ANNEXURE – I

Curriculum

(i) GOAL:

The broad goal of the teaching of undergraduate students in Biochemistry is to make them understand the scientific basis of the Life processes at the molecular level and to orient them towards the application of the knowledge acquired in solving clinical problems,

(ii) OBJECTIVES:

(a) KNOWLEDGE:

At the end of the course the student shell be able to:

(1) Describe the molecular and functional organization of a cell and list its subcellular components;
(2) Delineate structure, function and inter-relation ships of bimolecular and consequences of deviation from normal;
(3) Summarize the fundamental aspects of enzymology and clinical application wherein regulation of enzymatic activity is altered.
(4) Describe digestion and assimilation of nutrients and consequence of malnutrition;
(5) Integrate the various aspects of metabolism and their regulatory pathways;
(6) Explain the biochemical basis of inherited disorders with their associated sequel;
(7) Describe mechanisms involved in maintenance of body fluid and pH homeostasis;
(8) Outline the molecular mechanisms of gene expression and regulation, the principles of genetic engineering and their application in medicine;
(9) Summarize the molecular concept of body defenses and their application in medicine;
(10) Outline the biochemical basis of environmental health hazards, biochemical basis of cancer and carcinogenesis;
(11) Familiarize with the principles of various conventional and specialized laboratory investigations and instrumentation analysis and interpretation of a given data;
(12) Suggest experiments to support theoretical concepts and clinical diagnosis.

(b) SKILIS:

At the end of the course, the student shall be able to :

(1) Make use of conventional techniques/instruments to perform biochemical analysis relevant to clinical screening and diagnosis;
(2) Analyze and interpret investigative data;
(3) Demonstrate the skills of solving scientific and clinical problems

(c) INTEGRATION

The knowledge acquired in biochemistry shall help the students to integrate molecular events with structure and function of the human body in health and disease.

(d) CURRICULUM

(A)Theory

1. Cell : Structural and functional unit of life. Cell organelle structure; significance and isolation. Structure of cell membrane and membrane transport mechanisms
2. Water : Body, water, compartments of body fluid composition and measurement, Water and electrolyte balance of the body. The concept of pH, blood buffers, mechanism of action of maintenance of acid-base balance.
3. Osmosis : Osmotic pressure applications. Colloid and crystalloids, Colloidal osmotic pressure applications. Dialysis. Donnan membrane equilibrium, surface tension Viscosity; applied aspects.
4. Modern techniques in biochemistry-Photoelectric colorimetry, spectrophotometry; electrophoresis and chromatography & uses of radioactive isotopes.
5. Carbohydrates :
   General biochemistry, Classification-monosaccharides, amino sugar, uronic acids, sugar phosphates, glycosides,

6. Proteins:
   proteins-classification, structure, properties, plasma proteins, immunoglobulin, hemoglobin, isolation of proteins. Separation of proteins.
7. Lipids :
   General biochemistry, classification of lipids-fatty acids, prostaglandins, properties of fatty acids. Fats and oils. Tests for purity of fat and oil. Separation of fats and fatty acid. Rancidity of fats; antioxidants.

Phosoholirids-Classification, site of occurrence and significance. Glycolipids, sulpholipids, Lipoproteins. Sterols and cholesterol.

8. Enzymes :
   Definition, classification, properties, extraction. Factors affecting enzyme action, mechanism of enzyme action, coenzymes, cofactors. Enzyme inhibitions- competitive, noncompetitive, allosteric and feedback inhibitions. Isoenzymes. Clinical enzymology.
9. Nucleoproteins :
   Nucleoproteins, nucleotides. Naturally occurring free nucleotides, synthetic nucioprotein made nucleoside, analogs for medical use.
10. Biochemical genetics : Nucleic acid structure and function- DNA, m- PNA, t-RNA and r-RNA, DNA organization and replication, Chromatin. Histones , Non histones. Introexons, DNA synthesis and replication ,DNA polymerase. Degradation and repair of DNA,DNA,recombinant technology and restriction endonuclease.

    RNA synthesis technology and processing. DNA depen lent RNA polymerase and transcription heterogeneous nuclear RNA, transcription signals. Nucleases.
    Genetic Code (Codons) – characteristics and properties. Protein synthesis t-RNA function and anticodons translation of m – RNA initiation, elongation and termination. Post translational processing inhibitors synthesis. Mutation. Regulation of gene expression, Immunoglobin gene rearrangement. Gene amplification. Transcription control.

11. Vitamins :
    Introduction
    Vitamins – water soluble and fat soluble : sources, functions, daily requirement, deficiency diseases, hypervitaminosis.

12. Biological oxidations : Biological oxidations electron transport chain and oxidative phosphorylation in vitro. Nitochondrial inhibitors of transport chain and oxidative phosphorylation.
13. Metabolism of carbohydrates :
    Biochemical aspects of digestion and absorption of carbohydrates. Glycogen sis, glycogenolysis. TCA cycle HMP shunt pathway, Gluconeogenesis, uronic acid path way, metabolism of aminosugars, metabolism of fructose and galactose. Regulation of carbohydrate metabolism. Blood sugar homeostasis the role of endocrines and the diabetic state. Glucose tolerance test.

14. Metabolism of Lipids :

    Biochemical aspects of difestion and absorption of lipds. Physiological value of fats. Essential fatty acids. Prostagladin. Blood lipids. Fatty acid synthesis and beta oxidation of fatty acids. Metabolism of acyl glycerols, triacy glaycerol, plasmaoces, Metabolism of springolds. Metabolism of adipose and mobilization of fat. Metabolism of the plasma lipoproteins, chylomicrons, VLDL, IDL, LDL, HDL and FFa Apoproteins. Role of LXAT. Role of liver in lipid metabolism. Fatty livers and ethanol metabolism. Ketogenesis, Ketone body utilization, Ketosis. Cholesterol metabolism and regulation. Coronary heart Disease and atherosclerosis, hypolipidemic agents, Disorders of the plasma lipoproteins, Regulation of lipid metabolism, Interco version of major food stuffs. Metabolism during starvation.

15. Metabolism of proteins :

    Introduction : Biochemical aspects of digestion and absorption of proteins. Aminoacid pools. Dynamic flux of body. Proteins equilibrium between tissue and plasma proteins. Nitrogen equilibrium, storage of proteins and amino acid in the body, Essential and nonessential aminoacids. Proteins and amino acids in the urine. Fate of amino acids after absorption metabolism of amino acids in general, production of ammonia (transamination and deamination) , its transport and its conversion to urea. Regulation of urea formation and metabolic disorders of the urea cycle, 1 carbon metabolism and sulphur metabblism. Catabolism of the carbon skeletons of amitic acids, ketogenic and glucogenic amino acids, conversion of the carbon skeletons of amino acid of amphibolic intermediates. Metabolism of phenylalanine and tyrosine. Metabolic defects in amino acid metabolism. Hormonall control of protein metabolism, conversion of amino acids to specialised products, creatinine, glutathione, GABA, serotohin histamine etc. Integration of carbohydrate, protein abd fat metabolism. Terminal pathway of carbohydrate protein and fat metabolism.

16. Porphyrins :

    Porphyrins, Haemoglobin, Bile pigments and hypebillirubinemias.

17. Metabolism of nucleotides : Metabolism of purines- uric acid production, clinical disorders of purine metabolism. Hyperuricemia and gout. Lesch Neyhan syndrome. Hyperuricaemia, Metabolism of pyrimidine nucleotides.

18. Metabolism of minerals : Sources, absorption, transport, requirement, metabolic role and metabolic disorders of minerals. Calcium. Absorption, daily requirement, metabolism, hormonal regulation of metabolism, and metabolic, hormonal and nutritional disorders of calcium. Phosphours metabolism. Iron : metabolism-ferritin, transferring, hemosiderosis and requirements of iron for different age groups. Magnesium, Potassium, Copper etc.

19. Nutrition :

Energy, metabolism, energy value of foods, R.Q. of foods. Basal metabolic tare, factors influencing B.M.R, S.D.A., Energy requirement of individuals. Diet and its components. Nutritional importance of proteins, effects of protein deficiency. Diseases associated with protein malnutrition and proteins. Nutritional value of carbohydrates, Nutritional aspects of lipids. Effect of EFA deficiency Nutritional aspects of vitamins and minerals Nutritional value of eggs and milk. Balanced diet.

20. Organ functional tests :

Liver function tests and detoxication mechanism, Gastric analysis. Renal function tests . Thyroid function tests.

21. Biochemistry of blood clotting :

22. Biochemistry of muscle contraction :

23. Biochemistry of respiration :

24. Biochemistry of hormones :

(B) PRACTICALS

No.	Exercise :
1.	Study of monosaccharides
2.	Study of disaccharides
3.	Study of Polysaccharides
4.	Acid and enzymatic hydrolysis of starch
5.	Preparation of osazones
6.	Colour reactions of proteins
7.	Coagulations and precipitation reaction with proteins
8.	Study of composition of bile
9.	Study of composition of C.S.F.
10.	Study of constituents of normal urine
11.	Study of constituents of abnormal urine
12.	Estimation of calcium/Phosphorus
13.	Estimation of blood urea.
14.	Estimation of serum cholesterol.
15.	Estimation of plasma proteins.
16.	Estimation of serum bilirubin
17.	Estimation of blood creatinine
18.	Estimation of SGOT
19.	Estimation of SGPT
20.	Estimation of HDL cholesterol
21.	Estimation of LDL cholesterol
22.	Estimation of triglyceride

23. Estimation of Albumin
24. Spectrophotometer, colorimeter, electrophoresis, chromatography, ELISA, ABG analyzer, Electrolyte analysis by ISE method, Auto Analyzers
25. Immunodiffusion, Quality Control, DNA isolation from tissues/blood