

Second Year	Semester III		Semester IV	
<b>4 Credits</b>	<i>201:Biophysics &amp; Instrumentation</i>		<i>204:Advance Techniques</i>	
	Unit 1:	Water, pH, Buffers, pH meter	Unit 1:	Microscopy
	Unit 2:	Adsorption, Viscosity, S.T, osmosis, Donan Equilibrium	Unit 2:	Centrifugation & cell fractionation
	Unit 3:	Chromatography & Electrophoresis	Unit 3:	Radioisotopes & measurements
	Unit 4:	Colorimeter, Spectrophotometer. Spectrofluorometer	Unit 4:	Analysis of Biochemical data (Biostatistics)
	<i>202:Cell biology &amp; Physiology</i>		<i>205: Advance Physiology</i>	
<b>4 Credits</b>	Unit 1:	Cell biology	Unit 1:	Respiratory system
	Unit 2:	Tissues (epithelial, connective, muscle, nerve)	Unit 2:	Digestive system
	Unit 3:	Physiological Chemistry	Unit 3:	Excretory system
	Unit 4:	Circulatory system	Unit 4:	<b>Blood</b>
<b>2.5 credits</b>	<i>203: Practical</i>		<i>206: Practical</i>	
<b>2 credits</b>	<i>Sub Elective: 201</i>		<i>Sub Elective: 202</i>	

## Semester IV

### *204: Adv. Techniques*

*(4 credits)*

#### **Unit 1: Microscopy**

Definitions, Relationship between Magnification, Numerical Aperture, Angular Aperture, Resolving Power and Limit Of Resolution, Phase Contrast Microscopy  
 Path of Light, study of Important Lens Systems, Objective Lens System, Condenser Lens System, Ocular Lens System, Dark Field Microscopy, Fluorescent Microscopy, TEM, SEM,  
**Steps In** Preparation of Samples for Electron Microscope

#### **Unit 2: Centrifugation**

Principle of Sedimentation, Factors affecting Sedimentation  
 Types of Rotors used in Centrifuges, Separation Methods in Different Rotors  
 Preparative Centrifuges: Differential Centrifugation, Sub Cellular Fractionation, Density Gradient Centrifugation, Applications, Preparation of Gradients, Sample Collection Methods, Zonal Rotors  
 Analytical Centrifuges: Ultracentrifugation, Working and Applications  
 Care and Maintenance of Centrifuges

### **Unit 3: Radioactivity**

Radioactive Decay, Units of Radioactivity

Measurement of Radioactivity Based On Ionization, Design and Working of GM Counters

Measurement of Radioactivity Based On Scintillation, Design and Working of Scintillation Counters

Measurement of Radioactivity: Autoradiography

Applications of Radioactivity/Radioisotopes in Biological Sciences

Hazards of Radioactivity

### **Unit 4: Analysis of Biochemical Data (Biostatistics)**

Sampling Methods, Representation of Data (Tally, Histogram, Frequency Polygons, Pie Chart Etc)

Measures of Central Tendency (Mean, Median, Mode) & Applications in Biological Research

Measures of Deviation (Range, MD, SD and Coefficient of Variation) & Applications in Biological Research

Normal Distribution, Standard Error

### **Ref:**

1. Berg JM, and Tymoczko TJ, Stryer L,: Biochemistry (6<sup>th</sup> ed)
2. Daniel, C Harris: Quantitative Chemical Analysis
3. David Freifelder: Physical biochemistry (2<sup>nd</sup> ed) WH Freeman, USA)
4. Donald Voet and Voet J: Biochemistry (4<sup>th</sup> ed) 2011
5. Ghatak KL: Techniques and methods in Biology. PHI learning Pvt Ltd. 2011
6. Nelson DL and Cox MM: Lehninger's Principles of Biochemistry (5<sup>th</sup> ed) 2008
7. Oser: Hawks Physiological Chemistry (4<sup>th</sup> ed) 1965.
8. Upadhyay and Nath: Biophysical chemistry: Principles and Techniques (3<sup>rd</sup> ed)
9. West and Todd: Text book of biochemistry ((4<sup>th</sup> ed) 1970
10. Wharton and McCarty: Experiments and methods in Biochemistry
11. Willard and Merrit: Instrumental methods of analysis (4<sup>th</sup> ed) 1971.
12. Wilson K and Walker J: Principles and Techniques of Biochemistry and Molecular Biology (6<sup>th</sup> ed) 2006. Cambridge University Press.

## Semester IV

### 205: *Advanced Physiology*

(4 credits)

#### **Unit 1: Respiratory System**

Respiratory Unit, External And Internal Respiration, **Definitions TV, RV, IRV, ERV Vital Capacity & RQ.**

Diffusion of Gases, Factor affecting the Diffusion of Gases, Transport of Gases, Saturation Curve of Haemoglobin, Bohr's Effect, Chloride Bicarbonate Shift, Role of Lungs in Maintaining Acid Base Balance, Acidosis and Alkalosis

#### **Unit 2: Digestive System**

Anatomy of GI Tract and its Function, Types of Digestive Glands, Digestion in Oral Cavity, Stomach and Intestine.

Composition, Secretion and Regulation of Saliva, Gastric Juice, Pancreatic Juice, Intestinal Juice, & Bile

Digestion, Absorption, and Role of Various Hormones and Enzymes in Carbohydrates, Proteins and Lipids, Role of Bile Salts in Lipid Digestion and Absorption, Formation of Faces, Intestinal Putrefaction, Fermentation.

#### **Unit 3: Excretory System**

Structure and Functions of Kidney, Structure of Nephron, Normal and Abnormal Constituents of Urine, Mechanism of Urine Formation, Function of Glomerular Membrane, GFR, T<sub>max</sub>

Structure, Function & Characteristics of Tubules, Tubular Load, Plasma Clearance, Threshold Substances, Filtration Pressure, Selective Reabsorption, Selective Secretion, Active and Passive Transport of Sugars, Amino Acids, Urea, and Creatinine, Role of Kidneys in maintaining Acid Base Balance .

Acid Base Balance: Acidification and Ammonia Formation, Role of Aldosterone, ADH

#### **Formation of Dilute & Concentrated Urine**

#### **Unit 4: Blood**

Functions of Blood, Composition of Blood, Functions of Plasma Proteins.

Cells:

Normal Count, Variation of RBC, Morphology and functions of RBC. ESR.

Functions and Properties of Haemoglobin.

Classification of WBC, Differential Count, Variations, Composition and Functions.

Definitions-Stem Cells and Haematopoiesis (Show The Flowchart Only)

Composition and Functions of Platelets, Normal Count, and its Variations.

Mechanism of Blood Coagulation, Intrinsic and Extrinsic Pathways of Blood Clotting, Fibrinolytic System, Importance of Coagulation. Just List And Name The Blood Clotting Factors.

Blood Groups and Grouping Systems (ABO Rh, MN), Clinical Importance of Blood Groups, HDN and Hazards of Incompatible Blood Transfusion, Importance of Blood Group Studies.

**Ref:**

1. Best And Taylor: Physiological Basis Of Medical Practice
2. Bhagavan NV: Medical Biochemistry (4<sup>th</sup> ed), Jones and Bartlett Publishers
3. Charterjee: Human Physiology Vol. 1 and 2.
4. Chatterjee and Shinde: Text book of Medical Biochemistry
5. Das AK: Human Physiology
6. Ganong WF: Review of Medical Physiology (12<sup>th</sup> ed). Lange Medical Publishers
7. Guyton AG and Hall JE: Text book of Medical Physiology (11<sup>th</sup> ed) Harcourt Asia.
8. Murray RK, Granner DK, Mayes PA and Rodwell, VW: Harper's Biochemistry (25<sup>th</sup> ed) 2000, Prentice Hall publishers.
9. Sherwood: Human Physiology (5<sup>th</sup> ed) 2004
10. Talwar PC: Text book of Biochemistry and Human Physiology
11. Tortora G and Grabowski SR: Principles of Anatomy and Physiology (10<sup>th</sup> ed) 2003. John Wiley and sons.

**206: Practicals****(2.5 credits)****Duration: 3hr****Marks: 100****Total 60 hrs**

1. Introduction to centrifuge and its use in separation of molecules.(A/G method of separation of globulin from serum)
2. Data collection and its statistical analysis (problem solving eg, Mean, **Median, Mode** & standard deviation).

**Haematology practicals**

3. Hb estimation by Sahli's method
4. Bleeding time and clotting time by capillary tube method
5. Determination of PCV or Hematocrit (Demonstration)
6. RBC count
7. Total WBC count
8. Differential WBC count
9. Blood group determination
10. E.S.R (Demonstration)

**Qualitative analysis of urine.**

11. Examination of physico-chemical properties of urine.
12. Examination of normal or physiological constituents of urine.
13. Examination of abnormal or pathological urine samples.

**Other practicals**

14. Qualitative test for starch digestion by amylase.
15. Extraction of lipid from oil seeds by Soxhlet method.(ground nuts)
16. Separation of plant alkaloids by TLC.(Curcuma longa, turteric).
17. Estimation of Urea by DAMO method.
18. Estimation of Creatinine by alkaline picrate method.
19. Estimation of sugar by Folin-Wu method.
20. Literature Survey (for selected students)

**Ref:**

1. Oser: Hawk's Physiological Chemistry (14<sup>th</sup> ed)
2. Plummer: An introduction to practical Biochemistry
3. Sheela Sharma: Experiments and Techniques, 2007.
4. Thomas and Schalkhammer: Analytical Biochemistry, 2002
5. Varlery H: Practical Clinical Biochemistry
6. Whatton and McCarty: Experimental methods in Biochemistry
7. Willard and Merrit: Instrumental methods of analysis.

## IMPORTANT INSTRUCTIONS

1. Each theory paper comprises of four units. Each unit carries equal marks.
2. In all theory question papers each question will correspond to each unit as per sequence of units in syllabus.
3. The question will have internal option. The last question i.e. Q5 will be comprised of all units. There will be short questions of either ONE / TWO marks.
4. In order to qualify to appear in the university practical examination, the student must have performed 80% of the practical syllabus during the entire semester & submit his/her duly certified journal during the examination