



## Andhra Pradesh State Council of Higher Education

### B.Sc. – Honours in BIOCHEMISTRY - MAJOR

w.e.f. 2023-24 AY onwards

#### COURSE STRUCTURE

Year	Semester	Course	Title	No. Hrs./ Week	No. of Credits
I	I	1	Introduction to Classical Biology	5	4
		2	Introduction to Applied Biology	5	4
	II	3	Biomolecules - (T)	3	3
			Biomolecules - (P)	2	1
		4	Cell Biology - (T)	3	3
			Cell Biology- (P)	2	1
II	III	5	Analytical techniques- (T)	3	3
			Analytical techniques- (P)	2	1
		6	Basic Microbiology- (T)	3	3
			Basic Microbiology- (P)	2	1
		7	General Physiology- (T)	3	3
			General Physiology- (P)	2	1
		8	Genetics - (T)	3	3
			Genetics - (P)	2	1
	IV	9	Bioenergetics and Metabolism of Carbohydrates and Lipids- (T)	3	3
			Bioenergetics and Metabolism of Carbohydrates and Lipids- (P)	2	1
		10	Clinical Biochemistry- (T)	3	3
			Clinical Biochemistry- (P)	2	1
		11	Immunology - (T)	3	3
			Immunology - (P)	2	1
III	V	12	Nutritional Biochemistry - (T)	3	3
			Nutritional Biochemistry - (P)	2	1
		13	Enzymology- (T)	3	3
			Enzymology- (P)	2	1
		14	Molecular biology - (T)	3	3
			Molecular biology - (P)	2	1
	15	Metabolism of Nitrogen compounds - (T)	3	3	
		Metabolism of Nitrogen compounds - (P)	2	1	
	VI		Long term Internship/ Apprenticeship		
	IV	VII	16	Recombinant DNA technology - (T)	3
Recombinant DNA technology - (P)				2	1
17			Endocrinology - (T)	3	3
			Endocrinology - (P)	2	1
18		Biomedical Correlation of Diseases - (T)	3	3	
		Biomedical Correlation of Diseases - (P)	2	1	
VIII	19	Applied Biochemistry - (T)	3	3	

### III SEMESTER

#### Course No-5 : ANALYTICAL TECHNIQUES

Credits -1

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1. Estimation of ascorbic acid
2. Separation and estimation of total carotenoids and  $\beta$ -carotene
3. Extraction and estimation of vitamin A, vitamin E, niacin and free amino
4. Estimation of phosphorus by Fiske and Subbarow method Characterization of fats – estimation of saponification number, iodine number, acid number and R.M.Number
5. Extraction of Phytoconstituents by Soxhlet and quantification

#### COURSE OUTCOMES

1. After completing this course, the student will
2. Understand the basic concepts and principles of biochemical techniques namely Spectrophotometry, Fluorimetry, Chromatography and Centrifugation.
3. Analyse biochemical compounds such as Carotenoids, Vitamins, Alkaloids and Flavonoids.
4. Identify the compounds by various biochemical techniques and interpret the results
5. Apply the laboratory skills and concepts in carrying out experiments using sophisticated instruments.

#### Reference Books

1. Physical Biochemistry- Application to Biochemistry and Molecular Biology: Friefelder D. WH Freeman and Company 1. Principles and Techniques of Biochemistry and Molecular Biology: - Ed. K. Wilson and J. Walker, Cambridge Univerity Press.
2. The Tools of Biochemistry: Cooper T.G., John Wiley and Sons Publication.
3. Biophysical chemistry. Principles and Techniques: Upadhayay A, Upadhayay K and Nath N., Himalaya publishing house.
4. Experimental Biochemistry. Cark Jr J. M. and Switzer R.L, W.H. Freeman and Company.
5. Research Methodology for Biological Sciences: Gurumani.N. M.J.P. Publishers., Chennai, India.
6. Instrumental Methods of Chemical Analysis: Chatwal. G and Anand.S., Himalaya Publishing House, Mumbai, India.
7. A Biologist's Guide to Principles and Techniques of Practical Biochemistry: Williams. B.L. and Wilson. K. (ed.) Edward Arnold Ltd. London
8. Jayaraman, J. (2011). Laboratory Manual in Biochemistry, New Age International (P) Ltd.
9. Sadasivam, S. and Manickam, A. (2005). Biochemical Methods, Second edition, New Age International (P) Ltd.

**III SEMESTER**  
**Course No-06: BASIC MICROBIOLOGY**

Credits -3

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**COURSE OBJECTIVES**

1. The objective of the course is learning and understanding the fundamentals of Microbiology like important characteristics and biology of bacteria, fungi, mycoplasma, viruses etc. and to learn basic knowledge about control methods of microorganisms and industrial application of microbes for water and sewage treatment.
2. Designed to learn nutritional requirements in microorganisms and virus classification, morphology and Methods of culturing of viruses, Isolation, purification and characterization.
3. The objectives of the course are to learn and understand the genetic material, chromosome and gene and understand the gene arrangement in prokaryotes.
4. To know the various microbial diseases and their prevention and treatment.

**UNIT-I**

Morphology and classification of bacteria – phenotype, numerical and phylogenetic tree - rRNA, DNA and Proteins, Microbial diversity, Major characteristics used in taxonomy – morphological, physiological and metabolic, ecological, genetic analysis and molecular characterizations- (protein, nucleic acid composition), Isolation and cultivation of bacteria, bacterial growth curves. Culture media and methods, staining techniques, differences between Gram-positive and Gram-negative bacteria. Methods of sterilization and Pasteurization.

**UNIT-II**

Molds – characteristics, classification and reproduction. Yeasts – morphology, characteristics, and reproduction. General characteristics of Actinomycetes, Rickettsiae, Spirochaetes and mycoplasma. Economical and industrial uses of algae.

**UNIT-III**

Microbial interactions – mutualism, proto cooperation, commensalism, predation, parasitism, amensalism, competition, symbiosis in complex system. Role of microorganisms in domestic and industrial sewage.

Microbiology of fermented foods, food spoilage and its control (Preservation). Food borne diseases – Botulism, Salmonellosis, E. coli diarrhoea, Shigellosis, Staphylococcal food poisoning

**UNIT-IV**

Microbial diseases-Pathogenesis of bacterial diseases – maintenance, transport, invasion and multiplication and regulation. Airborne diseases–Diphtheria, Meningitis, Pneumonia, Tuberculosis and Streptococcal diseases. Arthropod borne – Lyme, Plague. Direct contact –

Anthrax, Gonorrhoea, Conjunctivitis, Gastritis, Syphilis, Tetanus, Leprosy, Staphylococcal diseases. Sepsis, Mycoses, Malaria, Amoebiasis, Candidiasis

#### **UNIT-V**

Viruses- classification, structure, and replication. Methods of assay and cultivation chicken embryo, animal inoculation and tissue culture, quantification and propagation. Maintenance of animal and plant viruses. Tumour viruses. Viral diseases – Dengue, Hepatitis, HIV, Polio, Rabies, SARS. Inactivation of viruses – photodynamic inactivation. Antiviral agents- chemical and biological agents.

### **III SEMESTER**

#### **Course No-06: BASIC MICROBIOLOGY**

Credits -1

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#### **PRACTICAL OBJECTIVES**

- 1) To understand various methods involved in sterilization and preparation of media.
- 2) To study the methods of isolation of microbes from various sources.
- 3) To impart knowledge about Biochemical tests.

#### **PRACTICAL SYLLABUS**

1. Sterilization Techniques-Autoclaving, hot-air oven sterilization, Sieve filtration, membrane filtration.
2. Preparation of culture media – Nutrient Broth, Nutrient Agar, Blood agar MacConkey's agar, Potato dextrose agar.
3. Isolation of bacteria – Streak plate and pour plate methods
4. Identification of bacteria by staining techniques – simple, differential, Gram staining and acid-fast staining.
5. Identification of bacteria – Morphological, cultural and biochemical characteristics
6. Motility of Bacteria – “Hanging drop” technique
7. Bacteriological examination of water and milk
8. Bacterial growth curve

#### **COURSE OUTCOMES:**

After completing this course, the student will:

1. Understand the concept of basic microbiology – sterilization techniques.
2. Know about the isolation of microorganisms from various sources.
3. Discuss the staining techniques to study the morphology of microorganisms.
4. Describe the antibiotic activity 5. Infer the importance of various biochemical test.

#### **REFERENCE BOOKS**

1. Vasanthakumari.R, (2009) Practical Microbiology, BI Publishers Pvt Ltd, India

2. Dubey.R.C and Maheshwari D.K., (2002), Practical Microbiology, S.Chand& comp Ltd, NewDelhi.
3. Microbiology by Pelczar, Chan and Krieg 5th edn. 1995 Mc Grew- Hill.
4. General Microbiology: Boyd, R.F., Times Mirror/ Mosby College, 1984.
5. A Textbook of Microbiology, R.C.Dubey and D.K.Maheswari, S.Chand Co (2001).
6. Pharmaceutical Microbiology, By Hugo and Russell, Blackwell Scientific (1987).
7. An Introduction to Viruses by S.B.Biswas, Vikas Publishing house.
8. Microbiology 4th edition, Prescott, Harley, Klein (Mc grew Hill)
9. Fundamentals of Microbiology – M. Frebisher.

**III SEMESTER**  
**Course No-7:GENERAL PHYSIOLOGY**  
Credits -3

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**COURSE OBJECTIVES:**

1. To impart knowledge about blood composition and function and blood clotting mechanism.
2. To study about the muscular and nervous system.
3. To appreciate about the components of Urinary system and mechanism of Urine formation
4. To understand the structure and function and different components of Digestive system.
5. To introduce the organization of endocrine system and classification of hormones

**UNIT-I**

Blood- composition & function. Types of blood cells, morphology & function - RBC, WBC, platelets erythropoiesis. Blood groups- A B O & Rhesus system; Coomb's test, Bombay blood group, function of plasma proteins. Composition & functions of lymph & lymphoid system, Blood clotting mechanism, anticoagulants

**UNIT-II**

Muscular system- types of muscle & functions. Brief outline of nervous system, structure of brain and spinal cord. Synapses- chemical and electrical synapse, nerve impulse, action potential and neurotransmitters.

**UNIT-III**

Urinary system – components of the urinary system, Kidney structure and organization. Structure, function and classification of nephrons. Mechanism of urine formation- functions of glomerular filtration rate and selective reabsorption and tubular secretion.

**UNIT-IV**

Digestive system- structure and function of different components of digestive system, Mechanism of secretion of HCL, Role of hormones and enzymes in digestive process. Digestion of carbohydrates, lipids, and proteins

**UNIT-V**

General organization of endocrine system- classification of hormones. Biological functions - Thyroid, Para Thyroid, Insulin, Glucagon, hormones of the adrenal glands and gonadal hormones.

### III SEMESTER

#### Course No- 07 GENERAL PHYSIOLOGY

Credits -1

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#### **PRACTICAL SYLLABUS**

1. Microscopy
2. RBC count & WBC count
3. Differential leucocyte count by Leishman' s staining
4. Estimation of Hemoglobin by Sahli's acid haematin method
5. Determination of Packed cell volume (PCV)
6. Determination of Erythrocyte sedimentation rate (ESR)
7. Determination of Coagulation time & Bleeding time
8. Determination of blood group

#### **COURSE OUTCOME**

1. Recognize and analyse blood cells and blood groups Blood clotting mechanism
2. Outline the muscular and nervous system, Mechanism of muscle contraction and structure of brain and spinal cord
3. Utilise the knowledge about the structure kidney and nephron, to understand the mechanism of Urine formation and learn the concept of Dialysis,
4. Acquire knowledge about the components of Digestive system, Hcl formation and Digestion process
5. Compile the classification of Hormones and its biological role

#### **REFERENCE BOOKS**

1. Textbook of Medical Physiology – Guyton & Hall, 11th edition ,2006
2. Davidson's Principles and Practice of Medicine (XX Edition)- John.A.A.Hunter
3. Human Anatomy & Physiology – Elaine N.Marieb ,3rd edition ,1995
4. Essentials of Medical Physiology –Sembulingam ,1999 5. Medical Physiology – Ganong
5. Text book of Medical Biochemistry Physiology – MN.Chatterjee and , Rana Shinde,7th edition.
6. Animal physiology – Mariakuttikan and Arumugam

**III SEMESTER**  
**Course No-8:GENETICS**  
Credits -3

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**Course Objectives**

1. The objectives of the course are to learn and understand the fundamentals of genetics like DNA as genetic material, chromosome and gene and understand the gene arrangement in prokaryotes and eukaryotes.
2. To learn and understand the concept of bacterial genetics and detailed information about Mutation.
3. To learn and understand the bacterial, transformation, transduction, and conjugation and Transposable genetic elements and their antibiotic resistance
4. To learn and understand the bacteriophage lifecycle and various plasmids and CRISPR- Gene editing

**UNIT-I**

Genetic material – Direct and Indirect evidences of DNA as genetic material, experimental proof. Evidences of RNA as genetic material – eg. Virus. Chromosome - Chromosome and genes, chromosomal replication, genetic mapping of chromosomes, structure of chromatin - nucleosomes and higher orders of organization, chromosome banding, transposition in human chromosome and chromosomal abnormalities.

**UNIT-II**

Gene – arrangements in prokaryotes and eukaryotes. Gene structure in eukaryotic organisms, introns, exons, pseudogenes, and gene clusters, spacers, repetitive sequences. Single and multiple copy genes in eukaryotes, eg – Histones, Alu, copia, satellite. Mapping of human genes – techniques used, assignment of important genes. Gene regulatory mechanisms and cell memory. Mechanism of recombination, extra nuclear inheritance. Non-coding explosion, cell fate determination and reprogramming. Genetic technique for Archea. New gene evolution, Tiniest genome of proteobacteria and bacteriodates.

**UNIT-III**

Bacterial genetics – Bacterial chromosomes, plasmids – fertility, resistance, colicinogenic and other, PBR322 and other synthetic plasmids - isolation and uses. Transposable genetic elements, transformation, transduction, and conjugation in bacteria. Linkage map of bacterial chromosome. Recombination in bacteria.

**UNIT-IV**

Structure of Bacteriophages and their use in the study of molecular genetics – lytic cycle-replication of T-phages, Lysogeny and its regulation. Transduction – specialized, generalized and abortive. Transfection and cosmids. Fine structure analysis of T- phages, Benzers work and concept of cistrons. Bacterial defence (CRISPR- Gene turning on).

**UNIT-V**



Mutation – Types of mutations, mutagens, mechanism of mutation, Mutagenesis, induction and isolation of mutants. Haploid genetic tools. Radiation effects on human heredity. Phylogenetic inheritance. Heritability and its measurements and mapping, gene duplication and self-incompatibility.

**III SEMESTER**  
**Course No-8: GENETICS**

Credits -1

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**PRACTICAL SYLLABUS**

1. Isolation of phages from sewage and quantification by plaque assay.
2. PCR amplification of insert
3. Restriction digestion of the vector and the insert
4. Ligation of restricted DNA fragments
5. Preparation of competent E.coli cells, transformation and expression of cloned gene
6. PCR and restriction diagnosis-based identification of positive clones

**COURSE OUTCOMES**

After the completion of this course, the student will be able to

1. The students will learn about the DNA, RNA as genetic material.
2. Learn about bacterial transformation, transduction and inputs to genetic engineering
3. Gain knowledge on mutations and isolation of mutants and types of mutagens.

**RECOMMENDED BOOKS:**

1. Molecular Genetics by D Friefelder
2. Cell molecular biology, Albert Bruce
3. Gene VII by Lewin
4. Molecular cloning by Maniatis and Co Vol I, II, III
5. Genetics by Gardner
6. Molecular Biology of the gene by Watson.
7. Genetics by G Zubay
8. Molecular Biology of the Cell by Albert Bruce.
9. Cell molecular Biology by Baltimore.
10. Molecular Biology by D Friefelder.
11. Genes VII Benjamin Lewin (2000). Oxford Univ. Press. London.
12. Cell and Molecular Biology 2ndEdit. (2002) By P. K. Gupta, Rastogi Publ.

**IV -SEMESTER**  
**BIOENERGETICS AND METABOLISM OF CARBOHYDRATES AND LIPIDS-**  
**(Course No-9)**

Credits -3

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**COURSE OBJECTIVES**

1. To acquire knowledge related to the intermediary metabolism and the role of TCA cycle in central carbon metabolism.
2. To learn basic concepts of Bioenergetics, the importance of high energy compounds, electron transport chain, synthesis of ATP, mechanisms of oxidative phosphorylation and photophosphorylation.
3. To understand the fundamentals of cellular metabolism of carbohydrates their association with various metabolic diseases.
4. To learn biosynthesis and degradation of Lipids, fatty acids and cholesterol, Metabolism of lipoproteins and Ketone bodies.

**UNIT-I**

Principles of thermodynamics, free energy, enthalpy and entropy, Free energy changes in biological transformations in living systems. Redox potential, phosphate group transfer potential and ATP, High-energy compounds, oxidation and reduction reactions.

**UNIT-II**

Oxidative phosphorylation, Mitochondria ultrastructure, Energy harnessing cascade from nutrients, Reducing equivalents, Electron transport and its carriers-Complex I, II, III, IV; Mitchell's Hypothesis—experimental verification, Determination of P:O ratio, ATP synthesis by F<sub>1</sub>-F<sub>0</sub> ATP synthase, E. Racker's experiment. Relation of proton movement and ATP synthesis. Experimental demonstration of the movement of ATP synthase.

Oxidation and reduction enzymes, utilization of oxygen by oxygenase's, superoxide dismutase and catalase. respiratory control, Mechanism, and theories of oxidative phosphorylation. Respiratory chain inhibitors and uncouplers of oxidative phosphorylation. Microsomal electron transport system. Bioluminescence.

**UNIT-III**

Approaches for studying intermediary metabolism. Glucose as fuel, glucose transporters, Glycolysis, and its regulation. Substrate cycling, TCA cycle – function and regulation, Glyoxylate cycle, Gluconeogenesis, and its regulation, HMP shunt and its significance, Uronic acid pathway, Glycogen metabolism and its regulation with special reference to phosphorylase and glycogen synthase, Metabolism of fructose, galactose and lactose, Biogenesis of amino sugars, peptidoglycans, glycosyl aminoglycans and glycoproteins. Inborn errors of carbohydrate metabolism.

**UNIT-IV**

Lipid metabolism – Oxidation of fatty acids, Biosynthesis of fatty acids and regulation; Metabolism of arachidonic acid; formation of prostaglandins, thromboxanes, leukotrienes,

Biosynthesis of triglycerides.

## **UNIT-V**

Metabolism of phospholipids, sphingolipids. Biosynthesis of cholesterol and its regulation, Formation of bile acids. Role of liver and adipose tissue in lipid metabolism. In born errors of lipid metabolism

## **IV -SEMESTER**

### **BIOENERGETICS AND METABOLISM OF CARBOHYDRATES AND LIPIDS- (Course No-9)**

Credits -1

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#### **PRACTICAL SYLLABUS**

1. Isolation of casein from milk
2. Preparation of lactalbumin from milk
3. Estimation of reducing sugar by DNSA (dinitrosalicylic acid) method
4. Titration of glucose by Benedict's method
5. Estimation of urea by Diacetylmonoxime method
6. Estimation of creatinine in serum
7. Estimation of cholesterol by ZAK's method

#### **COURSE OUTCOMES**

After the completion of this course, the student will be able to

1. Explain the broad outlines of intermediary metabolism and importance of carbohydrate metabolism in life.
2. Describe the importance of Electron transport and ATP production mechanism.
3. Gain in knowledge in Carbohydrate metabolism and their associated with disorders.
4. Describe the details of lipid metabolism.

#### **RECOMMENDED BOOKS**

1. Principles of Biochemistry, White. A, Handler, P and Smith.
2. Biochemistry, Lehninger A.L.
3. Biochemistry, David E. Metzler.
4. Biochemistry, LubertStryer.
5. Text of Biochemistry, West and Todd.

**IV-SEMESTER**  
**Course No-10: Clinical Biochemistry**

Credits -3

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**COURSE OBJECTIVES**

1. To understand the basic concepts of laboratory techniques.
2. To understand the basic concepts of organ functions.
3. To gain knowledge about various investigations and their interpretations.

**UNIT-I**

Clinical Biochemistry Laboratory and Investigation of Homeostasis. The use of biochemical tests- Specimen collection and types, Automation and Computerization Water and electrolyte homeostasis - renin angiotensin – aldosterone system Pathological variations of water and electrolytes- diagnosis and Interpretations Self Study: Acid base balance and imbalance - Mechanism of regulations, Anion gap, Acidosis and Alkalosis.

**UNIT-II**

Abnormal Hemoglobin and Inherited Disorders 9hrs Inborn errors of Metabolism: Patterns of inheritance - alkaptonuria, phenyl ketonuria, albinism, glycogen storage diseases and inherited disorders associated with urea cycle. Abnormal hemoglobin and hemoglobinopathies- Sickle cell anemia and thalassemias, porphyrias and porphyrinurias. Self-study: Plasma proteins in health and diseases

**UNIT-III**

Investigation of Renal and Gastric Functions. Renal functions tests: Preliminary investigations, tests based on GFR, RPF and tubular function. Diseases related to kidney - nephritis, nephrosis, uremia, renal failure, renal calculi, renal hypertension, renal tubular acidosis, diabetes insipidus.. Dialysis - hemodialysis and peritoneal dialysis. Gastric function tests: Examination of resting content, Fractional gastric analysis, stimulation tests, Tubeless gastric analysis. Malabsorption syndrome, acidity, ulcers - gastric, duodenal and peptic, colon cancer, pancreatitis, gastric and pancreatic 'function tests. Self study: Gout, Leschnyhan syndrome and oroticaciduria.

**UNIT-IV**

Liver Function Tests and Lipid Disorder Liver function tests: Tests based on abnormalities of bile pigment metabolism, detoxification and excretory functions. Diagnosis of different types of jaundice. Pancreatic function tests. Diseases relating to liver - jaundice, cirrhosis, hepatitis, cholestasis, cholelithiasis, hepatic coma, hepatic carcinoma, inherited diseases of bilirubin metabolism Lipid: Lipoproteinemias and atherosclerosis coronary heart diseases and hypertension. Self study: Biochemical changes in cancer - detection of tumor markers

**UNIT- V**

Blood Glucose Regulation and Enzymes of Diagnostic Importance 9 hrs Carbohydrates: Blood glucose level - regulation and its clinical significance, Diabetes mellitus, Glycosuria and GTT. Enzymes and Isoenzymes of clinical importance - general principles of assay - Clinical significance of enzymes and isoenzymes (LDH, CK, phosphatase, 5' nucleosidase,

amylase, lipase, acetyl cholinesterase, transaminase and gamma glutamyl transferase) Self study: meningitis, encephalities, epilepsy, Parkinson's, Alzheimer's, cerebral palsy.

**IV -SEMESTER**  
**Course No-10: Clinical Biochemistry**  
Credits -1

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**PRACTICAL SYLLABUS**

1. Blood analysis:  
Iron and Hemoglobin, Glucose, GTT. 10hrs
2. Serum and Urine analysis:  
Creatine, chloride, phosphorus, calcium. 10 hrs
3. Lipid profiles (Serum) –  
Total cholesterol, triglycerides, HDL, LDL 5 hrs
4. Liver function tests –  
Total Bilirubin, total protein, albumin, globulin, albumin/globulin ratio, AST, ALT, ALP 10 hrs
5. Kidney function tests  
Urea, creatinine, uric acid.

**COURSE OUTCOMES**

1. After completing this course, the student will:
2. Obtain basic knowledge about specimen collections, pathological variations of water, electrolytes
3. Interpret the results to diagnose the abnormal functions of organs.
4. Understand the antinutrient factors and its implication on other nutrients in food. Understand the, patterns of inherited disorders and disorders of hemoglobin metabolism
5. Correlate the tests used for renal and gastric functions and their interpretations
6. Impart the diagnostic tests for liver function and lipoprotein metabolic disorders
7. Evaluate the alterations in blood glucose regulation and enzymes of clinical importance

**REFERENCE BOOKS**

1. Gowenlock, A.H. and Donald, J(2002). Varley's practical clinical Biochemistry, sixth edition, CBS publications and Distributors, New Delhi.
2. Sembulingam, K and Sembulingam, P(2010). Essentials of Medical Physiology, fifth edition. Jaypae Brothers (p) ltd, New Delhi.
3. Burtis and Ashwood (2007) Tietz Fundamentals of Clinical chemistry, 6th edition, WB Saunders Company, Oxford Science Publications USA.
4. Chatterjee and Shindae(2012). Text book of medical biochemistry, 8th edition.

5. Devlin, T.M(2010). Text Book of Biochemistry with clinical correlations, 7th edition. NewYork.
6. Gans, G and Murphy, J.M. (2008). Clinical Biochemistry, fourth edition, Churchill Livingstone, Elsevier

## IV -SEMESTER

### Course No-11: IMMUNOLOGY

Credits -3

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#### COURSE OBJECTIVES

1. To have a key understanding of the components of the immune system, their functions and interactions.
2. To understand the immune mechanisms involved in disease conditions.
3. To impart knowledge on the latest techniques in immunology.

#### UNIT-I

Introduction Overview of defense mechanisms in plants and animals; Hematopoiesis, cells and organs of the immune system, primary and secondary lymphoid organs and tissues.

#### UNIT-II

Innate immunity in plants and animals Plants - Chemical and morphological defence in plants; elicitors, receptors, Basal resistance, and innate biochemical host defences Animals - Anatomical barriers, cell types of innate immunity, Pattern Recognition Receptor (PRR), connections between innate and adaptive immunity, cell adhesion molecules, chemokines, leukocyte extravasation, localized and systemic response. Complement activation by classical, and alternate pathway, biological consequences of complement activation.

#### UNIT-III

Adaptive Immunity in Plants and Animals Plants - Biotic- interactions with symbionts, pathogens. Biochemical host defences, Basal resistance and basic compatibility; Gene for gene concept; interaction in host-pathogen systems, receptor-elicitor model, plant gene-gene interaction. Cytological protection and induced resistance. Passive and active defences. Animals - Antigens and haptens, Factors that dictate immunogenicity, B and T cell epitopes.

#### UNIT-IV

Structure and distribution of classes and subclasses of immunoglobulins (Ig), Ig fold, effector functions of antibody, antigenic determinants on Ig and Ig super family. Generation of antibody Diversity. Monoclonal antibodies; Immunological methods- Antigen-antibody interactions; Histocompatibility antigens - MHC, HLA and Disease; T and B cell - Maturation, activation and effector response, Positive and Negative selection, APC and Antigen Presentation, Cytokines and Chemokines.

#### UNIT-V

Immune dysfunction and applications Immunological tolerance; Immunological disorders – Hypersensitivity and Autoimmune diseases. Immunodeficiencies; Transplantation Immunology; Immune response against major classes of pathogens.



## IV- SEMESTER

### Course No-11: IMMUNOLOGY

Credits -1

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#### PRACTICAL SYLLABUS

1. Survey of structural plants defences: viz. cuticle, wax, lignin, bark, thorns, prickles, trichomes.
2. Immunodiffusion – SRID. Rocket IEP
3. Spleen cell isolation and counting.
4. ABO and Rh blood grouping
5. Latex agglutination assay
6. Quantitative immunoprecipitation assay

#### COURSE OUTCOMES

After successfully completing this course, the students will be able to:

1. To get an overview of the immune system and learn about the various cells, organs and tissues of the immune system.
2. Learn the basic defines mechanisms of the human body, learn how our body differentiate self from non self and thus successfully eliminate any danger from outside
3. Understand the cellular and molecular pathways of humoral and cell-mediated immune responses and appreciate the importance of immune system in health and disease.
4. Learn about the various preexisting structural and induced defenses in plants and how pathogens can cause disease in plants and understand the genetic basis of plant-pathogen interaction.
5. Learn how immunodeficiency makes us vulnerable and how vaccine is essential to protect us from infectious diseases.

#### REFERENCE BOOKS

1. Immunology, T .J. Kindt, R. A. Goldsby, and B.A. Osborne. (2007) W.H.Freeman and Co, New York.
2. Biochemistry, Voet, D. and Voet, J.G. (2004). 3rd Edition, John Wiley & Sons, Inc.USA.
3. Immunology - Kuby
4. Immunology - J. Kannan, MJP Publishers, Chennai-5 Immunology - Roitt Ivan, Jonathan Brastoff, David Male, 1993.
5. Immunology - Janis Kuby, 4th edition, 2000.
6. Immunology - An introduction, Tizarrd, R. 1995.
7. Fundamentals of Immunology - LippincotPraven publications, 4th edition.
8. Essential and clinical Immunology - Halen chapel, Mansal Haney, Siraj Misbah and NialSnowdan.
9. Immunology - Geoffrey Zubay, W.M.C, Brown publishers, 4th edition 1992.
10. Immunology - The immune system in health and disease, 3rd edition.

ANDHRA KESARI UNIVERSITY-ONGOLE, PRAKASAM DISTRICT  
Single Major Programme from the Year 2023-24 Onwards  
Programme- B. Sc. Biochemistry -Question Paper model,  
Second Year-Semester-III & IV

Time: 3 Hours

Total Marks: 75

PART –A

Answer any Five of the following

5X5=25 Marks

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10

PART –B

Answer the following One question from each unit

5x10=50 Marks

11a.

Or

11b.

12a.

Or

12b.

13a.

Or

13b.

14a.

Or

14b.

15a.

Or

15b.