

S.V.K.P& Dr K.S.RAJU ARTS & SCIENCE COLLEGE (A), PENUGONDA
Recognized by UGC as “College with Potential for Excellence”
Accredited by NAAC with “A” Grade
(Affiliated to ADIKAVI NANNAYA UNIVERSITY)



B.Sc., BIOCHEMISTRY
SYLLABUS
SEMESTER I TO V
2024-2025



I Semester Syllabus

BIOCHEMISTRY

(w.e.f. 2023-24 Admitted Batch)

23BSC11 INTRODUCTION TO CLASSICAL BIOLOGY

Hours/Week: 5

Credits:4

Unit1: Introduction to systematics, taxonomy and ecology.

- 1.1 Systematics– Definition and concept, Taxonomy –Definition and hierarchy.
- 1.2 Nomenclature– ICBN and ICZN, Binomial and trinomial nomenclature.
- 1.3 Ecology– Concept of ecosystem, Biodiversity and conservation.
- 1.4 Pollution and climate change.

Unit 2: Essentials of Botany.

- 2.1 The classification of plant kingdom.
- 2.2 Plant physiological processes (Photosynthesis, Respiration, Transpiration, phytohormones).
- 2.3 Structure of flower–Micro and macro sporogenesis, pollination, fertilization and structure of mono and dicot embryos.
- 2.4 Mushroom cultivation, floriculture and landscaping.

Unit 3: Essentials of Zoology

- 3.1 The classification of Kingdom Animalia and Chordata.
- 3.2 Animal Physiology –Basics of Organ Systems & their functions, Hormones and Disorders
- 3.3 Developmental Biology –Basic process of development (Gametogenesis, Fertilization, Cleavage and Organogenesis)
- 3.4 Economic Zoology –Sericulture, Apiculture, Aquaculture

Unit4: Cell biology, Genetics and Evolution

- 4.1 Cell theory, Ultrastructure of prokaryotic and eukaryotic cell, cell cycle.
- 4.2 Chromosomes and heredity–Structure of chromosomes, concept of gene.
- 4.3 Central Dogma of Molecular Biology.
- 4.4 Origin of life

Unit 5: Essentials of chemistry

- 5.1 Definition and scope of chemistry, applications of chemistry in daily life.
- 5.2 Branches of chemistry
- 5.3 Chemical bonds–ionic, covalent, non-covalent– Vander Waals, hydrophobic, hydrogen bonds.
- 5.4 Green chemistry

References

1. Sharma O.P., 1993. Plant taxonomy. 2nd Edition. McGraw Hill publishers. India.
2. Jordan E.L., Verma P.S., 2018. Chordate Zoology. S. Chand publishers, New Delhi, India.
3. Rastogi, S.C., 2019. Essentials of animal physiology. 4th Edition. New Age International Publishers.
4. Verma P.S., Agarwal V.K., 2006. Cell biology, genetics, Molecular Biology, Evolution and Ecology. S. Chand publishers, New Delhi, India.
5. Sathyanarayana U., Chakrapani, U., 2013. Biochemistry. 4th Edition. Elsevier publishers.
6. Jain J.L., Sunjay Jain, Nitin Jain, 2000. Fundamentals of Biochemistry. S. Chand publishers, New Delhi, India.
7. Karen Timberlake, William Timberlake, 2019. Basic chemistry. 5th Edition. Pearson publishers.
8. Subrata Sen Gupta, 2014. Organic chemistry. 1st Edition. Oxford publishers.



I Semester Syllabus
BIOCHEMISTRY
(w.e.f. 2023-24 Admitted Batch)
23BSC12 INTRODUCTION TO APPLIED BIOLOGY

Hours/Week: 5

Credits:4

Unit 1: Essentials of Microbiology and Immunology

- 1.1 History and Major Milestones of Microbiology; Contributions of Edward Jenner, Louis Pasteur, Robert Koch and Joseph Lister.
- 1.2 Groups of Microorganisms–Structure and characteristics of Bacteria, Fungi, Archaea and Virus.
- 1.3 Applications of microorganisms in–Food, Agriculture, Environment and Industry.
- 1.4 Immune system–Immunity, types of immunity, cells and organs of immune system.

Unit 2: Essentials of Biochemistry

- 2.1 Biomolecules I–Carbohydrates,Lipids.
- 2.2 Biomolecules II–Amino acids & Proteins.
- 2.3 Biomolecules III–Nucleicacids-DNA and RNA.
- 2.4 Basics of Metabolism–Anabolism and catabolism.

Unit 3: Essentials of Biotechnology

- 3.1 History, scope and significance of biotechnology. Applications of biotechnology in Plant, Animal, Industrial and Pharmaceutical sciences.
- 3.2 Environmental Biotechnology– Bioremediation and Biofuels, Biofertilizers and Biopesticides.
- 3.3 Genetic engineering– Gene manipulation using restriction enzymes and cloning vectors; Physical, chemical and biological methods of gene transfer.
- 3.4 Transgenicplants–Stresstolerantplants(bioticstress–BTcotton,abioticstress–salt tolerance).
Transgenic animals – Animal and disease models.

Unit 4: Analytical Tools and techniques in biology– Applications

- 4.1 Applications in forensics–PCR and DNA fingerprinting
- 4.2 Immunological techniques– Immuno blotting and ELISA.
- 4.3 Monoclonal antibodies–Applications in diagnosis and therapy.
- 4.4 Eugenics and Gene therapy

Unit 5: Biostatistics and Bioinformatics

- 5.1 Data collection and sampling. Measures of central tendency –Mean, Median, Mode.
- 5.2 Measures of dispersion– range, standard deviation and variance. Probability and tests of significance.
- 5.3 Introduction, Genomics, Proteomics, types of Biological data, biological databases- NCBI, EBI, Gen Bank; Protein 3D structures, Sequence alignment
- 5.4 Accessing Nucleic Acid and Protein databases, NCBI Genome Workbench

REFERENCES

1. Gerard J., Tortora, Berdell R. Funke, Christine L. Case., 2016. Microbiology: An Introduction. 11th Edition. Pearson publications, London, England.
2. Micale, J. Pelczar Jr., E. C. S. Chan., Noel R. Kraig., 2002. Pelczar Microbiology. 5th Edition. McGraw Education, New York, USA.
3. Sathyanarayana U., Chakrapani, U., 2013. Biochemistry. 4th Edition. Elsevier publishers.
4. Jain J. L., Sunjay Jain, Nitin Jain, 2000. Fundamentals of Biochemistry. S. Chand publishers, New Delhi, India.
5. R. C. Dubey, 2014. Advanced Biotechnology. S. Chand Publishers, New Delhi, India.
6. Colin Ratledge, Bjorn, Kristiansen, 2008. Basic Biotechnology. 3rd Edition. Cambridge Publishers.
7. U. Sathyanarayana, 2005. Biotechnology. 1st Edition. Books and Allied Publishers pvt. ltd., Kolkata.
8. Upadhyay, Upadhyay and Nath. 2016. Biophysical Chemistry, Principles and Techniques. Himalaya Publishing House.
9. Arthur M. Lesk. Introduction to Bioinformatics. 5th Edition. Oxford publishers.
10. AP Kulkarni, 2020. Basics of Biostatistics. 2nd Edition. CBS publishers.



II Semester Syllabus
BIOCHEMISTRY HONOURS (23BC21 MAJOR/MINOR)
(w.e.f. 2023-24 Admitted Batch)
BIOMOLECULES

Hours/week-3

Credits-3

UNIT-I

Fundamentals of Biochemistry: History, scope and avenues of Biochemistry. Water as a biological solvent. Measurement of PH, Buffers, Biological relevance of Buffers. Outlines of surface tension, adsorption and osmosis and their biological relevance.

UNIT-II

Carbohydrates: Classification, monosaccharides, D and L designation, open chain and cyclic structures, epimers and anomers, mutarotation. Reactions of carbohydrates (due to functional groups - hydroxyl, aldehyde and ketone. Amino sugars, Glycosides. Structure and biological importance of disaccharides (sucrose, lactose, maltose, isomaltose, trehalose), trisaccharides (raffinose, melezitose). Structural polysaccharides (cellulose, chitin, pectin) and storage polysaccharides (starch, inulin, glycogen). Glycosaminoglycans.

Additional Inputs:- Glycoproteins & Glycolipids

UNIT- III

Lipids Classification, saturated and unsaturated fatty acids, structure and properties of fats and oils (acid, saponification and iodine values, rancidity). General properties and structures of phospholipids. Prostaglandins-structure, types and biological role. Lipoproteins-types and functions

UNIT-IV

Amino Acids and Proteins Classification, structure, stereochemistry, chemical reactions of amino acids due to carbonyl and amino groups. 2. Titration curve of glycine and pK values. Essential and non essential aminoacids, non-protein aminoacids.3.Peptide bond –nature and conformation. Naturally occurring peptides - glutathione, enkephalin. 4. Proteins: Classification based on solubility, shape, and function. Determination of amino acid composition of proteins. 5. General properties of proteins, denaturation, and renaturation of proteins. 6. Structural organization of proteins- primary, secondary, tertiary, and quaternary structures (Eg. Hemoglobin and Myoglobin).

UNIT-V

Nucleicacids and porphyrins, Types of RNA and DNA. Structure of purines and pyrimidines, nucleosides, nucleotides. Stability and formation of phosphor diester linkages.2.Effect of acids, alkali and nucleases on DNA and RNA. 3. Structure of Nucleic acids- Watson-Crick DNA double helix structure, denaturation and renaturation of nucleic acids, Tm-values and their significance, cot curves and their significance. 4. Structure and properties of porphyrins: Heme, cytochromes and chlorophylls.

Additional Inputs:- Chemistry and types porphyrins

S.V.K.P& Dr K.S.RAJU ARTS & SCIENCE COLLEGE (A), PENUGONDA
II Semester Syllabus (w.e.f. 20203-24 Admitted Batch)

BIOCHEMISTRY
PRACTICAL SYLLABUS

Hours/week-2

Credits-1

1. Preparation of buffers (acidic, neutral, and alkaline) and determination of pH.
2. Qualitative identification of carbohydrates- glucose, fructose, ribose/xylose, maltose, sucrose, lactose, starch/glycogen.
3. Qualitative identification of aminoacids- histidine, tyrosine, tryptophan, cysteine, arginine.
4. Qualitative identification of lipids- solubility, saponification, acrolein test, Salkowski test, Lieberman-Burchard test.
5. Preparation of Osazones and their identification
6. Estimation of proteins in biological samples:
 - a. Biuret method.
 - b. Folin-Lowry method.
 - c. UV method.
 - d. Bradford's dye binding method
7. Estimation of amino acid by Ninhydrin method.
8. Estimation of tyrosine by Million's-reaction

Recommended Books

1. Fundamentals of Biochemistry–Jain,J.L., Jain,S.,Jain, N.S. Chand & Co.
2. Biochemistry–Satyanarayana.U and Chakrapani.U,Books & Allied Pvt.Lt
- 3.Nelson.D.L.andCox.M..M-Lehninger's Principles of Biochemistry-Freeman&Co.-
7th Edition



II Semester Syllabus
BIOCHEMISTRY
(w.e.f. 2023-24 Admitted Batch)
23BC22 CELL BIOLOGY

UNIT-I

Prokaryotic and Eukaryotic cells: Cell organelles Structure, Composition and functions of nucleus, mitochondria plastids, endoplasmic reticulum, Golgi, lysosomes, vacuole, micro bodies, ribosomes, cytoskeleton.

UNIT-II

Cell division: mitosis, meiosis, cell cycle and its regulation, different phases of cell cycle. Apoptosis, Regulation of cell cycle, Cyclins, MPF, Cyclin dependent kinases, Growthfactors, Nuclear Laminins, inhibition of cell cycle progression, MPF and progression to Metaphase, Proteolysis and MPF, Regulation of MPF activity. Check points in cell cycle regulation.

UNIT-III

Cell communication: general principles of cell communication, cell adhesion and roles of different adhesion molecules, cell junction/gap junctions, extracellular matrix, integrins. Signal transduction: Cell surface receptor, G-protein coupled receptors, signal transduction pathways, second messengers, regulation of signalling pathways, bacterial and plant two component systems, bacterial chemotaxis, and quorum sensing.

UNIT-IV

Protein Sorting and Targeting: Overall pathway of synthesis of nuclear coded, secretory, lysosomal and membrane proteins. Import across ER – Signal hypothesis, post translational modifications of secretory/membrane proteins in ER, sorting of lysosomal proteins, Mannose
- 6 - Phosphate receptors, synthesis, trafficking, and localization of mitochondrial proteins. Protein traffic into and out of nucleus.

UNIT-V

Bio membranes: Chemical composition of Membranes, Composition of plasma and organelle membranes of animal and plant cells. Lipids, proteins, and Carbohydrates of membranes Distribution of membrane lipids. Assembly of membrane components. Molecular structure of membranes: Miscelle, and liposomes, biological membrane; Symmetry of the membrane; Membrane fluidity; fluid mosaic model of biological membranes. Nanomaterials and their applications.
Membrane Transport: Donnan membrane equilibrium, Diffusion across cellular membranes Mediated transport; Energetics of transport systems; Passive transport anion exchange proteins; Active transport; Active transport of Na^+ K^+ (Sodium potassium ATPase) Ca^{2+} (Ca^{2+} -ATPase). Active transport of sugars coupled to Phosphorylation; group translocation (Y-Glutamyl cycle). Proton motive force in bacterial transport processes. Ionophores Gap junctions; Endocytosis, Exocytosis. Nature of receptors.

S.V.K.P& Dr K.S.RAJU ARTS & SCIENCE COLLEGE (A), PENUGONDA
II Semester Syllabus (w.e.f. 20203-24 Admitted Batch)
23BC22P BIOCHEMISTRY
PRACTICAL SYLLABUS

Hours/week-2

Credits-1

1. Estimation of Chlorophyll
2. Isolation of chloroplast
3. Isolation of mitochondria from the liver
4. Mitosis experiment
5. Meiosis experiment
6. Nuclei staining by DAPI /PI
7. Apoptosis-DNA Ladder Pattern, Annexin V staining
8. Low cytometric analysis

Recommended Books

1. Goldman, Emanuel, and Lorrence H.Green, eds. Practical hand book of microbiology. CRC Press, 2015.
2. Dubey,R.C.,andD.K.Maheshwari.Practicalmicrobiology.S.Chand,2002.
3. Microbiology: A laboratory manual by Cappuccino and Sherman, Pearson Education, 6th



III SEMESTER

(w.e.f. 2023-24 Admitted Batch)

ANALYTICAL TECHNIQUES – 23BC31

Credits-3

UNIT-I

Methods of tissue homogenization. Salt and organic solvent extraction and fractionation. Dialysis, Reverse dialysis, ultra filtration, lyophilization.

Chromatography: principle, procedure and application of partition chromatography, adsorption chromatography, ion exchange chromatography, gel chromatography, affinity chromatography, GLC and HPLC.

Additional Inputs:- RF Values, Solvents

UNIT-II

Electrophoresis: Principle, procedure and application of free flow, zone electrophoresis (Paper electrophoresis, Gel electrophoresis, PAGE, SDS-PAGE and Disc PAGE). Isoelectric focusing, High voltage electrophoresis, Pulse field electrophoresis, Immunoelectrophoretic.

UNIT-III

Centrifugation: Principle of sedimentation technique. Different types of centrifuge and rotors. Principle, procedure and application of differential centrifugation, density gradient centrifugation, ultra centrifugation, rate zonal centrifugation, isopycnic centrifugation.

UNIT-IV

Colorimetry and spectrophotometry: Laws of light absorption -Beer - Lambert's law. UV and visible absorption spectra, molar extinction coefficient and quantitation. Principle and instrumentation of colorimetry and spectrophotometry. Principle of nephelometry, fluorimetry, Atomic absorption and emission spectrophotometer

UNIT-V

Important stable radioisotopes used in biochemical research. P 32, I 125, I 131, Co 60. C 14 etc. Radiation hazards and precautions taken while handling radioisotopes. Principle and application of RIA. Measurement of radioactivity by GM counter and Scintillation counter.

Additional Inputs:- Radio Isotopes in Biology

S.V.K.P& Dr K.S.RAJU ARTS & SCIENCE COLLEGE (A), PENUGONDA

(w.e.f. 20203-24 Admitted Batch)

III SEMESTER, PRACTICAL SYLLABUS

ANALYTICAL TECHNIQUES -23BC31P Credits-1

PRACTICAL SYLLABUS

1. Estimation of Ascorbic acid
2. Separation and estimation of total carotenoids and β -carotene
3. Extraction and estimation of vitamin A, vitamin E, niacin and free amino
4. Estimation of phosphorus by Fiske and Sub barow method Characterization of fats estimation of saponification number, iodine number, acid number and R.M. Number
5. Extraction of Phyto constituents by Soxhlet and quantification

Reference Books

1. Physical Biochemistry-Application to Biochemistry and Molecular Biology: Frie felder D. WH Freeman and Company 1. Principles and Techniques of Biochemistry and Molecular Biology: Ed. K.Wilsonand J.Walker, Cambridge Univerity Press.
2. The Tools of Biochemistry: Cooper T.G.,John Wiley and Sons Publication.
3. Biophysical chemistry. Principles and Techniques: UpadhayayA, UpadhayayK and Nath N., Himalaya publishing house.
4. Experimental Biochemistry. Cark Jr J.M. and Switzer R .L,W .H.Freeman and Company.
5. ResearchMethodologyforBiologicalSciences:Gurumani.N.M.J.P.Publishers., Chennai, India.
6. Instrumental Methods of Chemical Analysis: Chatwal. Gand An and. S., Himalaya Publishing House, Mumbai, India.
7. ABiologist's Guideto Principles and Techniques of Practical Biochemistry: Williams.

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PENUGONDA-534 320, West Godavari District., (A.P.)

III SEMESTER

(w.e.f. 2023-24 Admitted Batch)

BASIC MICROBIOLOGY -23BC32

Credits-3

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.

Additional Inputs:- General Characters 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. Arthropodborne—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.

S.V.K.P & Dr K.S. RAJU ARTS & SCIENCE COLLEGE (A), PENUGONDA

III SEMESTER, PRACTICAL SYLLABUS

(w.e.f. 20203-24 Admitted Batch)

BASIC MICROBIOLOGY – 23BC32P

Credits-1

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

REFERENCE BOOKS

1. Vasanthakumari.R,(2009)PracticalMicrobiology,BIPublishersPvtLtd,India
2. Dubey .R .C and Maheshwari D.K., (2002), Practical Microbiology, S.Chand & comp Ltd, New Delhi.
3. Microbiology by Pelczar, ChanandKrieg5thedn. 1995McGrew- Hill.
4. General Microbiology :Boyd, R.F.,Times Mirror/MosbyCollege,1984.
5. ATextbookofMicrobiology,R.C.DubeyandD.K.Maheswari,S.ChandCo(2001).
6. PharmaceuticalMicrobiology,ByHugoandRussell,BlackwellScientific(1987).
7. An Introduction to Viruses by S.B.Biswas,Vikas Publishing house.
8. Microbiology4thedition,Prescott,Harley,Klein(Mcgrew Hill)
9. Fundamentals of Microbiology–M. Frebisher.



III SEMESTER

(w.e.f. 2023-24 Admitted Batch)

GENERAL PHYSIOLOGY – 23BC33

Credits -3

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.

Additional Inputs:- Normal and abnormal Constituents of Urine

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.

Additional Inputs:- Signal Transduction of Protein Hormones

S.V.K.P& Dr K.S.RAJU ARTS & SCIENCE COLLEGE (A), PENUGONDA

(w.e.f. 2023-24 Admitted Batch)

III SEMESTER, PRACTICAL SYLLABUS

GENERAL PHYSIOLOGY – 23BC33P

Credits-1

PRACTICAL SYLLABUS

1. Microscopy
2. RBC count & WBC count
3. Differential leucocyte count by Leishman's staining
4. Estimation of Hemoglobin by Sahli's acidhaematin 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

REFERENCE BOOKS

1. Text book 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, 1995. 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

(w.e.f. 2023-24 Admitted Batch)

GENETICS – 23BC34

Credits-3

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 bacterioidates.

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.

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

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 GZu bay
8. Molecular Biology of the Cell by Albert Bruce.
9. Cell molecular Biology by Baltimore.
10. Molecular Biology by D Frie felder.
11. Genes VII Benjamin Lew in (2000).Oxford Univ. Press. London.
12. Cell and Molecular Biology 2nd Edit.(2002) ByP.K.Gupta, Rastogi Publ.



IV-SEMESTER

(w.e.f. 2023-24 Admitted Batch)

BIOENERGETICS AND METABOLISM OF CARBOHYDRATES AND LIPIDS - 23BC41

Credits-3

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 F₁-F₀ 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. Inborn errors of lipid metabolism

S.V.K.P& Dr K.S.RAJU ARTS & SCIENCE COLLEGE (A), PENUGONDA
(w.e.f. 20203-24 Admitted Batch)
IV-SEMESTER, PRACTICAL SYLLABUS
BIOENERGETICS AND METABOLISM OF CARBOHYDRATES AND LIPIDS -
23BC41P Credits-1

PRACTICAL SYLLABUS

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

RECOMMENDED BOOKS

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



IV-SEMESTER

(w.e.f. 20203-24 Admitted Batch)

CLINICAL BIOCHEMISTRY – 23BC42

Credits-3

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 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 gastricanalysis. Malabsorptionsyndrome, acidity, ulcers -gastric, duodenalandpeptic, 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 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 iso enzymes (LDH,CK, phosphatase,5'nucleosidase, amylase, lipase, acetylcholinesterase, transaminase and gammaglutamyltransferase) Self study: meningitis, encephalities, epilepsy, Parkinson's, Alzheimer's, cerebral palsy.

Additional Inputs:- Hyper Glycemia and Diabetic Hormones

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(w.e.f. 20203-24 Admitted Batch)

IV-SEMESTER, PRACTICAL SYLLABUS

CLINICAL BIOCHEMISTRY – 23BC42P

Credits-1

PRACTICALSYLLABUS

1. Blood analysis: Iron and Hemoglobin, Glucose, GTT. 10hrs
2. Serum and Urine analysis: Creatine, chloride, phosphorus, calcium. 10hrs
3. Lipid profiles (Serum)– Total cholesterol, triglycerides, HDL, LDL 5hrs
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.

REFERENCEBOOKS

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. Jaypee 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 Shinde (2012). Textbook of medical biochemistry, 8th edition.
5. Devlin, T.M (2010). Textbook of Biochemistry with clinical correlations, 7th edition. New York.
6. Gans, G and Murphy, J.M. (2008). Clinical Biochemistry, fourth edition, Churchill Livingstone, Elsevier



IV –SEMESTER**(w.e.f. 20203-24 Admitted Batch)****IMMUNOLOGY - 23BC43**Credits -3

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.

Additional Inputs:-Types of Immunity**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.

Additional Inputs:- Antigen-Antibody Reactions**UNIT-V**

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

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IV-SEMESTER, PRACTICAL SYLLABUS

IMMUNOLOGY – 23BC43P

Credits -1

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

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.

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PENUGONDA-534 320, West Godavari District., (A.P.)

V Semester Syllabus

BIOCHEMISTRY

(w.e.f. 2020-21 Admitted Batch)

20BC5A1 – CLINICAL BIOCHEMISTRY

UNIT – I

Introduction:

Organization of Clinical laboratory. Introduction to instrumentation and automation in Clinical biochemistry laboratories, safety regulations and first aid. General comments on specimen collection, Type of specimen for biochemical analyses. Precision, accuracy, quality control, precautions and limitations.

UNIT – II

Basics of Hepatic and Renal physiology:

Evaluations of biochemical changes in liver and kidney diseases, Liver function tests (LFTs), Renal function tests (RFTs), GFR. Diagnostic biochemical profile.

UNIT – III

Glucose metabolism

Digestion, absorption and assimilation of carbohydrates. Enzymes and hormones (Insulin, Glucagon) in regulation of blood glucose levels. Clinical significance of variations in blood glucose levels, disorders - Diabetes mellitus, Insulin resistance

UNIT – IV

Lipid profile: Lipids, fats, Triglycerides, cholesterol, fatty acids, PUFAS. Digestion and absorption of lipids. Composition and functions of lipoproteins. Clinical significance of elevated lipoproteins.

Exercises

Estimation of triglycerides, cholesterol, LDL, VLDL and HDL cholesterol.

UNIT – V

Cardiovascular diseases: Basic cardiovascular physiology, biochemical symptoms associated with cardiovascular diseases and their evaluation. Involvement of enzymes in diagnosis of heart diseases including Aspartate transaminase, Isoenzymes of creatine kinase and lactate dehydrogenase and troponin.

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V Semester Syllabus (w.e.f. 2020-21 Admitted Batch)
BIOCHEMISTRY

BSc	Semester:V(SkillEnhancementCourse-Elective)	Credits:1
Course:20BC 5A1	Clinical BiochemistryLab	Hrs/Wk:2

1. Collection of blood, separation of plasma, serum and their storage
2. Estimation of bilirubin (direct and indirect method)
3. Estimation of serum transaminases (AST, ALT) and serum alkaline phosphatases (ALP)
4. Quantitative determination of serum urea and creatine
5. Use of urine strips / dip strip method for urine analysis
6. Estimation of blood glucose by glucose oxidase - peroxidase method
7. GTT (Glucose Tolerance Test)
8. Estimation of cholesterol
9. Estimation of creatine kinase (CK)
10. Estimation of LD

SUGGESTED READING

1. Medical laboratory technology a procedure manual for routine diagnostic tests. Volume 1, Mukherjee, K.L., Tata Mc Graw hill publishing Company Limited, (New Delhi). ISBN 9780070076594/ISBN-978007007663
2. Medical laboratory technology a procedure manual for routine diagnostic tests. Volume 2, Mukherjee, K.L., Tata Mc Graw hill publishing Company Limited, (New Delhi). ISBN 9780070076648
3. Medical Biochemistry 2005, 2 nd Edition, Bayner, J.W, and Dominiazak, M.H, Elsevier, Mosby Ltd (Philadelphia). ISBN-0/7234/3341/0
4. Experimental Biochemistry, A student companion (2005), Rao, B.S, and Deshpande, V., IK international Pvt.Ltd(NewDelhi) ISBN-8188237/41
5. Clinical diagnosis and management by Lab methods (John Bernard Henry, W.B. Salunders Company, 1984).
6. Clinical Biochemistry – S. Ramakrishnan and Rajiswami.



V Semester Syllabus

BIOCHEMISTRY

(w.e.f. 2020-21 Admitted Batch)

20BC5A2- HAEMATOLOGICAL AND IMMUNOLOGICAL TECHNIQUES

UNIT - I

Introduction

Organization of Clinical Immunology laboratory. Introduction and maintenance of clinical Immunology laboratory; hazards in clinical laboratory; units; 'normal range', reference values. Factors affecting reference values quality control in laboratory – use of external and internal standards; use of WHO standards.

UNIT - II

Composition of blood and Lymph

Plasma and cells-RBC, WBC, platelets, blood clotting, plasma proteins, separation and applications, plasma therapy. Lymph.

UNIT - III

Advanced diagnostic methods

Identification of viral, bacterial and other diseases - ELISA, Western blot, RT-PCR, Tissue Histopathology, fixing, staining (H&E) and microtome sections

UNIT - IV

Auto immunity

Introduction, Auto recognition, classes of auto immuno diseases. (Hashimoto disease, thyrotoxicosis, Systemic lupus erythematosus, Autoimmune haemolyticanaemia, Rheumatoid arthritis).

UNIT – V

Immunoglobulins (Igs) ,Types of Igs, nature and structure of Igs –Light chain, heavy chain and functions.

Adjuvants, Antibody production,enzymaticcleavageofIgs,Haptens.

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V Semester Syllabus (w.e.f. 2020-21 Admitted Batch)
BIOCHEMISTRY

BSc	Semester:V(SkillEnhancementCourse-Elective)	Credits:1
Course:20BC5A2	Haematological and Immunological Techniques Lab	Hrs/Wk:2

1. Determination of human blood groups
2. Differential Leucocyte count in human peripheral blood by Leishmans staining
3. Separation of mononuclear cells from human peripheral blood
4. Determination of Erythrocyte Sedimentation Rate (ESR)
5. Determination of Packed Cell Volume (PCV)
6. Estimation of Haemoglobin (Hb) by Sahlis acid hematin method
7. Detection of HCG by latex agglutination inhibition test
8. Widal test
9. Ouchterlony double immuno diffusion
10. Single Radial Immunodiffusion

REFERENCE BOOKS

1. Essential Immunology - By I. Roitt, Publ: Blackwell
2. Immunology - By G. Reeve& I. Todd, Publ: Blackwell
3. Abbas AK, Lichtman AH, Pillai S. Cellular and Molecular Immunology. Saunders Publication, Philadelphia
4. Golds by RA, Kindt TJ, Osborne BA. Kuby's Immunology. W.H. Freeman and Company, New York
5. Ronald Hoffman, Edward J. Benz Jr., Leslie E. Silberstein, Helen Heslop, Jeffrey Weitz, John Anastasi - Hematology: Basic Principles and Practice, Elsevier Health Sciences, 201



V Semester Syllabus

BIOCHEMISTRY

(w.e.f. 2020-21 Admitted Batch)

20BC5B1-FOOD TECHNOLOGY

UNIT-I

Food Regulations and Standards

Sampling methods - Sample preparation for analysis; Statistical evaluation of analytical data - Official Methods of Food Analysis. Moisture in foods - determination by different methods - ash content of foods, wet, dry ashing, microwave ashing methods; Significance of Sulphated Ash, water soluble ash and acid insoluble ash in foods determination of dietary fibre and crude fibre.

UNIT-II

Analysis of major food components

Determination of total fats in foods by different methods; Analysis of oils and fats for physical and chemical parameters, Quality standards, and adulterants; different methods of determination of protein and amino acids in foods; determination of total carbohydrates, starch, disaccharides and simple sugars in foods

UNIT-III

Processing and preservation of foods

Blanching, pasteurization, sterilization, microwave heating. Low Temperature-refrigeration, freezing, dehydro-freezing. Food irradiation. Processing and preservation by drying, concentration and evaporation. Non-thermal methods like High pressure, pulsed electric field, hurdle technology. Use and application of enzymes and microorganisms in processing and preservation of foods.

UNIT-IV

Environmental contaminants and drug residues in food:

Fungicide and pesticide residues in foods; heavy metal and their health impacts; use of veterinary drugs (e.g. Malachite green in fish and β -agonists in pork); other contaminants in food, radioactive contamination of food, Food adulteration and potential toxicity of food adulterants. Endocrine disrupters in food.

UNIT-V

Fermentative food Products

Foods: Processes for preparing fermented products including Yogurt (curd) and other Traditional Indian Products like idli, dosa, dhokla, shrikhand, Soya based products like soya sauce, natto, Cheese.; Alcoholic Beverages based on fruit juices (wines), cereals (whisky, beer, vodka.), sugar cane (rum) Process description, quality of raw materials, fermentation process controls.

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V Semester Syllabus (w.e.f. 2020-21 Admitted Batch)
BIOCHEMISTRY

BSc	Semester: V (Skill Enhancement Course-Elective)	Credits:1
Course:6B	Food Technology Lab	Hrs/Wk:2

1. Titratable Acidity in foods.
2. Determination of proteins, fats and carbohydrates
3. Methods for Processing and preservation of foods
4. Determination of Glucose content by enzymatic method (amylase, invertase)
5. Qualitative detection of adulterants in foods
6. Wine preparation from fruit juices and molasses
7. identification of microbial strains in yogurt
8. MBRT of milk

Reference Books

1. A first course in food analysis By A. Y. Sathe.
2. Hand book of analysis and quality control for fruit & vegetable products By S. Ranganathan.
3. Handling and storage of food grains by S. V. Pingale.
4. Food science chemistry & experimental food By Dr. M. Swaminathan.
5. Food chemistry by William Hogland Meyer.
6. Food adulteration By Thankamma Jacob.
7. Food Microbiology by William C. Frazier.
8. Preservation of Fruits and Vegetables Giridharilal.



V Semester Syllabus
BIOCHEMISTRY
(w.e.f. 2020-21 Admitted Batch)
7B- FOOD MICROBIOLOGY

UNIT I

History and development of Microbiology-Importance and significance of microorganisms in food science. Bacterial growth curves, Factors affecting the growth of microorganisms in food – Intrinsic and Extrinsic parameters

UNIT II

Determination of microorganisms and their products in food: Sampling, sample collection, transport and storage, sample preparation for analysis. Microscopic and culture dependent methods- Direct microscopic observation, culture, enumeration and isolation methods; Chemical and Physical Methods-Chemical, immunological and nucleic acid-based methods;

UNIT III

Protection and preservation of Foods:

Chemical, Modified atmosphere, Radiation in foods from the microbiological angle. Indicators of water and food safety and quality: Microbiological criteria of foods and their Significance.

UNIT IV

Food spoilage: characteristic features, dynamics and significance of spoilage of different groups of foods - Cereal and cereal products, vegetables and fruits, meat poultry and sea foods, milk and milk products, packed and canned foods.

UNIT V

Food borne diseases: *Bacterial borne diseases* (Staphylococcal intoxication, Botulism, Salmonellosis, Shigellosis, Enteropathogenic *Escherichia Coli Diarrhoea*, *Clostridium Perfringens* gastroenteritis, *Bacillus cereus Gastroenteritis*). *Mycotoxins:* Aflatoxicosis, Deoxynivalenol Mycotoxicosis, Ergotism. Drug resistance - phenomena and mechanism.

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V Semester Syllabus (w.e.f. 2020-21 Admitted Batch)
BIOCHEMISTRY

BSc	Semester: V(Skill Enhancement Course-Elective)	Credits:1
Course:7B	Food Microbiology Lab	Hrs/Wk:2

1. Preparation of common laboratory media and special media.
2. Bacterial count by standard plate method (SPC)
3. Isolation and Identification of bacteria
4. Gram's staining
5. acid-fast staining
6. Microbiological analysis of typical processed foods
7. Coli form test
8. Microbiological analysis of food born bacterial pathogens

Text books and reference materials

1. Prescott LM Harley JP and Klein DA (2006). Microbiology (7th edition) McGraw Hill, Newyork.
2. Frazier, W.C. (1988) Food Microbiology, Mc Graw Hill Inc. 4th Edition.
3. Vijaya Ramesh,K. (2007) Food Microbiology. MJP publishers, 2007
4. Yasmine Motarjemi and Martin Adams. (2006) Emerging Food borne pathogen- Wood Head Publishing England.
5. Arun, K Bhunia. (2008) Food borne microbial pathogens: Mechanisms and pathogenesis. Springer.
6. Thomas J. Montville, Karl R. Matthews, Kalmia E. Knierl (2012). Food Microbiology: An Introduction, American Society for Microbiology.
7. Dubey, R.C. and Maheswari, D.K. (2008) Text book of Microbiology. S Chand Publishing.



V Semester Syllabus

BIOCHEMISTRY

(w.e.f. 2020-21 Admitted Batch)

6C-GENETIC ENGINEERING

UNIT -I

Basics of Genetic engineering

Introduction, historical perspective, basics of cloning, Vectors, Restriction enzymes, plasmids PBR 322, PUC vector, Cosmids, YACs, cDNA libraries.

UNIT -II

Genetic Engineering in Animals

Gene transfer methods in Animals. Transfection. Microinjection, Embryonic-stem cells Gene transfer and Retrovirus Gene transfer methods to create transgenic animals. Applications of transgenic animals in agriculture, medicine and pharmaceuticals.

UNIT -III

Genetic engineering in Plants

Manipulation of Plant Genes-Electroporation, Shotgun method, *Agrobacterium* mediated gene transfer. Applications in Crop improvement, disease and pest resistance, tolerance to environmental stress. Genetically engineered foods.

UNIT- IV

Genetic engineering in Microorganisms

Gene transfer methods in microorganisms - transformation, transduction and conjugation. Transposons.

UNIT- V

Genetic engineering-Environment

Bioremediation Biodegradation, Biofuels and Bioplastics from genetically engineered rape oil seed and other

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V Semester Syllabus (w.e.f. 2020-21 Admitted Batch)
BIOCHEMISTRY

BSc	Semester: V(Skill Enhancement Course-Elective)	Credits:4
Course:6C	Genetic Engineering Lab	Hrs/Wk:4

1. PCR
2. Restriction mapping
3. CaCl₂ mediated transfection
4. Restriction Fragment Length Polymorphism (RFLP)
5. Random Amplified Polymorphic DNA (RAPD)
6. Plasmid isolation from E. coli

Suggested books

1. Genes and Probes, A Practical Approach Series (1995) by Hames and SJ Higgins; Oxford
2. Gel Electrophoresis of Nucleic Acids, A practical Approach (1990) by D Rickwood and BD Hames. Oxford Univ. Press.
3. Genetics by Gardinar
4. Biotechnology by U.Satyanarayana



V Semester Syllabus
BIOCHEMISTRY
(w.e.f. 2020-21 Admitted Batch)
20BC5C2-BIOINFORMATICS

UNIT- I

Scope of Bioinformatics No. of Hours:6

Genomics, structural and functional genomics, genome annotations, gene production approaches and tools. DNA microarray and computational analysis tools. Computer aided drug design and systems biology.

UNIT- II

Biological data bases No. of Hours:6

Introduction to biological databases. Primary, secondary and composite databases, NCBI, EBI, Nucleic acid databases (Gene Bank), EMBL, DDBJ, NDB) protein database, (PIR, Swissport, TrEMDL, PDB) Metabolic databases (KEGG, EcoCyc).

UNIT -III

Sequence Alignments:

Similarity, identities and homology. Concept of alignment pairwise sequence alignment, gaps, gap-penalties, scoring matrices, PAM 250, BLOSUM62, Local and Global Sequence alignment, multiple sequence alignment, progressive alignment, Logarithm alignment. Application of multiple sequence alignment- CLUSTAL W, BLAST-blastn, blastp and blastx

UNIT- IV

Genome projects

General introduction to genome projects (rice and *Mycobacterium tuberculosis* genome project). Special emphasis on Human Genome Project (HGP). Science behind HGP, benefits of HGP, genetic testing standard, quality and commercialization.

UNIT- V

Proteomics

Introduction, principle, technique of swiss- 2D PAGE data base. Gel analysis, post gel analysis, MALDITOF. Significance and application of proteomics in modern biology

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V Semester Syllabus (w.e.f. 2020-21 Admitted Batch)
BIOCHEMISTRY

BSc	Semester:V (Skill Enhancement Course-Elective)	Credits:1
Course:7C	Bioinformatics Lab	Hrs/Wk:2

1. Searching data from Biological data bases
2. Demonstration on Nucleic acid and protein databases
3. Simple and multiple Sequence alignment
4. Searching structural data from PDB
5. Database search using BLAST
6. SDS-PAGE
7. IEF (2-D gel analysis)
8. Demonstration of MALDI -TOF

Suggested books

1. Genome Mapping: A practical approach. Dear P (Editor). 1st Ed. 2000. Oxford University.
2. Developing Bioinformatics Skills. Alfonso Valencia and Blaschke. L (2005) Oreilles
3. Bioinformatics sequence, structure and data banks ed. By Des Higgins Willie Taylor (2006).
4. Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins" (Andreas D. Baxevanis, B. F. Ouellette), Paperback, 2nd ed., 470 pp., ISBN: 0471383910, Publisher: Wiley, John & Sons, Inc.Pub.
5. David W. Mount, Bioinformatics: Sequence and Genome Analysis, 2nd edition, Cold Spring Harbor Laboratory, 2004.
6. Introduction to Bioinformatics by T.K. Altwood and D.J Parry-Smith (Pearson Education Asia1999).