REVISED SYLLABUS OF BIOCHEMISTRY :

CBCS PATTERN FOR SEMISTER III AND SEMISTER IV

FROM ACADEMIC YEAR 2017- 2018

Second Year	Semester III		Semester IV	
4 Credits	*201:Biophysics & Instrumentation*		*204:Advance Techniques*	
	Unit 1:	Water, pH, Buffers, pH meter	Unit 1:	Microscopy
	Unit 2:	Adsorption, Viscosity, S.T, osmosis, Donnan	Unit 2:	Centrifugation & cell fractionation
	Unit 3:	Chromatography & Electrophoresis	Unit 3:	Radioisotopes & measurements
	Unit 4:	Colorimeter, Spectrophotometer. Spectroflurimeter	Unit 4:	Analysis of Biochemical data (Biostatistics)
	202:Cell biology &Physiology		*205: Advance Physiology*	
4 Credits	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:	Blood
2.5 credits	*203: Practical*		*206: Practical*	
2 credits	*Sub Elective: 201:*		*Sub Elective: 202:*	

Semester III
201: Biophysics & Instrumentation (4 credits)

Unit 1: Water, pH, Buffers, pH meter

Properties of water, Water a biological solvent, self Ionization of water: Kw and pKw. Acid, base, Ampholyte, pH, pOH, pKa, Weak and Strong Acids, Physiological importance of pH.

Buffers, Buffer Action, Buffer Capacity, Henderson – Hasselbalch equation, its limitations and uses, Laboratory Use Of Buffers, Physiological Importance Of Buffers In Body Fluids and Tissues.

Measurement of pH: Indicators, pH meter, Different Types Of Electrodes, Advantages And Disadvantages Of Different Electrodes, Principle, Working, Application, Factors Affecting Ph Determination

Unit 2: Biophysics

Definition of Viscosity, Poiseuille's Equation, Unit of Viscosity, Relative Viscosity and its Determination, Factors Affecting Viscosity, Physiological Importance.
Definition & Principle of Adsorption, Types of Adsorption, Factors affecting Adsorption, Physiological Importance Of Adsorption

Definition & Principle of Surface Tension, ST & Its Relation To Surface Energy& Surface Area, Methods To Determine ST, Factors Affecting Surface Tension, Gibbs – Thomson Principle, Physiological Importance Of ST.

Definition & Explanation Of Osmosis & Osmotic Pressure, Van't Hoff's Laws of Osmotic Pressure, Measurement of Osmotic Pressure (Pfeffer's, Method),Units, Mechanism of Osmotic Pressure, Counter Current Distribution, Distribution of Solutes between two Immiscible Solvents, Physiological Importance of Osmotic Pressure.
Donnan Membrane Equilibrium and its Relation to Osmotic Pressure, Membrane Hydrolysis, Importance of DM Equilibrium in Tissue Fluids.

Unit 3: Chromatography & Electrophoresis

Principle, Technique, Applications, Advantages and Disadvantages Of: Paper Chromatography (Ascending, Descending) Adsorption Chromatography Thin Layer Chromatography, Ion Exchange Chromatography, Gel Filtration Chromatography, Affinity Chromatography,, HPLC, GLC,
Principle, Technique, Factors affecting, Detection, Applications, Advantages and Disadvantages of Gel Electrophoresis (PAGE, SDS PAGE, Agarose, Cellulose Acetate) Detection Methods (Staining, Densitometer)
Isolectrofocusing Electrophoresis, 2D Electrophoresis (Only Principle).

Unit 4: Colorimeter, Spectrophotometer & Spectrofluorometer

Beer-Lamberts Law, Derivation, Principle, Parts & Working of a Single Cell Colorimeter, & Double Cell Colorimeter.
Monochromators: Filters, Diffraction Grating, Prisms.
Principle, Parts and Working of Spectrophotometer and Spectrofluorometer
Applications, Merits and Demerits of: Colorimeter, Spectrophotometer and Spectrofluorometer.

Ref:

1. Berg JM, and Tymoczko TJ, Stryer L,: Biochemistry (6^{th} ed)
2. Daniel, C Harris: Quantitave Chemical Analysis
3. David Freifelder: Physical biochemistry (2^{nd} ed) WH Freeman, USA)
4. Donald Voet and Voet J: Biochemistry (4^{th} 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^{th} ed) 2008
7. Oser: Hawks Physiological Chemistry (4^{th} ed) 1965.
8. Upadhyay and Nath: Biophysical chemistry: Principles and Techniques (3^{rd} ed)
9. Van Holde KE: Physical Biochemistry. Prentice Hall, NJ.
10. Vogel AI: A text book of quantitative inorganic analysis (3^{rd} ed), 1975.
11. West and Todd: Text book of biochemistry ((4^{th} ed) 1970
12. Wharton and McCarty: Experiments and methods in Biochemistry
13. Willard and Merrit: Instrumental methods of analysis (4^{th} ed) 1971.
14. Wilson K and Walker J: Principles and Techniques of Biochemistry and Molecular Biology (6^{th} ed) 2006. Cambridge University Press.

Semester III
202: Cell biology &Physiology (4 credits)

Unit 1: Cell Biology

Structure, Composition and Functions of Plant and Animal Cell Organelles:
Cell Wall, Plasma Membrane, Endoplasmic Reticulum, Chloroplasts,
Mitochondria, Lysosomes, Golgi Bodies, Ribosomes, Nucleus, Peroxisomes, Glyoxysomes,
Cytosol. Localization of Enzymes in Organelles, Comparison of Prokaryotic and Eukaryotic Cells. Cell Fractionation methods to study Cell Organelles.

Unit 2: Tissues (Epithelial, Connective, Muscle, Nerve)

Epithelial Tissue, Structure of Sarcomere, Proteins Present in Muscle, Muscle Contraction, Sliding Filament Theory, Regulation and Role of Hormones and Calcium in Muscle Contraction

Structure and Functions of Nerve and Glial Cells, Action Potential and Nerve Conduction, Chemical and Electrical Synapses, Reflex Action, Neurotransmitters : Acetyl Choline, norepinephrine (noradrenaline; NE, NA)

Structure of Bone, Inorganic and Organic Phase, (Collagen), Bone Cells,
Bone Mineralization, Factors affecting Bone Remodeling, Bone Deformities.

Unit 3: Physiological Chemistry

Hormones: Introduction & Mechanism of Hormone Action (Gene Activation, Camp).
Pancreatic (Insulin & Glucagon) & Thyroid Hormones.
Vitamins as Coenzymes (B Complex) Functions of Vitamin C
Structure of Vitamins & Coenzymes, Dietary Sources, Name of the Deficiency Diseases, Role of the Coenzyme in Enzyme Catalyzed Reaction with an example**.**

Unit 4: Circulatory System

Structure And Functions of Heart, Pulmonary and Systemic Circulation, Rhythmicity of Heart & Junctional Tissues, Cardiac Cycle, Heart Sounds, Blood Pressure, Factors affecting Blood Pressure & Its Significance, Heart Rate, Factors affecting Heart Rate, Cardiac Output, ECG,.

Ref:

1. Best and Taylor: Physiological basis of Medical practice
2. Bhagavan NV: Medical Biochemistry (4th 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 (12th ed). Lange Medical Publishers
7. Guyton AG and Hall JE: Text book of Medical Physiology (11th ed) Harcourt Asia.
8. Murray RK, Granner DK, Mayes PA and Rodwell, VW: Harper's Biochemistry (25th ed) 2000, Prentice Hall publishers.
9. Sherwood: Human Physiology (5th ed) 2004
10. Talwar PC: Text book of Biochemistry and Human Physiology
11. Tortora G and Grabowski SR: Principles of Anatomy and Physiology (10th ed) 2003. John Wiley and sons.

203: Practicals *(2.5 credits)*

Duration: 3hr **Marks: 100** **Total 60 hrs**

Experiments involving colorimeter

1. Sugar estimation by Nelson Somogyi method
2. Estimation of cholesterol by Zlatki's method.
3. Protein estimation by Folin-Ciocalteau method
4. Estimation of Uric acid by phosphotungstic method.
5. Estimation of Iron by 2,2 dipyridyl method
6. Estimation of Phosphorus by Fiske-Subbaroa method.

Experiments involving Biophysics & Instrumentation

7. Electrophoresis of serum proteins(demonstration)
8. SDS-gel electrophoresis. (demonstration)
9. Study of Absorption Spectra of coloured compound. (demonstration)
10. Paper chromatography for separation of simple sugars.
11. Paper chromatography for separation of amino acids.
12. Column chromatography for separation of plant pigments.
13. Thin layer chromatography for amino acids.
14. Viscosity measurement of oils. (Any two oils)
15. pH measurements & Numericals based on pH.
16. Preparation of buffer & Numericals based on buffer.

Titration

17. Estimation of sugar from Urine by Benedict's method.
18. Estimation of Vitamin C from Lemon.

Ref:

1. Oser: Hawk's Physiological Chemistry (14th 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.