



Mahatma Gandhi University, Nalgonda
B.Sc. BIOCHEMISTRY SYLLABUS (w.e.f. 2021-22 A.Y. onwards)

(SCHEMA FOR CHOICE BASED CREDIT SYSTEM)

SEMESTER-I				
Code	Course Type	Course Title	HPW	Credits
BS 101	AECC 1	Environmental Science/ Basic Computer Skills	2	2
BS 102	L-1A	English	4	4
BS 103	L-2A	Second Language	4	4
BS 104	DSC - 1A	Chemistry of Biomolecules	4T+2P=6	4+1=5
BS 105	DSC - 2A	Optional II	4T+2P=6	4+1=5
BS 106	DSC - 3A	Optional III	4T+2P=6	4+1=5
		TOTAL		25
SEMESTER-II				
BS 201	AECC 2	Basic Computer Skills/ Environmental Science	2	2
BS 202	L-1B	English	4	4
BS 203	L -2B	Second Language	4	4
BS 204	DSC -1B	Chemistry of Nucleic acids and Biochemical Techniques	4T+2P=6	4+1=5
BS 205	DSC -2B	Optional II	4T+2P=6	4+1=5
BS 206	DSC -3B	Optional III	4T+2P=6	4+1=5
		TOTAL		25
SEMESTER-III				
BS 301	SEC -1	Communication Skills/Professional Skills	2	2
BS 302	SEC - 2	Biofertilizers and Organic Farming/ Apiculture/ Remedial methods for pollution, drinking water and soil fertility@	2	2
BS 303	L -1C	English	3	3
BS 304	L -2C	Second Language	3	3
BS 305	DSC - 1C	Bioenergetics, Biological oxidation and Enzymology	4T+2P=6	4+1=5
BS 306	DSC - 2C	Optional II	4T+2P=6	4+1=5
BS 307	DSC - 3C	Optional III	4T+2P=6	4+1=5
		TOTAL		25
SEMESTER-IV				
BS 401	SEC - 3	Leadership and Management Skills/ Universal Human values	2	2
BS 402	SEC - 4	Mushroom Culture Technology/ Vermiculture/ Chemistry of Cosmetics and Food Processing@	2	2
BS 403	L-1D	English	3	3
BS 404	L-2D	Second Language	3	3

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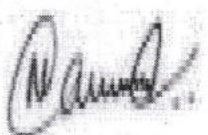

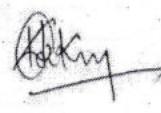



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BS 405	DSC- 1D	Intermediary Metabolism	4T+2P=6	4+1=5
BS 406	DSC- 2D	Optional II	4T+2P=6	4+1=5
BS 407	DSC- 3D	Optional III	4T+2P=6	4+1=5
		TOTAL		25
SEMESTER-V				
BS 501	GE-1	UG V sem generic electives list (w.e.f 2019-20 batch onwards) attached with the syllabus	4T	4
BS 502	L-1E	English	3	3
BS 503	L-2E	Second Language	3	3
BS 504	DSE-1E	A – Physiology, Nutrition and Clinical Biochemistry	4T+2P=6	4+1=5
		B - Cell Biology, Genetics and Microbiology		
BS 505	DSE-2E	Optional II A/B	4T+2P=6	4+1=5
BS 506	DSE-3E	Optional III A/B	4T+2P=6	4+1=5
		TOTAL		25
SEMESTER-VI				
BS 601	L-1F	English	3	3
BS 602	L-2F	Second Language	3	3
BS 603	DSE-1F	A - Molecular Biology and Immunology	4T+2P=6	4+1=5
		B – r-DNA technology and Biotechnology		
BS 604	DSE-2F	Optional II A/B	4T+2P=6	4+1=5
BS 605	DSE-3F	Optional III A/B	4T+2P=6	4+1=5
BS 606		Project work/Optionals	4	4
		TOTAL		25
		TOTAL CREDITS		150

AECC- Ability Enhancement Compulsory Course; DSC- Discipline Specific Course; SEC- Skill Enhancement Course; DSE- Discipline Specific Elective; GE- Generic Elective; L- Language; HPW – Hours per week; @=list attached with the syllabus.

- *Credits under Non-CGPA : i. NSS/NCC/Sports/Extra-curricular – 2 in each year (upto 6)
ii. Summer internship – 2 in each semester, after I & II years (upto 4)







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DSC -1A
Semester – I: Paper-BS104 (Theory): Chemistry of Biomolecules
(4 Credits; 4Hr/week)

Credit- I: Introduction

1. Scope of Biochemistry
2. Water as biological solvent
3. Weak acids and bases
4. pH and concept of Buffers
5. Biological buffers and their physiological importance
6. Henderson- Hasselbalch equation (Simple numerical problems)
7. Concept of Stereo chemistry with reference to Carbohydrates and Amino acids.

Credit – II: Amino acids & proteins

1. Classification, structure, stereochemistry and chemical reactions of amino acids.
2. Titration curve of glycine & pK values.
3. Essential, nonessential amino acids and non-protein amino acids.
4. Peptide bond- Nature and conformation, Naturally occurring peptides –Glutathione and Brain peptides (Enkephalin)
5. Outlines of protein classification, structural organization of proteins: primary, secondary, tertiary and quaternary structures (ex. hemoglobin & myoglobin)
6. General properties of proteins, denaturation and renaturation of proteins.
7. Determination of amino acid composition of proteins.

Credit - III: Carbohydrates

1. Classification of carbohydrates
2. Monosaccharides : Structures, Fisher and Haworth projections
3. Reactions of monosaccharides, Mutarotation
4. Amino sugars and Glycosides
5. Disaccharides, Oligosaccharides and Polysaccharides
6. Storage and Structural Polysaccharides
7. Glycosaminoglycans and Bacterial cell wall polysaccharides.

Credit – IV: Lipids

1. Classification of lipids, Reactions & properties of lipids
2. Saturated, Unsaturated and Essential fatty acids
3. Structure and functions of Neutral fats, waxes, phospholipids, sphingolipids,
4. Structure and functions of cholesterol and glycolipids.
5. Prostaglandins and lipoproteins.
6. Bio membranes, behavior of amphipathic lipids in water, formation of micelles, bilayers, vesicles, Liposomes
7. Membrane composition and fluid mosaic model.

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References:

1. Lehninger's Principles of Biochemistry – Nelson.D.L. and Cox.M.M., Freeman & Co.
2. Biochemistry – Berg.J.M., Tymoczko.J.L. and Stryer.L., Freeman & Co.
3. Biochemistry – Voet.D and Voet., J.G., John Wiley & Sons
4. Textbook of Biochemistry – West.E.S., Todd.W.R., Mason.H.S. and Bruggen, J.T.V., Oxford & IBH Publishers.
5. Outlines of Biochemistry – Conn.E.E., Stumpf.P.K., Bruening, G and Doi.R.H., John Wiley & Sons .
6. Harper's Illustrated Biochemistry – Murray, R.K., Granner.D.K. & Rodwell,V.W., McGraw-Hill
7. Biochemistry-Lippincott's Illustrated Reviews. Champe, P.C. and Harvey, R. A. Lippincott
8. Fundamentals of Biochemistry – Jain, J.L., Jain, S., Jain, N. S. Chand & Co.
9. Biochemistry – Satyanarayana.U and Chakrapani.U, Books & Allied Pvt. Ltd.

DSC – 1A

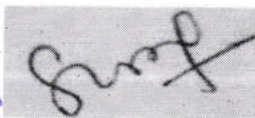
Semester – I: BS 104; Practicals: Qualitative Analysis of Biomolecules (1 Credits; 2Hrs/week)

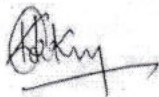
1. Laboratory general safety procedures
2. Preparation of standard solutions (Molar, Normal and percent solutions)
3. Determination of pKa values of amino acids by titration (Glycine)
4. Preparation of buffers (Acetate and Phosphate buffers)
5. Qualitative identification of Carbohydrates
6. Qualitative identification of Amino acids
7. Qualitative identification of Lipids

References

1. Experimental Biochemistry-A student companion-Beedu Sashidhar Rao and Vijay Deshpande.
2. Laboratory Manual in Biochemistry- Jayaraman, J. Wiley Eastern

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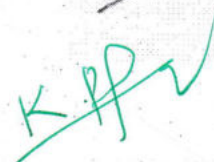












References

1. Biochemistry – Voet.D and Voet., J.G., John Wiley & Sons
2. Textbook of Biochemistry – West.E.S., Todd.W.R., Mason.H.S..and. Bruggen, J.T.V., Oxford & IBH Publishers.
3. Outlines of Biochemistry – Conn.E.E., Stumpf.P.K., Bruening, G and Doi.R.H., John Wiley & Sons .
4. Principles and Techniques of Practical Biochemistry- Wilson, K. and Walker, J. Cambridge Press.
5. The Tools of Biochemistry- Cooper, T. G. John Wiley & Sons Press.
6. Physical Biochemistry- Friefelder, D.W.H. Freeman Press.
7. Analytical Biochemistry – Holme.D.J. and Peck.H., Longman.
8. Biophysical Chemistry: Principle and techniques- Upadhyay A, Upadhyay K and Nath. N. Himalaya Publishing House.
9. Experimental Biochemistry- Clark Jr. J.M and Switzer, R. L. Freeman &Co..

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DSC – 1B

Semester – II: Paper-BS204; Practicals: Quantitative Analysis of Biomolecules

(1 Credit; 2Hrs/week)

1. Amino acid Estimation by Ninhydrin method
2. Protein Estimation by Biuret
3. Protein estimation by Folin's Method
4. Estimation of Total Sugars by Anthrone Method
5. Estimation of Total Reducing Sugars by Dinitrosalicylate method
6. Estimation of Keto sugar by Roe's resorcinol Method

References

1. Experimental Biochemistry-A student companion-BeeduSashidharRao and VijayDeshpande.
2. Laboratory Manual in Biochemistry- Jayaraman, J. Wiley Eastern

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DSC – 1C
Semester – III: Paper-BS305 (Theory): BIOENERGETICS, BIOLOGICAL OXIDATION
AND ENZYMOLOGY
(4 Credits; 4Hr/week)

Credit- I : Bioenergetics

1. Energy transformations in the living system
2. Free energy, Enthalpy and Entropy concepts.
3. Exergonic and endergonic reactions.
4. High energy compounds.
5. Phosphate group transfer potential.
6. Substrate level phosphorylation.
7. Cytochromes-structure, types and their functions

Credit – II: Biological Oxidations

1. Biological oxidations: Definition, enzymes involved- oxidases, dehydrogenases and oxygenases.
2. Redox reactions: Redox couplers. Reduction potential (ϵ , ϵ_0 , ϵ'_0). Standard reduction potential (ϵ'_0) of some biochemically important half reactions.
3. Ultrastructure of mitochondria, Electron transport chain and carriers involved.
4. Oxidative phosphorylation, theories of oxidative phosphorylation- Mitchell's chemiosmotic theory. $F_0 F_1$ -ATPase, Inhibitors of respiratory chain and oxidative phosphorylation, uncouplers.
5. Formation of reactive oxygen species and their disposal through enzymatic reactions.
6. Ultrastructure of chloroplast
7. Cyclic and non-cyclic photophosphorylation.

Credit- III : Introduction to Enzymology

1. Introduction to biocatalysis, differences between chemical and biological catalysis.
2. Nomenclature and classification of enzymes.
3. Definition of holo-enzyme, apo-enzyme, coenzyme, cofactor, Fundamentals of enzyme assay, enzyme units.
4. Methods of Enzyme purification
5. Enzyme specificity. Active site.
6. Principles of energy of activation, transition state.
7. Interaction between enzyme and substrate- lock and key, induced fit models.

Credit – IV: Enzyme Kinetics and Enzyme action

1. Rate of a Reaction – Law of Mass action, Factors affecting the catalysis- substrate concentration, pH, temperature, Time, Enzyme concentration and Product concentration
2. Michaelis - Menten equation for single substrate reaction, significance of K_M and V_{max} .
3. Enzyme inhibition- irreversible and reversible, types of reversible inhibitions- competitive and non-competitive.
4. Outline of mechanism of enzyme action-acid-base catalysis, covalent catalysis, electrostatic catalysis, and metal ion catalysis.
5. Regulation of enzyme activity- allosterism and cooperativity, ATCase as an allosteric enzyme, covalent modulation- covalent phosphorylation of phosphorylase
6. Zymogen activation- activation of trypsinogen and chymotrypsinogen.
7. Isoenzymes (LDH) and Multienzyme complexes (PDH). Ribozyme.

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8. Fundamentals of Biochemistry – Jain, J.L., Jain, S., Jain, N. S. Chand & Co.-
9. Biochemistry – Satyanarayana.U and Chakrapani.U, Books & Allied Pvt. Ltd.
10. Fundamentals of Enzymology – Price.N.C. and Stevens.L., Oxford University Press.
11. Understanding Enzymes – Palmer.T., Ellis Harwood.
12. Enzymes – Biochemistry, Biotechnology, Clinical Chemistry – Palmer.T., Affiliated East-West Press

DSC – 1C

Semester – III: Paper-BS305 (Practicals): ENZYMOLOGY (1 Credit; 2Hrs/week)

1. Assay of salivary α -amylase
2. Assay of β -amylase from sweet potatoes
3. Assay of urease
4. Assay of catalase
5. Assay of phosphatase
6. Determination of optimum temperature and pH for amylase
7. Determination of optimum pH for phosphatase
8. Effect of Substrate concentration of amylase activity

References

1. Experimental Biochemistry-A student companion-Beedu Sashidhar Rao and Vijay Deshpande.
2. Laboratory Manual in Biochemistry- Jayaraman, J. Wiley Eastern
3. Enzyme Assays- A practical Approach: Eisenthal, R and Dawson, M.I., IRL Press.
4. Biochemical Methods- Sadasivam, S and Manickyam, A. New Age International Publishers.

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DSC – 1 D
Semester – IV: Paper-BS405 (Theory): INTERMEDIARY METABOLISM
(4 Credits; 4Hrs/week)

Credit-I : Amino acid Metabolism

1. General reactions of amino acid metabolism- transamination, decarboxylation and deamination
2. Urea cycle and regulation
3. Catabolism of carbon skeleton of amino acids- glycolytic and ketogenic amino acids.
4. Metabolism of glycine, serine, aspartic acid, methionine, phenylalanine and leucine.
5. Biosynthesis of creatine.
6. Inborn errors of aromatic amino acids
7. Inborn errors of branched chain amino acid metabolism.

Credit- II : Carbohydrate Metabolism

1. Concept of anabolism and catabolism.
2. Glycolytic pathway, energy yield. Fate of pyruvate- formation of lactate and ethanol, Pasteur effect.
3. Citric acid cycle, regulation, energy yield, amphipathic role. Anaplerotic reactions.
4. Glycogenolysis and glycogenesis.
5. Pentose phosphate pathway.
6. Gluconeogenesis.
7. Photosynthesis- Light and Dark reactions, Calvin cycle and C₄ Pathway, CAM Pathway

Credit – III: Lipid Metabolism

1. Catabolism of fatty acids (β - oxidation) with even and odd number of carbon atoms
2. Ketogenesis
3. *de novo* synthesis of fatty acids
4. Elongation of fatty acids in mitochondria and microsomes
5. Biosynthesis and degradation of triacylglycerol
6. Biosynthesis of lecithin.
7. Biosynthesis of cholesterol.

Credit – IV : Nucleic acid Metabolism

1. Biosynthesis of purine and pyrimidine nucleotides, *de novo* and salvage pathways.
2. Regulation of purine and pyrimidine nucleotides
3. Catabolism of purines and pyrimidines.
4. Biosynthesis of deoxyribonucleotides- ribonucleotidoreductase and thymidylate synthase and their significance.
5. Disorders of nucleotide metabolism- Gout, Lesch- Nyhan syndrome.
6. Biosynthesis of heme
7. Degradation of heme

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3. Biochemistry – Voet.D and Voet., J.G., John Wiley & Sons .
4. Textbook of Biochemistry – West.E.S., Todd.W.R., Mason.H.S..and. Bruggen, J.T.V., Oxford & IBH Publishers.
5. Principles of Biochemistry: General Aspects-Smith, E. L., Hill, R.L. Lehman, I. R. Lefkowitz, R.J. Handler, P., and White, A. McGraw-Hill
6. Outlines of Biochemistry – Conn.E.E., Stumpf.P.K., Bruening, G and Doi.R.H., John Wiley & Sons .
7. Harper's Illustrated Biochemistry – Murray, R.K., Granner.D.K. & Rodwell, V.W., McGraw-Hill
8. Biochemistry-Lippincott's Illustrated Reviews. Champe, P.C. and Harvey, R. A. Lippincott
8. Fundamentals of Biochemistry –Jain, J.L., Jain, S., Jain, N. S. Chand & Co.
9. Biochemistry – Satyanarayana.U and Chakrapani.U, Books & Allied Pvt. Ltd.
10. Biochemistry – RamaRao. A and RatnaKumari. D, Kalyani Publishers.
11. Biochemistry- The Molecular Basis of Life – McKee. T and McKee, J. R, McGraw-Hill.

DSC – 1 D

Paper-BS405 (Practicals): BIOCHEMICAL PREPARATIONS AND SEPARATIONS (1 Credits; 2Hrs/week)

1. Absorption maxima of colored substances- *p*-Nitrophenol, Methyl orange and KMnO_4 .
2. Absorption spectra of Amino acid – Tyrosine; protein-BSA, nucleic acids- Calf thymus DNA.
3. Isolation of egg albumin from egg white.
4. Isolation of cholesterol from egg yolk.
5. Isolation of starch from potatoes.
6. Isolation of casein from milk.
7. Separation of amino acids by Paper chromatography
8. Separation of Plant pigments by TLC

References

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2. Laboratory Manual in Biochemistry- Jayaraman, J. Wiley Eastern

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DSE – 1 E

**Semester – V: Paper-BS 504 A (Theory): Physiology, Nutrition and Clinical Biochemistry
(4Credits; 4Hr/week)**

Credit-I: Physiology

1. Digestion and absorption of carbohydrates, lipids and proteins
2. Composition of blood and coagulation of blood
3. Hemoglobin and transport of gases in blood (oxygen and CO₂)
4. Heart- structure of the heart, Cardiac cycle, cardiac factors controlling blood pressure
5. Physiology of Vision
6. Muscle- kinds of muscles, structure of myofibril, organization of contractile proteins and mechanism of muscle contraction.
7. Structure of Neuron and propagation of nerve impulse

Credit-II: Endocrinology

1. Endocrinology- organization of endocrine system. Classification of hormones.
2. Mechanism of hormonal action- Steroid and peptide hormones such as adrenaline, glucocorticoids and insulin.
3. Chemistry, physiological role and disorders of hormones of Pituitary, Hypothalamus and Thyroid
4. Chemistry, physiological role and disorders of hormones of Pancreas
5. Chemistry, physiological role and disorders of hormones of Parathyroid
6. Chemistry, physiological role and disorders of hormones of Gonads, Placenta and Adrenals
7. Gastrointestinal hormones and their physiological role

Credit – III: Nutrition

1. Balanced diet. Calorific values of foods and their determination by bomb calorimeter.
2. BMR and factors affecting BMR. Specific dynamic action of foods.
3. Energy requirements and recommended dietary allowance (RDA) for children, adults, pregnant and lactating women.
4. Sources of complete and incomplete proteins. Biological value of proteins. Role of essential fatty acids in human nutrition.
5. Malnutrition- Kwashiorkar, Marasmus and PEM.
6. Vitamins- sources, structure, biochemical roles, deficiency disorders of water and fat soluble vitamins; Bulk and trace elements-Ca, Mg, Fe, I, Cu, Mo, Zn, Se and F.
7. Nutraceuticals; Obesity and starvation.

Credit-IV: Organs and Organ Function tests

1. Structure and functions of the liver.
2. Liver function tests- conjugated and total bilirubin in serum, albumin: globulin ratio, hippuric acid and bromsulphthalein tests. Serum enzymes in liver diseases- SGPT, GGT and alkaline phosphatase.
3. Kidneys-structure of nephron and Mechanism of urine formation
4. Normal and abnormal constituents of urine.
5. Biological buffers. Role of kidneys in maintaining acid-base and electrolyte balance in the body.
6. Renal function tests- creatinine and urea clearance tests, phenol red test.
7. Biochemical tests for the diagnosis of heart diseases- HDL/LDL cholesterol, SGOT, LDH, CK, C-reactive protein, cardiac troponins.





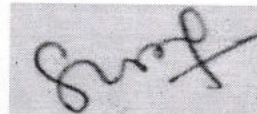




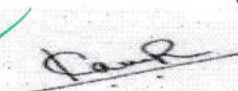













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References

1. Textbook of Biochemistry and Human Biology – Talwar, G.P. and Srivastava. L.M., Printice Hall of India
2. Review of Medical Physiology-Ganong.McGraw-Hill.
3. Human Physiology – Chatterjee.C.C, Medical Allied Agency
4. Textbook of Medical Physiology – Guyton.A.G and Hall.J.E., Saunders
5. William's Textbook of Endocrinology – Larsen, R. P. Korenberg, H. N. Melmed, S. and Polensky, K. S. Saunders
6. Mammalian Biochemistry- White, A. Handler, P. and Smith, E. L. McGraw-Hill.
7. Textbook of Human Nutrition- Bamji, PralhadRaoand Reddy V. Oxford & IBH Publishers.
8. Foods: Facts & Principle- ShakuntalaandShadaksharaswamy. Wiley Ester Press.
9. Essentials of Food and Nutrition – Swaminathan.M.Bangalore Press.
10. Human Nutrition and Dietetics.Davidson, S. and Passmore, J. R.ELBS.
11. A Textbook of Biochemistry: Molecular and Clinical Aspects. Nagini, S.Scitech Publishers.
12. Tietz Fundamentals of Clinical Chemistry- Burtis, A. A.andAshwood, E. R. Saunders-imprint Elsevier Pub.
13. Textbook of Biochemistry with Clinical Correlations – Devlin.T.M.,Wiley – Liss
14. Textbook of Medical Biochemistry – Chatterjea.M.N. andShinde.R, Jaypee Brothers Medical Publishers.
15. Textbook of Medical Biochemistry- Ramakrishnan, S., Prasannan, K. G. and Rajan, R. Orient Longman
16. Essentials of Food and Nutrition –Swaminathan M. Bangalore Press

DSE- 1E

Semester – V: Paper - BS 504 A (Practicals): Physiology, Nutrition and Clinical Biochemistry (1 Credit; 2Hrs/week)

1. Estimation of hemoglobin in blood.
2. Total count - RBC and WBC. Differential count.
3. Urine analysis for albumin, sugars and ketone bodies.
4. Estimation of urinary creatinine.
5. Estimation of blood urea.
6. Estimation of serum total cholesterol.
7. Determination of serum alkaline phosphatase activity.
8. Determination of SGOT and SGPT activity
9. Estimation of calcium by titrimetry
10. Estimation of iron in apple juice by phenanthroline method.
11. Estimation of vitamin C by 2, 6 -dichlorophenol indophenol method.
12. Isolation of total lipids by gravimetric method.
13. Determination of iodine value of an oil.
14. Determination of acid value of an oil.

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References

1. Experimental Biochemistry-A student companion-BeeduSashidharRao and VijayDeshpande:
2. Laboratory Manual in Biochemistry- Jayaraman, J. Wiley Eastern
3. Biochemical Methods- Sadasivam,S and Manickyam,A. New Age International Publishers

DSE – 1 E

Semester – V: Paper-BS 504 B (Theory): Cell Biology, Genetics and Microbiology (4 Credits; 4Hr/week)

Credit – I: Cell Biology

1. Cells as basic units of living organisms
2. Composition & functions of cell organelles
3. Cytoskeleton- Microfilaments, Microtubules & Intermediate filaments
4. Ultra-structure of prokaryotic cell and eukaryotic cells
5. Chromosome organization in Prokaryotes and Eukaryotes and structure of chromosomes (Polytene and Lamp Brush)
6. Mitosis and Meiosis and their significance
7. Cell Cycle and cell death; Apoptosis

Credit – II: Genetics

1. Basic concepts of Mendel's experiments – Law of segregation and Law of Independent assortment
2. Partial or incomplete dominance and Co-dominance
3. Non-Mendelian inheritance: Extra chromosomal inheritance (*Paramoecium* & *Drosophila*).
4. Maternal inheritance (Coiling in snails, Leber's hereditary optic neuropathy (LHON)).
5. Linkage and recombination
6. Polygenic inheritance (Introduction to quantitative traits).
7. Sex linked inheritance. X-linked recessive inheritance (colour blindness & Hemophilia). Concept of Autosomal recessive and dominant inheritance

Credit – III: Mutations and Mutagens

1. Mutations (spontaneous / induced, somatic / germinal, forward / reverse, transition / transversions)
2. Mutations (Silent, missense, nonsense, and frame shift mutations, conditional, leaky)
3. Detection, selection & isolation of microbial mutants
4. Estimation of mutation rates
5. Reversion and suppression of mutations
6. Mutagens – physical, chemical
7. Transposon mutagenesis, site-directed mutagenesis

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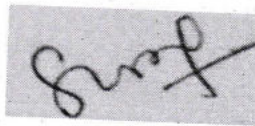
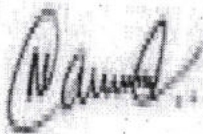
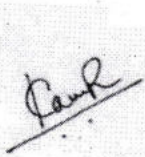
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Credit – IV : Microbiology

1. Introduction to brief history of microbiology. Classification of microorganisms, Mycoplasma.
2. Isolation and cultivation of bacteria. Selective media and enriched media.
3. Bacterial growth curve and kinetics of growth. Batch, continuous and synchronous cultures.
4. Gram's staining- Gram positive and Gram negative bacteria, motility and sporulation.
5. Industrial uses of *Aspergillusniger*, yeast and Spirulina.
6. Structure and composition of viruses. One-step growth and determination of plaque forming units (PFU).
7. Viral life cycles – T4 (Lytic), λ phage (lytic and lysogenic), TMV, Retro viruses- HIV.

References

1. Principles of Genetics by Eldon John Gardner, Michael J. Simmons, D. Peter Snustad; John Wiley
2. Modern Genetic Analysis Anthony JF Griffiths, William M Gilbert, Jeffrey H Miller, and Richard C Lewontin. Pub. W. H. Freeman
3. Lewin B. (Ed) (1996) Genes, VII edition, John Wiley and Sons, New York.
4. Cell and Molecular Biology, De Robertis and De Robertis, Lippincott & Wilkins
5. Cell Biology by C. B. Pawar
6. Principles of Genetics by R.H. Tamarin McGrawhill
7. Theory & problems in Genetics by Stansfield, Schaum out line series McGrawhill
8. Textbook of Microbiology – Ananthanarayan, R and Jayaram Paniker, C.K., Orient Longman.
9. Microbiology – Prescott.L.M., Harley.J.P. & Klein.D.A, McGraw-Hill.
10. Microbiology – Pelczar Jr., M.J., Chan.E.C.S. and Krieg.N.R., Tata McGraw-Hill.
11. Textbook of Microbiology- Dubey, R. C. and Maheshwari, D. K. S. Chand & Co.



Dr. T. SIVARAM

Asst. Professor

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DSE – 1 E

**Semester – V: Paper-BS 504 B (Practicals): Cell Biology, Genetics and Microbiology
(1 Credit; 2Hrs/week)**

1. Preparation of different stages of Mitosis
2. Preparation of different stages of Meiosis
3. Types of chromosomes
4. Karyotyping
5. Problems on Monohybrid cross
6. Problems on dihybrid ratio in *Drosophila*/maize
7. Problems on Linkage and Recombination
8. Studies on Sex linked inheritance and X-linked recessive inheritance
9. Preparation of culture media and sterilization methods.
10. Isolation of pure cultures: (i) Streak plate method (ii) Serial dilution method.
11. Gram staining.
12. Motility of bacteria by hanging drop method.
13. Bacterial growth curve.
14. Antibiotic sensitivity by paper disc method.

References

1. Essential practical handbook of Cell Biology & Genetics, Biometry and Microbiology: A Laboratory Manual by Debarati Das, Academic Publishers
2. Microbiology – A Laboratory manual by Cappuccino and Sherman, Pearson Publications LPE.
3. Experiments in Microbiology, Plant Pathology and Biotechnology by Aneja A. R., New Age Publications


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DSE - 1 F
Semester - VI: Paper-BS 603 A (Theory): Molecular Biology and Immunology
(4Credits; 4Hrs/week)

Credit- I : DNA Replication

1. Organization of genome in prokaryotes and eukaryotes.
2. Experimental evidences to prove nucleic acids as genetic material.
3. Nature and structure of the gene.
4. DNA replication- models of replication, Meselson-Stahl's experimental proof for semi-conservative model.
5. DNA polymerases I, II and III of *E.coli*, helicase, topoisomerases, primase, ligase.
6. Bidirectional replication model. Okazaki fragments, leading and lagging strands of DNA synthesis.
7. Inhibitors of DNA replication.

Credit- II : Transcription and Translation


1. Transcription - RNA synthesis, RNA polymerases of prokaryotes and eukaryotes
2. Initiation, Elongation and Termination- rho dependent and rho independent.
3. Post-transcriptional modifications and Inhibitors of RNA synthesis.
4. Genetic code, structure of t-RNA, Deciphering of genetic code, Nirenberg's and Khorana's experiments, wobble hypothesis, degeneracy of genetic code.
5. Protein synthesis- activation of amino acids (aminoacyl t-RNA synthetases).
6. Ribosome structure. Initiation, elongation and termination of protein synthesis. Post-translational modifications and Inhibitors of protein synthesis.
7. Regulation of prokaryotic gene expression- induction and repression. Lac operon, catabolite repression. Tryptophan operon and attenuation.

Credit - III: Immunology

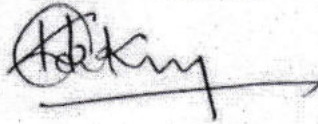
1. Organization of immune system.
2. Organs and cells of immune system.
3. Innate and acquired immunity.
4. Cell mediated and humoral immunity (T- and B- cells).
5. Classification of immunoglobulins, structure of IgG. Theories of antibody formation- clonal selection theory.
6. Epitopes / antigenic determinants. Concept of haptens. Adjuvants.
7. Monoclonal antibodies and their applications

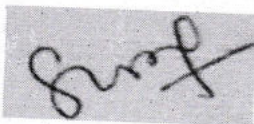
Credit - IV: Immunotechnology

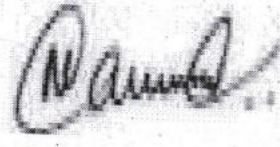
1. Antigen-antibody reactions- agglutination, immunoprecipitation, immunodiffusion.
2. Blood group antigens.
3. Immunodiagnosics-RIA, ELISA.
4. Vaccines and their classification. Traditional vaccines-live and attenuated, toxoids.
5. Modern vaccines- recombinant and peptide vaccines.
6. Outlines of hypersensitivity reactions.
7. Fundamentals of graft rejection and MHC proteins.


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References

1. Molecular Biology of Cell- Alberts, B. Bray, D. Lewis, J. Raff, M. Roberts, K. and Watson, J. D. Garland Publishing.
2. Recombinant DNA and Biotechnology: A Guide for teachers- Helen and Massey. ASM Press.
3. Genes VIII – Lewin. B, Oxford University Press .
4. Molecular Biology- Freifelder. D. Naroasa Pub. House
5. Molecular Biology of the Gene- Watson. J.D., Baker, T.A, Bell, S.P., Gann.A, Levine, M and Losick.R, Pearson Education.
6. Molecular Biotechnology- Glick, B. R. and Pasternak, J. J. ASM Press
7. Principles of Gene Manipulation: An Introduction to GE- Old, R. V. and Primrose, S. B. Blackwell Sci. Pub.
8. Molecular Cell Biology- Lodish, H., Berk, A., Matsudaira, P., Kaiser, C. A., Krieger, M. Scott M P., Zipursky, S. L. and Darnell, J. Freeman & Co.
9. Immunology. Tizard, I. R. Thomson Press.
10. Kuby Immunology – Kindt.T.J., Goldsby.R.A. and Osborne.B.A., Freeman & Co.
11. Roitt's Essential Immunology – Roitt.I.M. and Delves.P.J., Blackwell Science.

DSE – 1 F

Semester – VI: Paper - BS 603 A (Practicals): Molecular Biology and Immunology (1 Credit; 2Hrs/week)

1. Isolation of DNA from onion/liver/coconut endosperm.
2. Isolation of plasmid DNA
3. Isolation of RNA
4. Determination of purity of nucleic acids by UV-spectrophotometric method.
5. Estimation of DNA by diphenylamine method.
6. Estimation of RNA by orcinol method.
7. Electrophoresis of nucleic acids and visualization by methylene blue staining.
8. Restriction mapping: λ - DNA with any two restriction enzymes.
9. Agglutination: ABO and D Ag typing
10. ODD
11. ELISA - sandwich ELISA



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1. Experimental Biochemistry-A student companion-BeeduSashidharRao and VijayDeshpande.
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3. Biochemical Methods- Sadasivam,S and Manickyam,A. New Age International Publishers

DSE – 1 F

Semester – VI: Paper-BS 603 B (Theory): r-DNA technology and Biotechnology (4 Credits; 4Hrs/week)

Credit – I: rDNA technology I

1. Outlines of cloning strategies.
2. DNA sequencing- Maxam Gilbert and Sanger's methods.
3. Tools of r-DNA technology: Enzymes- Restriction endonucleases and ligases
4. Restriction mapping.
5. Cloning vectors- Plasmids, Cosmids, and λ phages
6. Hosts- *E.coli*
7. Molecular markers-RFLP,AFLP and RAPD

Credit – II: rDNA technology II

1. Construction of c-DNA libraries.
2. Polymerase chain reaction- principle and applications.
3. Outlines of blotting techniques-Southern, Northern and Western.
4. Applications of gene cloning- production of insulin
5. Production of human growth hormone
6. Production of Bt cotton
7. Edible vaccines.

Credit – III: Plant and Animal Biotechnology

1. Plant tissue culture and its applications.
2. Plants as bioreactors and valuable chemical factories (production of bioactive compounds)
3. Transgenic plants, Crop improvement, Production of herbicide and insect resistant plants
4. Genetically modified crops – Arabidopsis, Golden rice, soybeans, Bt cotton, tobacco, potato, papaya, jatropha,
5. Animal cell cultures and its applications.
6. Animal cells as bioreactors.Molecular pharming; Production of vaccines, pharmaceutical proteins, recombinant hemoglobin and blood substituents
7. Transgenic animals

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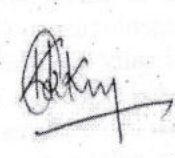
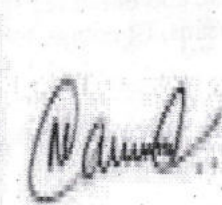
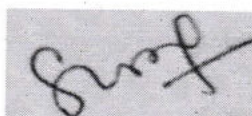
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Credit – IV: Microbial and Environmental Biotechnology

1. Microbes as biocontrol agents, Overview of Microbial insecticides (Baculoviruses, *Bacillus thuringiensis* and *Bacillus sphaericus*)
2. Bioremediation, Biodegradation of cellulose and lignocellulose, bio-surfactants and bio-emulsifiers
3. Microbial ore leaching and production of microbial fuels (hydrogen, methane)
4. Renewable and Non-renewable energy sources
5. Strategies involved in Municipal solid waste treatment, Treatment of industrial and domestic effluent(aerobic and anaerobic)
6. Biomaterials as an alternative to non-degradable materials. Microorganisms for Heavy Metal Accumulation. Biosorption.
7. Heavy metal tolerance (including mechanism) and its impact on environment

References

1. Principles of Gene Manipulation: An introduction to GE – Old, R. and Primrose, S.B. Blackwell Sci. Pub
2. Molecular Biotechnology Glick, BR and Paternak, JJ. Publish ASM Press
3. Introduction to Biotechnology, William J. Thieman, Michael A. Palladino, Benjamin Cummings Publ
4. Biotechnology- Arora, Himalaya pub. House
5. Introduction to Environmental Biotechnology by A. K. Chatterji, PHI Learning Pvt. Ltd.
6. Animal Cells as Bioreactors - By Terence Gatoright, Cambridge Univ Press
7. Text Book of Biotechnology - By H.K. Das (Wiley Publications)
8. Introduction to Plant Tissue Culture - By M.K. Razdan (Oxford and IBH Publishing Company, New Delhi)
9. Industrial Microbiology by L.E. Casida



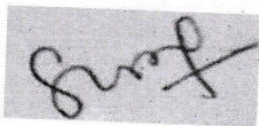
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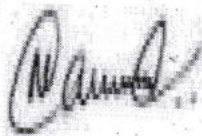
DSE – 1 F
Semester – VI: Paper-BS 603 B (Practicals): r-DNA technology and Biotechnology
(1Credits; 2Hr/week)

1. Gene cloning (Demonstration only)
2. Preparation and transformation of competent cells
3. Preparation of MS medium and initiation of callus
4. Micropropagation of plants
5. Preparation of animal cell culture media, Cell disaggregation and cell counting
6. Isolation of microbes from environment (soil, water, skin, bread, milk)
7. Microbial degradation of organic matter
8. Efficacy testing for bio-fertilizers (nodulation test for rhizobia)
9. Efficacy testing for bio-pesticides
10. Municipal solid waste treatment and Waste water treatment
11. Production of hydrogen and methane

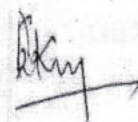
References

1. Molecular Cloning (Lab manual) by Maniatis T, Fritsch EF, Sambrook J, Volume –I, CSH
2. Microbial Biotechnology – A Laboratory Manual for bacterial systems by Das, Surajit, Dash, HirakRanjan, Springer-Verlag
3. Plant Tissue Culture by Kalyan Kumar De
4. Biogas Technology by b.T. Nijaguna
5. Biotechnology procedures and experiments handbook by S. Harisha, Infinity Science Press LLC.



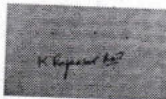
















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Mahatma Gandhi University, Nalgonda.
FACULTY OF SCIENCE
B.Sc. Biochemistry
SEMESTER(CBCS) EXAMINATION
THEORY MODEL PAPER

Time 3 Hrs.

Max Marks 80

PART A (4x5=20M)
(SHORT ANSWER TYPE)

NOTE: ANSWER ANY FOUR OF THE FOLLOWING QUESTIONS

1. CREDIT I
2. CREDIT II
3. CREDIT III
4. CREDIT IV
5. CREDIT I or II
6. CREDIT III or IV

PART -B(4x15=60M)
(ESSAY ANSWER TYPE)

NOTE: ATTEMPT ALL THE QUESTIONS

7. (a) CREDIT I
(or)
(b) CREDIT I
8. (a) CREDIT II
(or)
(b) CREDIT II
9. (a) CREDIT III
(or)
(b) CREDIT III
10. (a) CREDIT IV
(or)
(b) CREDIT IV

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Mahatma Gandhi University, Nalgonda.
FACULTY OF SCIENCE
B Sc. MODEL PAPER
Skill enhancement course (SEC)

Max Marks 40

Time: 2 Hrs.

SECTION A (4X5=20 Marks)
(Short answer type)

Note: Answer any four questions.


1. CREDIT I
2. CREDIT I
3. CREDIT I
4. CREDIT II
5. CREDIT II
6. CREDIT II

SECTION B (2X10 = 20 Marks)
(Essay answer type)

Note: Answer all questions. All questions carry equal marks.

7. a) CREDIT I
OR
b) CREDIT I

8. a) CREDIT II
OR
b) CREDIT II


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