Handling of prescription, Prescription reading and reviewing

3. **Patients Counseling**

   Steps involved Patient counseling aids: Medication record, Pictograms, Product information leaflets. Patient counseling about diseases and medicines: Acidity, Diabetes, Asthma, Hypertension, OTC medicines, Computerized dispensing services.

4. **Compounding and Dispensing**

   Solution, Suspension, Emulsion, Lotion, Liniment, Cream, Ointment and Powder

5. **Incompatibilities in Prescription-** Physical & Chemical

References:

1. *Prescription pharmacy - sprowls*
2. *Dispensing for pharmacy students - Cooper & Gunn*
3. *Pharmaceutical practice - Collet & Alton*
4. *Dispensing of medication – Hoover*
5. *Modern Dispensing Pharmacy by A.P. Pawar. & R.S. Gaud , Career Publication*
6. *The extra pharmacopoeia - Martindale*
7. *Remingtons Pharmaceutical calculations - Bradly*
8. *Remingtons Pharmaceutical calculations - Joel L. Zatz.*
9. *Remingtons Pharmaceutical sciences.*

1.2.3 Organic Chemistry-I (Theory)

1. Chemical bond, atomic orbital, molecular orbital, hybrid orbital, unshared pair of electrons, polarity of bonds, polarity of molecules and intermolecular forces.
2. Inductive effect, resonance effect, electromeric effect, hyperconjugation and steric effect.
3. **Reaction intermediates**

   Carbocations, carbanions, carbenes and free radicals (Structure, generation, stability and reactions).
4. **Acids and Bases-** Theories, factors affecting strengths of acids and bases
5. **IUPAC nomenclature**
6. **Alkyl halides**

   General methods of preparations and reactions. SN_1 and SN_2 reaction with mechanism. Factors affecting necleophilic substitution reactions
7. **Alkenes**

   General methods of preparations & reactions. E_1 and E_2 elimination reaction with mechanism. Saytzeff, Hofmann, Markovnikov's and anti-Markovnikov's rules.

   Definition, types, method of preparations and reactions of dienes.
8. **Alkynes**

   General methods of preparations and reactions.
9. **Alcohols & ethers**

   Alcohols- General methods of preparations & reactions, qualitative tests for alcohols.

   Ethers- General methods of preparations and reactions.

1.2.9 Organic Chemistry-I (Practical)

1. Hazards & safety in chemistry laboratory.
2. Qualitative analysis of organic compounds & their derivatization. (Ten Compounds)
3. Separation of organic binary mixtures. (Five mixtures)

References:

1. *Advanced Organic Chemistry, Ed. 4– Jerry March.*
2. *Fundamentals of Organic Chemistry Vol. I & II Finar I.L.*
3. *Organic Chemistry by Pine*
4. *Advanced Organic Chemistry by Solomans*
5. *Organic Chemistry : Morrison & Boyd*
6. *A Guidebook to reaction mechanism in Organic Chemistry: Peter Sykes*
7. *Advanced Organic Chemistry: Bahl B.S. & Bahl A.*
8. *Organic Chemistry by Jain M.K.*
9. *Reaction Mechanisms and Reagents: Gurudeep Chatwal.*
10. *Vogel's Textbook of practical organic chemistry*
11. *Practical Organic Chemistry- Mann and Saunders*
12. *Qualitative Analysis in Organic Chemistry-Nadkarni V.V. and Fernades P.S.*
13. *A Laboratory handbook of Organic qualitative analysis and separations-Kulkarni V.S. and Pathak S.P.*

1.2.4 Biochemistry- II (Theory)

1. **Amino acids & protein**

   Amino acids- Structure, classification, physicochemical properties, essential & non-essential amino acids.

   Protein- Definition, classification, biological functions of proteins.

   Primary, secondary, tertiary & quaternary structure of proteins.

   Determination of primary structure of protein. Protein denaturation.

   Protein metabolism- Decarboxylation of amino acids, transamination (SGOT & SGPT), Deamination, ammonia metabolism, urea cycle

2. **Protein biosynthesis**

   Diagrammatic presentation of protein biosynthesis: initiation, elongation, termination, role of DNA & different types of RNA.

3. **Nucleotides & nucleic acids**

   Nucleotides, DNA & RNA structure, biochemical functions, replication, genetic code, gene, genome.

4. **Enzymes & coenzymes**

   Definition, classification, functions of enzymes. Mechanism of enzyme action, enzyme specificity, enzyme kinetics, factors affecting enzyme activity.

   Enzyme inhibition- Reversible, irreversible, Allosteric.

   Enzyme induction & repression, isoenzyme, Feedback regulation.

   Coenzymes and cofactors.

5. **Vitamins**

   Definition, classification, structure, sources, daily requirements, biochemical role, and deficiency.

1.2.10 Biochemistry-II (Practical)

1. Qualitative test for amino acids & proteins (6 samples)
2. Isolation of casein from milk.
3. Activity of enzymes.

***References*:**

1. *Textbook of Medical biochemistry, By Dr. Rana Shinde.*
2. *Outlines of Biochemistry ,E.E.Cohn and P.K.Stumpf*
3. *Biochemistry by Albert Lehninger*
4. *Harper's Biochemistry, By R.K.Murry.*
5. *Practical Biochemistry By David T. Plummer*
6. *Jayaraman J, Laboratory mannual in Biochemistry, Wiley Eastern Ltd.New Delhi.*

1.2.5 Anatomy Physiology & Health Education-II (Theory)

1. **Urinary system**

   Anatomy of urinary system and gross structure of the kidney, Functions of kidney, Structure of nephron and juxta-glomerular apparatus, Physiology of urine formation, Renin-Angiotensin system, Acid base balance.

2. **Skeletal muscles**

   Histology, Physiology of muscle contraction, Physiological properties of skeletal muscle performance, Sports Physiology

3. **Nervous systems**

   Definitions and classification of nervous system,

   Central Nervous System

   - Functional areas and functions of cerebrum
   - Cerebellum
   - Pons and medulla
   - Thalamus and hypothalamus
   - Basal ganglion
   - Spinal cord: structure and reflexes-mono-poly-plantar
   - Cranial nerves-names and functions

   Autonomic Nervous System-anatomy and functions of sympathetic and parasympathetic nervous system.

4. **Endocrine system**

   Pituitary gland, Adrenal gland, Thyroid, Parathyroid gland, Pancreas, Gonads: Testis and ovary

5. **Reproductive system**

   Anatomy of Male reproductive system,

   Physiology of Spermatogenesis

   Anatomy of female reproductive system

   Physiology of oogenesis and menstruation

   Sex determination (genetic basis)

   Pregnancy and its maintenance and parturition

6. **Sense organs**

   Structure and functioning of eye, ear, skin, nose and tongue.

7. **Communicable and non communicable diseases**

Communicable diseases: Causative agents modes of transmission, symptoms, treatment and prevention of Tuberculosis, Chicken Pox, Small Pox, Measles, Mumps, Rubella, Influenza, Rabies, Diphtheria, Whooping Cough, Tetanus, Hepatitis, Cholera, Typhoid, Malaria, Filariasis, Kala Azar, Syphilis, Gonorrhea, AIDS.

Non communicable diseases: Definition, types, causes, symptoms and prevention of Diabetes mellitus, Hypertension, Cancer, and Heart Diseases- Angina Pectoris, Atherosclerosis, Myocardial infarction, Cardiac Arrhythmia & Congestive Heart Failure.

1.2.11 Anatomy Physiology & Health Education–II Practical

1. **Study of Histological Slides**

   Microscopic study of permanent slides of Nephron, spinal cord, cerebrum, cerebellum, thyroid, testes, ovary, Tongue
2. **Study of Models**

   Different models covering Urinary system, Male Reproductive system, Female Reproductive system Nervous system, Sense organs etc
3. **Study of Family Planning Devices**

   Family planning devices like Condoms, Diaphragm, Copper-T, Foam Tablets, Contraceptive Pills, etc.
4. **Osteology** - Study of bones of the human skeletal system
5. Blood Pressure measurement
6. Measurement of vital capacity by Spirometer.
7. Qualitative analysis of normal constituents of urine

References:

1. *AB Mc Naught and Callander R., " Illustrated Physiology", B.I. Churchill Living Stone, New Delhi.*
2. *Anne Waugh and Allison Grant, "Ross and Wilson Anatomy and Physiology in Health and Illness", Churchill Living Stone, Edinburgh.*
3. *Arthur C. Guyton and John E. Hall, "Text book of Medical Physiology" W.B. Saunders company.*
4. *Bhise S.B. and Yadav "Human Anatomy and Physiology", Nirali Prakashan, Pune*

(India).

5. *C.C. Chatterjee, "Human Physiology" (Vol. I & Vol. II), Medical Allied Agency, Calcutta.*
6. *Chaudhry Sujit K., "Consise Medical Physiology", New Cenrtal Book Agency, Calcutta.*
7. *De Gruchy`s Clinical Haematology, "Clinical Haematology in Medical Practice, Blackwell Science publishers.*
8. *Douglas E., Kelly, Richard Wood and Allen C. Enders, "Bailey`s TextBook of B.Pharm. Sci.*
9. *Microscopic Anatomy", Williams and Wilkins publishers, London.*
10. *Elaine N. Marieb, "Human Anatomy and Physiology", Addison Wesley, New York.*
11. *Elaine N. Marieb, "Human Anatomy and Physiology", Benjamin / Cumings publishing company.*
12. *Gerard J. Torotora, "Principles of Anatomy and Physiology", John-Wiley & sons New York.*
13. *Inderbir Singh, "Text Book of Human Histology with Colour Atlas, Jaypee Brothers, New Delhi.*
14. *Park J.E. and Park K., "Preventive and Social Medicine", Banarasidas Bhanot, India.*

1.2.6 Communicative Skills in English (Theory)

1. Role and importance of communication, Verbal and non-verbal communication, Group communication, effective communication, barriers to communication, communication media, participating in discussions, conduct of seminars, conferences etc., making presentations through collection, evaluation, organizing the information, interacting with learners and teachers, Role of wit and humor in communication.

2. Spoken English Vs Written English, reading method, formal /informal English (one way /two way); British/American/Indian English; how to introduce one self and others; how to tender apology; how to thank in different ways; greetings, some polite expressions; agreement and disagreements; how to use a dictionary; how to use a thesaurus; vocabulary development; synonyms and antonyms; one word substitutes; comprehension.

3. Communication through letters; official and personal letters; letters of complaint; letters of enquiries; and responses; writing memos, circulars and notices; what to avoid while writing; paragraph writing; scientific/technical report writing; drafting and delivering a speech, resume writing and interview techniques.

4. Grammar: Sequence of tenses, voice, articles, direct and indirect speech; degrees of comparison; common errors in English made by Indian learners of English. Concepts of learning and listening: types and methods of learning and listening; learning and listening of knowledge, attitudes, skills, and practices.