ACADEMIC ORGANISER- 2019-20

M.Sc (Biochemistry) Ist year

SEMESTER I

PAPER I: Chemistry and Metabolism of proteins, lipids and porphyrins

Name of the lecturer: Dr.S.Padma

MONTH & No of teaching days	Unit	Name of the topic
SEPTEMBER 8	Unit I Chemistry of Amino Acids, & Proteins	Classification and structure of 20 aa, essential, non–essential, unusual and non-protein General properties of aa, acid – base titrations, pKa Peptide bond – stability and formation,
OCTOBER 15 (+1 extra)	Unit I Chemistry of Amino Acids, & Proteins	Primary structure, GN Ramachandran plots Secondary structure and motifs, α helix, β sheet, 3-10 helix Leucine zipper, Zinc finger, Trans-membrane regions, βLHL Tertiary & Quaternary structure (myoglobin, hemoglobin) Protein-protein interactions (actin, tubulin) Small peptides (glutathione, peptide hormones), Cyclic peptides (Gramicidin) Classification of proteins-globular, fibrous, membrane, metallo-proteins, SCOP, CATH Denaturation (pH, temperature, chaotropic agents), refolding
NOVEMBER 16 (+2 extra)	Unit II Metabolism of Amino acids, & Proteins Unit III Chemistry of Lipids and Porphyrins	Metabolic fate of dietary proteins and amino acids Degradations to glucose and ketone bodies, Amino acids degraded to Pyruvate, Oxaloacetate Amino acids degraded to Acetyl-CoA, Succinyl-CoA Metabolism of branched chain amino acids Role of glutamate cycle information & circulation of ammonia Glucose alanine cycle, urea cycle Linking of citric acid and urea cycles, regulation of urea cycle,. Genetic defects in metabolism of amino acids and urea metabolism Classification & biological significance of lipids & fatty acids

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December 18	Unit III Chemistry of Lipids and Porphyrins	Fate of Steroids, Sterols, relation to vitamin D and steroid hormones Bile acids and salts, Phospholipids, Oils, waxes, isoprene units, Lipoproteins Glycolipids, Sphingolipids Structure & function of porphyrins (e.g. Heme, chlorophyll) Cerebrosides, gangliosides Prostaglandins, Prostacyclins Thromboxanes, Leukotrienes
	Unit IV Metabolism of Lipids & Porphyrins	Dietary lipids and Apo-lipoproteins Fatty acid biosynthesis, Desaturation of fatty acids Beta oxidation, breakdown of odd chain fatty acids, energy yields Regulation of β – oxidation, ώ – oxidation & α – oxidation Metabolism of phospholipids &Sphingolipids Regulation and Biosynthesis of cholesterol and other steroids Fate of acetyl CoA, formation of ketone bodies and ketosis Biosynthesis of prostaglandins, Prostacyclins, Thromboxanes, Leukotrienes Role of HDL, LDL, and Very-low-density lipoprotein (VLDL)and cholesterol levels in body Metabolism of Porphyrins and associated porphyrias

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Academic organizer
(2019-2020)
M.Sc Biochemistry

Semester I: paper II- Chemistry and Metabolism of Carbohydrates, Vitamins and Nucleic acids.

Name of the lecturer: Dr.A.Sai Padma

Month & no of teaching days	Unit	Name of the topic
September 6	Unit I Chemistry of Carbohydrates	Classification, monosaccharides (aldoses & ketoses),Configuration and conformation of monosaccharides (pyranose & furanose, chair & boat),Reducing and optical properties of sugars, Stability of glycosidic bond, disaccharides, oligosaccharides.
October 11	Unit I Chemistry of Carbohydrates Unit – II: Metabolism of Carbohydrates	Structural polysaccharides-cellulose, hemicellulose, pectin, lignin, chitin, chitosan, Storage polysaccharides; starch, glycogen, inulin, Steric factors in polysaccharides folding, sugar code and lectin,Glycosaminoglycans, mucopolysaccharides, hyaluronic acid, Chondriotin sulfate, keratan sulfate, dermatan sulfate, Bacterial cell wall – proteoglycans and peptidoglycans. Reactions, energy balance and regulation of Glycolysis, Reactions, energy balance and regulation of Gluconeogenesis.
November 14 (4 extra)	Unit – II: Metabolism of Carbohydrates Unit – III: Chemistry and Metabolism of Nucleic Acids	Pyruvate dehydrogenase complex, Reactions, energy balance and regulation of TCA cycle, Pentose phosphate pathway, regulation and significance, Pasteur and Crabtree effect, Anapleurotic reactions, Glyoxylate cycle Glucuronic acid cycle, Glycogen metabolism. Purines, pyrimidines, nucleosides, nucleotides, unusual bases, Structure of DNA – Watson Crick Model, A- and Z- forms, Supercoiling of DNA – negative and positive, linking number, Structure of mRNA, tRNA, rRNA, siRNA / miRNA, Properties of NA – denaturation and renaturation, Tm (factors affecting Tm) and Cot curves, Hetero duplex mapping – D loops and R loops,
December 15 (6 extra)	Unit – III: Chemistry and Metabolism of Nucleic Acids Unit – IV: Chemistry and Metabolism of Vitamins	Biosynthesis of purines and pyrimidines, Degradation of purines and pyrimidines, Regulation: *de novo*, salvation, nucleotide analogs Discovery of vitamins, classification, RDA, Vitamin A – source, biological role, deficiency, Vitamin B1 – Thiamine – source, biological role, deficiency, Vitamin B2 – Riboflavin – source, biological role, deficiency, Vitamin B3 – Niacin – and B5 – Pantothenic acid – sources, biological role, deficiency, Vitamin B6 – Pyridoxamine – and B7 – Biotin – source, biological role, deficiency, Vitamin B9 – Folic acid – and B12 – Cobalamine – source, biological role, deficiency, Vitamin C – Ascorbic acid – source. Biological role, deficiency, Vitamin D – Calciferol – source, biological role, biological role, deficiency, Vitamin E, Vitamin K – source, biological role, deficiency.

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M.Sc Biochemistry

Semester I: paper III Bioanalytical Techniques
Name of the lecturer –Dr Manju Devi S

Month & No: of teaching days	Unit	Name of the Topic
September 9	Unit 1- Spectroscopy	Unit 1- Spectroscopy. Beer Lambert's Law, Molar extinction coefficient, Absorption maximum.UV-Vis: Spectroscopy, Colorimetry–principle,instrumentation, application. FluorescenceSpectroscopy–principle, instrumentation, application. Atomic Absorption Spectrometry–principle, instrumentation,application.NMR–principle, instrumentation, application. ESR – principle, instrumentation application.
October 13	Unit 1- Spectroscopy Unit – II: Chromatography	CD – principle, instrumentation, application, ORD – principle, instrumentation, application.Mass spectroscopy – principle, instrumentation, application X-ray crystallography. Unit II- Partitioning and counter current distribution.PC – principle, instrumentation, application. TLC – principle, instrumentation, application.GC – principle, instrumentation, application Ion–exchange – principle, instrumentation, application.
November 14 +4(extra)	Unit – II: Chromatography Unit – III: Centrifugation and Electrophoresis	Ion exchange chromatography, applications. Unit -III Centrifugation, RCF and types of rotors. Ultracentrifugation-principle, instrumentation, application. CsCl density gradient and sucrose gradient centrifugation – principle, application.Electrophoresis – moving boundary and zonal electrophoresis. Native and SDS-PAGE, IEF and 2D PAGE Agarose Gels, PFGE,N-terminal sequencing of proteins
December 14 +6 (extra)	Unit – III: Centrifugation and Electrophoresis Unit 1V-Tracer techniques	IEF and 2D PAGE Zymography, PAGE for DNA sequencing DNase-I hypersensitivity mapping DNA-Foot-printing and Chromatin IP methods Denaturing gels for RNA, Southern and Northern Blots Unit 1V-Tracer techniques Stable and radioactive isotopes, Radioactivity theory, half life and emission spectra of half-life of biologically useful isotopes - ^{2}H, ^{3}H, ^{14}C, ^{18}O, ^{32}P, ^{35}S, ^{125}I Isotopes used for labeling proteins (^{3}H ^{14}C, ^{35}S, ^{125}I) and nucleic acids (^{3}H, ^{32}P).Detection of radioactivity by Scintillation counting.Autoradiography, Fluorography, Phosphor-imaging, applications GM counter, gamma counter Radiation hazards and safe disposal of radioactivity waste; luxometry and chemi luminescence as alternative to radioactivity. Isotope dilution method – pulse chase Historic examples- ^{14}C and ^{18}O to study photosynthesis Historic examples- ^{32}P and ^{35}S to study viral replication (Hershey-Chase experiment) Historic examples- ^{14}N and ^{15}N in DNA replication (Meselson and Stahl experiment)

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Academic organizer
(2019-20)
M.SC I YEAR

Semester I , P - IV
Bioenergetics and Photosynthesis
Name of the lecturer: D.Rajani

Month & no of teaching days	Unit	Name of the topic
September (7)	**Unit I Bioenergetics**	Elements of importance in biochemistry (H, C, N, O,P,S), types and energy of bonds and interactions(ionic, covalent, coordinate, H-bonds, Van der Waal's, hydrophobic interactions) Law of thermodynamics, Gibbs free energy Relevance of entropy and enthalpy in biological system and reactions Biological oxidation, free energy changes, redox potential & phosphate potential
October (8)	**Unit I**	High energy bonds and high energy compounds Electron transport chain, components & importance Mechanisms of oxidative phosphorylation. Uncouplers& inhibitors of energy transfer Substrate level & oxidative phosphorylation Bioluminescence
November (15)	**Unit II** **Biomembranes**	Composition of plasma membrane and organelle membranes of plant and animal cells Membrane dynamics. Forces stabilizing the membranes Membrane asymmetry- Membrane Lipids and proteins Fluid mosaic model of membrane Integral membrane proteins and their secondary structures-α helices and β barrels Methods of detecting transmembrane proteins, hydropathy plots. Lipid anchored membrane proteins-acyl, prenyl and GPI anchors Artificial membranes: Liposome, micelles and vesicles Reconstitution of functional membrane systems from purified components RBC membrane

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M.Sc I YEAR

Semester I: Biochemistry paper IV: Bioenergetics and photosynthesis
Name of the lecturer: Dr Kamala Golla

Month & no of teaching days	Unit	Name of the topic
December 20 (8 extra)	Unit III Membrane Transport	Transport across cell membranes. Fick's law. Types of transport- simple diffusion, passive and facilitated diffusion. Active transport-primary and secondary active transport systems. Formation of ion gradients across membrane (proton gradients in organelles). Aquaporins and ionophores. Gated channels (voltage and chemical). Group translocation. Transport ATPases, Na+/K+ATPases. ABC transporters; MDR1, CFTR Channels and pores. Bulk transport¬-endocytosis and exocytosis. Bacterial transport systems; Lactose permease, Phosphotransferase
	Unit IV Photosynthesis	Photosynthesis-structure of organelles involved in photosynthesis in plants & bacteria. Light& dark reactions, Hill reaction. Light receptors-chlorophyll; light harvesting complexes, bacteriorhodopsin. Photosystem I & II and their location. Mechanism of quantum capture and energy transfer between photosystems. Proton gradients & electron transfer in chloroplasts. Cyclic and non-cyclic Photophosphorylation, C3 pathway of carbon metabolism, C4 pathway and CAM metabolism. Regulation of photosynthesis. Photorespiration

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Academic Organizer
(2019-20)
M. Sc II YEAR Biochemistry (CBCS)

Semester III: Paper I- Gene Regulation and Genetic Engineering
Name of the lecturer: S. Vanitha

Month & no of teaching days	Unit	Name of the topic
June 9 (1 Extra)	Unit I Gene Regulation in Prokaryotes and Viruses	Operon concept for gene regulation, Positive (+ve) &Negative (-ve) control – Lac operon, Attenuation – Trp operon, Dual promoters – gal operon: Dual function of repressor – ara operon, Phase variation in *Salmonella* flagellar protein synthesis, Sporulation gene expression in *Bacillus*
July 18 (2 Extra)	Unit I Gene Regulation in Prokaryotes and Viruses Unit II Gene Regulation in Eukaryotes	Riboswitch, Anti – termination in lambda phage, Lytic / lysogenic switch in lambda phage, Control of plasmid copy number Chromatin structure in active and inactive regions – DNA methylation. Eu-chromatin, histone acetylation, H2AX foci, histone code Transcriptional control – cell specific expression – promoters, enhancers, Transcription factors, Post- transcriptional control – alternative splicing, RNA editing, RNA transport and stability, Translational feedback. Gene silencing – inactivation of mammalian X chromosome, Regulation by siRNA, Gal operon of yeast, MAT locus and mating type switch in yeast, Antigenic variation in *Trypanosoma*
August 13 (2 Extra)	Unit III Recombinant DNA technology	Enzymes in rDNA technology: Restriction endonucleases (discovery, properties), Enzymes in rDNA technology: DNA and RNA polymerases Enzymes in rDNA technology: Nucleases, Kinases. Phosphatases, and Ligases, Prokaryotic vectors (plasmids, cosmids, phage, phagemid, BAC) Eukaryotic vector-YAC and Expression vectors (insect, plant, mammalian cells), Shuttle vectors, Targeting vectors, Construction of cDNA and genomic DNA libraries, Screening a library (+ve) & (-ve) selection strategies, Preparation of probes, Southern blotting, Northern blotting, South-Western blotting, Creating KO cells, Cre – Lox systems.
September 15	Unit IV Genetic Engineering	Yeast 2 hybrid, Phage display, Reporter genes – GFP, b – gal, luciferase, Expression in heterologous systems – bacteria, Expression in heterologous system – yeast cells, Expression in heterologous system – insect cells, Expression in heterologous system – mammalian cells, Molecular markers – RFLP, AFLP, Random amplification of polymorphic DNA (RAPD), Short tandem repeat, Single-nucleotide polymorphism (SNP), Ribotyping.

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(2019-2020)
M.Sc Biochemistry

Semester III: paper II- Immunology and Immunotechnology
Name of the lecturer –Dr Manju Devi S

Month & No: of teaching days	Unit	Name of the topic.
June 12	Unit-1 Components of the Immune System	Components of the Immune System. Brief history of immunology. Elements of Immune system - Natural & acquired immunity, Specific & non-specific immune response. Cells & organs induced in immune system, Antigenic determinants, Epitopes, Concept of haptens. T-Cell and B-Cell epitopes, Super-antigens, Structure of CD4.
July 16 +3(extra)	Unit -1 Components of the Immune System Unit-II Immune response	Structure of Cd8, Classification, structure, and biological properties of immunoglobulins . Isotypes, allotype, idiotypes variations. Mucosal and neonatal immunity. Theories of antibody formation, Generation of antibody diversity. Genomic rearrangements & genes involved in antibody production. Unit II- Immune Response. Humoral& cell-mediated immune response. T cell& B cell activation. T cell and B cell receptors. Antigen processing & presentation. MHC proteins structure & functions . Kinetics and regulation of immune response. Assembly and secretion of Ig. Class switching regulation, of immune response (brief out line). Cytokines in immune response. Complement system – Biological consequences of complement fixation. Complement activation and types. (alternate, classical, Mannan-binding lectin pathway) and its regulation, Complement fixation test. Transplantation immunology (Types of graft rejection, mechanism of graft rejection, Graft vs host disease)Immune response to tumours.
August 12 +1(extra)	Unit –III Immune Disorders	Unit –III- Immune Disorders. Hypersensitivity– Gell & Coombs classification. Allergen . Type I, II, III and V Hypersensitivity . Mechanism of activation . Tests for diagnosis of hypersensitivity, Tuberculin test . Auto immune diseases; classification . Mechanism and study of selected autoimmune diseases . Immuno- deficiency disorders – primary and secondary. AIDS . Immunosuppressive drugs/agents & their mechanism of action . ADA Deficiency.
Septembe r 12 + 4(extra)	Unit –III Immune Disorders Unit IV- Immuno technology	Unit III- Immune evasion by bacteria & viruses Unit IV- Immunotechnology Production of polyclonal antibodies. Experimental animals models for production of antibodies. Methods of antibody purification (Salt precipitation, Affinity chromatography). Antigen-antibody binding analysis - Equilibrium dialysis; Affinity and Avidity of antibodies. Antigen-antibody interactions and visualization - gel diffusion (Ouchterlony, Mancini techniques). Agglutination reaction. Immune-electrophoresis (Rocket, counter-, 2-D), Immuno-fluorescence, RIA, Enzyme immune assay and their types. Western blotting and FACS techniques. Hybridoma technology – production of monoclonal antibodies and their applications; antibody engineering. Vaccines – Types, traditional vaccines and their applications Newer vaccine strategies (DNA, recombinant DNA, peptide and anti-idiotypic vaccines). Vaccination schedules. Benefits and adverse consequences of vaccination

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ACADEMIC ORGANISER 2019-20

M.Sc (Biochemistry) II yr

SEMESTER III

Paper-III: Cell signaling, Differentiation and Methods of cell study

Name of the lecturer: Dr.S.Padma

MONTH	Unit	Name of the topic
JUNE 11	Unit I Ultra structure of Cell	Structural organization of prokaryotic cells, Structural organization of eukaryotic cells (Plant/animal cells) Ultra structure of mitochondria, chloroplast, nucleus. ER. Golgi etc Extracellular matrix-collagen, elastin, figrillin, fibronectin, laminin & proteoglycans. Integrins. Cell junctions,Cell adhesions,
JULY 18	Unit I Ultra structure of Cell Unit II Methods of Cell Study	Cytoskeleton-microtubules, microfilaments and myosin,Totipotency, General strategies of cell cycle and its regulation, Early embryonic cell cycle & M-phase maturation factor Simple and compound microscope Phase contrast, dark field and polarization microscopy, Electron microscopy, SEM, TEM; freeze fracture, Fluorescence and Confocal microscopy; imaging live cells, FRET and FRAP, Atomic force microscopy, Flow-Cytometry and cell sorting (FACS), Plant tissue culture.
AUGUST 16	Unit III Cell Signaling	Animal and insect tissue culture, Methods of cell disruption and fractionation, isolation of organelles. Cell communication and types of signaling molecules,Types of receptors and their structure, Monomeric and trimeric G-proteins and their role, Second messengers – cAMP, cGMP, Ca^{+2}, calmodulin, inositol, NO, Introduction of signaling components in bacteria, Chemotaxis, Plant signaling system an over view.

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SEPTEMBER 15	Unit IV Cell & Differentiation	Stress signaling in plants (biotic), Stress signaling in plants (abiotic), Plants hormones and their mechanism of action Overview of developmental regulation, Platelet derived growth factor (PDGF); Epidermal growth factor (EGF), Insulin like growth factor (IGF), Nerve growth factor, Vascular endothelial growth factor (VEGF),Tumor necrosis factor (TNF) & erythropoietin, Fibroblast & muscle cell differentiation Formation of bodypattern in Drosophila, Apoptosis and apoptosome, Modes of action of TS genes – p110, p16, p21, Phosphatase and tensin homolog (pTEN),p53 and c-Myc.

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Academic organizer
(2019-20)
M.SC II YEAR

Semester: III, P-IV
Endocrinology and Metabolic Disorders
Name of the lecturer: D.Rajani

Month &no of teaching days	Unit	Name of the topic
June (10)	**Unit I** **Hormones and Endocrine glands**	History of endocrinology, Organization and classification of hormones and endocrine systems.Basic mechanism of action of peptide hormones and receptors.Basic mechanism of action of steroid hormones and receptors Chemistry, physiology, and disorders related to Hypothalamus-Pituitary axisChemistry, physiology, and disorders related to thyroid and parathyroid glands.Glycoprotein hormones (LSH, FSH, TH, hCG, POMC)Growth hormone family (GH, hCS, Prolactin).
July (15+1extra)	**Unit I** **Unit II Endocrine regulation**	Chemistry, physiology, and disorders related to parathyroid glands Adrenal hormones Gonadal hormones,Xenoestrogens and Phytoestrogens. Regulatory pathways (positive, negative, feedback loops), Regulation of biosynthesis of steroid hormones by peptide hormones (LH, FSH, ACTH) Endocrine regulation of growth. Endocrine regulation of stress. Endocrinology of Ca homeostasis. Endocrinology of blood sugar, hunger, digestion, and obesity. Endocrine regulation of renal function. Endocrine regulation of cardiovascular system (angiotensin, BNP, ET1)
August (15+2 extra)	**Unit II** **Unit III Disorders of Amino Acid and Carbohydrate Metabolism**	Endocrinology of fertility (changes in menstruation, pregnancy, and menopause). Medical uses of steroid hormones (contraception, HRT, hydrocortisone, anabolic steroids). Erythropoietin, Adipo-cytokines, Orexins. Disorders of proline and hydroxyproline metabolism. .Disorders of lysine metabolism. Hemoglobinopathies; Thalassemia. Genetic defects in metabolism of amino acids (maple syrup urine disease, homocystinuria, methyl malonic acidemia).Genetic defects in metabolism of urea (Argininemia, Arginosuccinicacidemia, Carbamoyl Phosphate Synthetase-I deficiency).Disorders of glycogen storage.
September (15+2 extra)	**Unit III** **Unit IV Disorders of Lipids and Nucleic Acids Metabolism**	Disorders of fructose and Galactose metabolism. Pentosuria. Diabetes. Disorders of acid Lipase deficiency. Farber's disease. Neiman-Pick's disease.Gaucher's disease.Krabbe's disease.Sulphatide-lipidosis disease Fabry's disease. Down's and Turner's syndrome. Hyperuricemia and Gout Hereditary Xanthinuria and Lesch-Nyhan syndrome.

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Academic organizer
(2019-20)
M.Com II YEAR (CBCS)

Semester - III
Interdisciplinary Course (IDC): Nutrition & Diet Planning
Name of the lecturer: S. Vanitha

Month & no of teaching days	Unit	Name of the topic
July 5 (3 extra)	Unit I Introduction to Nutrition	Food as source of nutrients, functions of food. Relationship between food, nutrition and health, Basic food groups and food pyramid, BMI (Body mass index) and nutritional status. Glycemic index, Nutritive value of Foods: Cereals, Legumes, Nuts and Oil seeds.
August 8 (2 extra)	Unit I Introduction to Nutrition Unit II Nutrition in health and disease	Nutritive value of Foods: Milk and milk products, Egg and egg products, Meat, fish, vegetables and fruits. Role of fiber in human nutrition. Anti-nutritive factors, Trans fatty acids in food substances. Common approved food additives, Food allergens. Nutrition - Fitness, Athletics & Sports. Diet Plans for individual's daily food intake in health conditions of anemia and hypertension.
September 8 (4 extra)	Unit II Nutrition in health and disease	Diet Plans for individual's daily food intake in health conditions of cardiovascular diseases and diabetes, Diet plan in pregnancy and lactation, Diet plan for child health, Calculation of calorific and nutritive value of foods, Good cooking practices for preserving nutritive value of foods. Food sanitation and hygiene, Common Food adulterants, Food Laws and standards.

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Department of Biochemistry

M.Sc (Biochemistry)II Year

SEMESTER III (2019-20)

Paper (SEC): Clinical laboratory diagnostics

Name of the lecturer: Dr.S.Padma

MONTH /no of teaching days	Unit	Name of the topic
JUNE 4(+2 extra)	I	Specimen collection and processing,
JULY 6(+2 extra)	I	Handling of specimens Haemaotology parameters, Autoanalyzer- Evaluation of different biochemical parameters in an autoanalyzer.
August 8	II	Collection and preservation of urine samples, Urine analysis, measurement of blood pressure, Histopathology -Tissue sectioning and staining,
September 6 (+2 extra)	II	ECG, Quality control and assurance in labs, Dispatch of reports with clinical correlations

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Academic Organizer
(2019-20)
M.Sc Biochemistry

Semester II: paper I- Enzymology
Name of the lecturer: Dr. A. Sai Padma

Month & no of teaching days	Unit	Name of the topic
January 8 (1 extra)	Unit – I: Basic Enzymology	Properties of enzymes, protein conformation &catalyses, Thermodynamics of catalysis, Energy of activation, Relation of ΔG and Keq, Coupled reactions (endergonic and exergonic) in biochemical pathways, Nomenclature and classification of enzymes, Metal, co-factor, and co-enzyme requirements, Methods to isolate and purify enzymes , Assays, Activity Units and Specific activity, High-Throughput enzyme assays
February 15 (5 extra)	Unit – I: Basic Enzymology Unit – II: Enzyme Kinetics	Chemicals to identify active site residues: Arg, Cys, Lys, His, Site-directed mutagenesis to identify active site residues: Triose Phosphate Isomerase Single substrate assumptions, Michaelis-Menten kinetics (derive equation and transformations), Steady state, Briggs -Haldane equation.Lineweavar Burk, EadieHofstee, Hanes plots. Bisubstrate reactions: sequential mechanism, compulsory order and random order mechanism, Non – sequential mechanisms, ping – pong mechanisms, Distinction between ordered and random addition of substrates and products release. Factors affecting catalysis (pH, temperature, pressure, enzyme and substrate concentration)
March 14 (4 extra)	Unit – II: Enzyme Kinetics Unit – III: Catalytic Mechanisms	Enzyme inhibition: Types of reversible inhibitions – competitive, non-competitive, un – competitive and mixed inhibition, Irreversible inhibition-covalent modification (suicide inhibition).Substrate inhibition, feedback inhibition and allosteric inhibition. Chemical nature of enzyme catalysis: General acid – base, Covalent and metal ion catalysis, Transition state, proximity and orientation.Mechanism of co-enzymes: pyridoxal phosphate and flavin nucleotides, Catalytic mechanism of RNase Catalytic mechanism of Chymotrypsin, Trypsin, Catalytic mechanism of Lysozyme Catalytic mechanism of Carboxypeptidase, Subtilisin, Slow transition and Hysteretic behavior in enzymes.Catalytic RNA and catalytic antibodies, Enzyme inhibitors as drugs: RT and Protease inhibitors as anti-HIV drugs.
April 13	Unit – IV: Enzyme Regulation	Convergent and divergent evolution of enzymes, Reversible and irreversible activation of enzymes (phosphorylation, pro-enzymes), Enzymes activation by ligand binding and dimerization (protein tyrosine kinase receptors), Allosteric enzymes; binding of ligands to proteins, co-operativity, Hill plot for Myoglobin and Hemoglobin, sigmoidal kinetics; MWC and KNF models. Significance of sigmoidal behavior. Study of ATCase as a typical allosteric enzyme.Regulation of Glutamine Synthetase, Multiple forms of enzymes -Lactate dehydrogenase., multi-enzyme complexes& significance -Fatty acid synthase complex.

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Academic organizer
(2019-2020)
M.Sc Biochemistry

Semester II: paper II: Molecular Biology
Name of the lecturer –Dr Manju Devi S

Month & No: of teaching days	Unit	Name of the Topic
January 8	Unit 1- Models of replication	Unit 1- Models of replication Models of replication – random, conservative, semiconservative Prokaryotic and eukaryotic DNA polymerases, helicases, ligases, topoisomerases. Initiation – primosome, ori-sequences, accessory proteins.Elongation – replisome, leading and lagging strands, Okazaki fragments.
February 16	Unit 1- Models of replication. Unit II- Types of DNA damage,	Termination, Inhibitors of replication.Replication of circular chromosomes by theta model -E. coli, ϕ X 174.Replication of circular chromosomes by rolling circle (lambda phage) and strand displacement models (mt-DNA). Replication of linear chromosomes, telomeres, telomerase.Amplification – Polytene and double minute chromosomes. *In vitro* replication – PCR Unit II- Types of DNA damage, Types of damage – oxidation, deamination, alkylation, adducts, breaks.Direct repair – MGMT, photo-reactivation, AlkB. Base Excision Repair (Short and Long Patch).Nucleotide Excision Repair. Mismatch Repair. Repair of DSBs by NHEJ and Homologous recombination.
March 18	Unit II- Types of DNA damage, Unit-III Transcription	Homologous recombination. Holiday junctions and repair of collapsed forks. SOS and bypass repair. Diseases due to defects in DNA repair. Roles of ATM, BRCA in DNA repair. Principles of transcription. Prokaryotic RNA polymerases. Bacterial transcription-Initiation–promoter sequences. Elongation and termination of transcription– rho dependent and independent.Basal, Constitutive and regulatory levels of transcription. Eukaryotic DNA dependent RNA polymerase -I (ribosomal repeats).Polymerase–II, Promoters and enhancers. Polymerase-III, 5s and tRNA. Post-transcriptional modifications - capping, Poly A addition. Splicing and RNA editing; Inhibitors of transcription.
April 14	Unit 1V- Translation	Unit 1V- Translation Nature of genetic code, Wobble hypothesis. Ribosomes, structure, functional domain and subunit assembly. Components and mechanism of translation. Initiation, elongation and termination of translation in Prokaryotes .Initiation, elongation and termination of translation in Eukaryotes. Inhibitors of protein synthesis.

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ACADEMIC ORGANISER 2019-20
M.Sc (Biochemistry) Iyr
SEMESTER II
Paper-III: BIOCHEMICAL GENETICS AND MODEL ORGANISMS
Name of the lecturer: Dr.S.Padma

MONTH	Unit	Name of the Topic
JANUARY 7 (+2 extra)	UNIT I Mendelian Genetics	Mendel's Laws, Importance of meiosis in heredity, Non-Mendelian Inheritance – Maternal effect, Maternal influence, Cytoplasmic inheritance, Gene interactions - Epistasis, Expressivity, Penetrance Sex linked, sex limited, and sex influenced genes; Polygenic inheritance and polyploidy Mutations (spontaneous / induced, somatic / germinal, forward / reverse, transition / transversions)
FEBRUARY 15 (+2 extra)	UNIT I Mendelian Genetics UNIT II Linkage and Mapping	Mutations (Silent, missense, nonsense, and frame shift mutations, conditional, leaky) Detection, selection & isolation of microbial mutants, Estimation of mutation rates Reversion and suppression of mutations Mutagens – physical, chemical Transposon mutagenesis, site-directed mutagenesis Discovery of linkage, Morgan's experiments Cytological proof of crossing over 2- and 3- point crosses Recombination, Interference Tetrad analysis Mapping human genes by pedigree analysis; Fundamentals of population genetics (HW Law)
MARCH 15 (2 EXTRA)	UNIT II Linkage and Mapping Unit III: Bacterial Genetics	Pedigrees of AR, AD, XR, and XD inherited traits, Mobile genetic elements – Zea Ac, Ds and Spm elements, *Drosophila copia*, Yeast Ty elements, Using recombination to make knockout cells / organisms Discovery of conjugation, Mapping bacterial genes by conjugation, Discovery of transformation, Mapping bacterial genes by transformation, Discovery of transduction Mapping bacterial genes by transduction Discovery of transposition, Structure of transposons, replicative and conservative transposition, use as mutagens Mapping phage genes – Fine structure of Rii locus

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APRIL 13 (+2 Extra)	Unit IV Model organisms	*Dictyostelium* to study cell – cell communication and differentiation. *Saccharomyces* to study homologous recombination in mating type switch; site of formation of buds, *Neurospora* to study one gene – one enzyme hypothesis, *Drosophila* to study embryonic development (homeotic mutations), *C. elegans* to study development and nervous system, *Danio* to study vertebrate development, GLO fish*Xenopus* to study embryogenesis, *Mus* inbred and knockout strains, NOD and nude mice, *Zea mays* to demonstrate cytological proof of crossing over*Arabidopsis* to study flower development

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Sainikpuri, Secunderabad-500

Academic organizer
(2019-20)
M.SC I YEAR

Semester II : PAPER: IV
Biostatistics and Clinical Biochemistry
Name of the lecturer: D.Rajani

Month & no of teaching days	Unit	Name of the topic
January (8+1 extra)	**Unit III Pathophysiology**	Clinical application of plasma enzyme assays in cardiac, liver and skeletal diseases. Jaundice- classification and differential diagnosis. Nutritional assessment therapy and monitoring. Cholesterol, sodium and blood pressure. Eating disorders: anorexia and bulimia. Physiological interrelationship between cardiovascular, respiratory and renal systems.
February (15+3 extra)	**Unit III** **Unit IV Moleculardiagnosis of genetic defects**	Free radical metabolism, ROS in disease. Plasma proteins in health and disease. .Paraproteinemias, proteinuria. Pregnancy test, prenatal diagnosis & genetic counseling. Diagnosis of anemia, thalassemia. Diagnosis of genetic diseases by molecular biology techniques (cystic fibrosis,hemachromatosis, thalassemias, sickle cell diseases). DNA probes; restriction fragment length polymorphism (RFLP); polymerase chain reaction (PCR). Amplification of mRNA. AIDS,Clinical diagnosis. Oncogenic enzymology: acid phosphatase, alkaline phosphatase, lactate dehydrogenase.
March (14+3 extra)	**Unit IV** **Unit I Biostatistics-I**	Body fluid constituents of use in oncology. Newborn screening: PKU, tyrosinemia, aminoacidurias, organic acidurias, porphyrias. Acetylcholinesterase and other tests on amniotic fluid; chromosomal abnormalities by cytogenetics. Biostatistics fundamentals (sample, population, variable); Types of variables, Measurement and measurement scales.Measures of central tendency (mean, median, mode).Measurement of dispersion (range, variance, standard distribution).Study of bivariate data: correlation and regression. Graphical methods to depict data (histograms, bar-plots, pie charts, line graphs).Probability and probability distribution(Normal, Binomial, Poisson). Student's t – test.Chi – square test; Contingency tests. CRD: Completely Randomized Design; 1-way ANOVA.
April (14+2 extra)	**Unit I** **Unit II Introduction to Clinical Biochemistry**	RCBD: Randomized Complete Block Design; 2-way ANOVA Precision, reliability, reproducibility and other factors in quality control. Normal values in health and diseases.Radio isotopes in diagnosis. Specimen collection. Automation and QA in clinical laboratories. Examination of Urine, Blood, Sputum & CSF.Storage of specimens.Clinical laboratory informatics.Renal function testsosmolarity and free water clearances, acute and chronic renal failure.Liver function tests.Gastric function tests and pancreatic function tests.

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Academic organizer
(2019-2020)
M.Sc Biochemistry

Semester IV: paper I: Physiology and Xenobiotics
Name of the lecturer –Dr Manju Devi S

Month & No: of teaching days	Unit	Name of the Topic
November 7	Unit 1- Neurophysiology	Unit 1- Neurophysiology, Types of neuronal cells, nerve regeneration of nerve fibres, Neurotransmitters Nerves: regeneration of nerve fibers, generation of nerve impulse, all or none principle. Mechanism of synaptic transmission, transmission of nerve impulse.Types of neurotransmitters and their receptors, mode of signaling
December 12	Unit 1- Neurophysiology	Generation of nerve impulse,mechanism of synaptic transmission, termination of visual signal Division of vertebrate nervous system, CNS,PNS, ANS , regions of the brain . ensory organs – eye, ear, skin, tongue.Vision: visual system, rhodopsin and classical GPCR mechanism, termination of visual signal Cone cells, specialization in color vision, physiology of colour blindness.
January 17 +5(extra)	Unit-1Neurophysiology Unit-II- Structure and physiology of Muscles Unit-III Human Reproductive Biology	Similarity between vision, olfaction, cone cells Unit II- Structure and physiology of muscles, structure of various types of muscles, muscles, mechanism of muscle contratcion, muscle gene expression and regulation, role of muscle protein in cell locomotion, neuro muscular transmission, electromyography, Sherrington Starling Kymograph, disorders of muscles.detection and treatment of muscle disorders Unit III- Female reproductive system, causes of female infertility, treatments, male reproductive system,anatomy endocrinology, causes of male infertility, puberty, reproductive ageing, gametogenesis, and fertilisation… mile stones in first and second trimester
February 15 + 4 (extra)	Unit-III Reproductive Biology Unit -1V – Liver and Xenobiotics	Unit III- Milestones in first and second trimester, Mile stones I third trimester placenta as a source of stem cells, cord banking Unit 1V- Liver functions, pharmacopeia, drug detoxification cytochrome p450,molecular biology, isozymes, inhibitors, pharmacodynamics, pharmacokinetics, Phase-1, phase-II and phase-III reactions modifications, eliminations, environmental factors influencing drug metabolism,effects and metabolism of model toxins, Nutrient drug interaction-I& II

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Academic organiser-2019-20
M.Sc (Biochemistry)
SEMESTER IV

Paper-II: Bioinformatics
Name of the lecturer: Dr.S.Padma

MONTH	Unit	Name of the topic
November 8 (+2 extra)	Unit I **Genomics**	Genomics and branches of genomics (Why study a genome?) HGP and Strategies for sequencing genomes (shotgun and hierarchical sequencing), 1st generation sequencing methods (Maxam and Gilbert Method; Sanger's method), 2nd and 3rd Generation DNA sequencing methods (Next Generation Sequencing),
December 17 (+2 extra)	Unit I **Genomics** Unit II **Transcriptomics**	Genetic and Physical maps of the genome, EST, STS, DNA sequence databases, Use of databases; data mining, Comparing DNA sequences, pairwise local and global alignment, BLAST, FASTA, PAM and BLOSUM matrices, Multiple sequence alignments (Phylogenetic trees, Clustal-W, COBALT),Epigenomics and metagenomics: Relation of transcriptome to genome and proteome (Why study a transcriptome?) Tools of transcriptomics: Northern blots, RNase protection assays, RT-PCR and Q-PCR, HT tools of transcriptomics: Microarrays for expression profiling, alternate sequencing,
January (15)	Unit II **Transcriptomics** Unit III **Proteomics** Unit IV **Synthetic Biology**	HT RNA sequencing: SAGE, MPSS, RNA-Seq, GIGA, Identifying expressed sequences by ChIP-seq, DNase-seq, ENCODE Project (Encyclopedia of DNA Elements), Design and analysis of siRNA / RNAi for expression analysis; siRNA libraries, Anti–sense oligos for regulating transcriptome, Regulation by miRNA, Extent and role of ncRNA, GWAS association with phenotypes, Transcriptome databases (ESTs, Transcriptome Shotgun Assembly, ArrayExpress) Relation of proteome to genome and transcriptome (Why study a proteome?) HUPO goals and accomplishments, Methods for sequencing proteins: Edman degradation 2D gels and peptide maps MS – MALDI. LC-MS, Tandem MS (MS-MS) Micro-arrays for proteins, Proteins motifs, sequences, and structure databases; Peptide sequence and MS profiles databases, Comparing protein sequences, alignment, Predicting secondary structure-*ab initio*, Homology folding, threading, Post-translational modification (kinome, glycosylation) Comparative genomics, evolution of human karyotype, Sequencing genomes of individuals; ethical concerns SNPs and human disease Genomics for rational drug design and drug discovery, Pharmacogenomics Nutrigenomics, Metabolomics, PCR techniques to create synthetic genes and genomes Minimal genome concept, Building an artificial phage; Building an artificial bacterium, Metagenomics for study of ecological samples.

S. Padma

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Academic Organizer
(2019-20)
M. Sc II YEAR Biochemistry (CBCS)

Semester IV: Paper III - Biotechnology
Name of the lecturer: S. Vanitha

Month & no of teaching days	Unit	Name of the topic
November 4 (1 extra)	Unit IV Protein engineering	Methods of immobilization of enzymes and cells, large scale production, site directed mutagenesis, high throughput screening tools, rational protein design
December 14 (5 extra)	Unit IV Protein engineering Unit III Animal biotechnology	Directed enzyme evolution, top 7 (Kuhlman *et.al*), tags for protein purification, natural and recombinant fusion protein, altering kinetics, pH, specific activity, increasing stability, pegylated interferon, macro modifications. Methods of drug design & delivery. Development, maintenance and establishment of animal cell culture, cloning in mammalian and non- mammalian cells, production of viral vaccines, IFN, tPA, high value therapeutics, urokinase, monoclonal antibodies, chimeric antibodies, immunotoxins as therapeutics.
January 12 (5 extra)	Unit III Animal biotechnology Unit II Plant biotechnology	Gene knockout , transgenic animals and application, human gene therapy, humanized animals as organ farm. Plant cell culture, callus, protoplast fusion, differentiation to plantlets, plant vectors- Ti plasmid, GM food and crops, terminator technology, anti- sense RNA, plantibodies, case studies of Bt cotton, Bt corn, Zeneca tomato paste, flavr savr tomato, , roundup ready, golden rice.
February 16 (3 extra)	Unit II Plant biotechnology Unit I Microbial biotechnology	Virus resistant papaya Large scale cultivation of microbes, fermenter design, down stream processing, production of biomass, SCP, low molecular weight compounds, insecticides, enzymes for research, production of HFCS, cheese, polysaccharides (xanthan gum, gellan, pullulan etc), microbial mining, production of human insulin, interferon, human growth hormone, tPA, Superbug, microbial degradation of oil - bioremediation of oil spills.

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Academic organizer
(2019-2020)
M.Sc II YEAR

Semester IV: Biochemistry paper IV: Microbiology
Name of the lecturer: Dr Kamala Golla

Month & no of teaching days	Unit	Name of the topic
December 4	Unit I Fundamental Microbiology	Classification of bacteria, morphological types. Isolation methods: Pure culture techniques & enriched cultures
January 8 (6 extra)	Unit I Fundamental Microbiology	Bacterial distribution in nature. Isolation methods: Pure culture techniques & enriched cultures, Motility in bacteria. Staining methods (Gram's staining acid-fast & spore staining). Sterilization methods: Autoclaving, dry heat, filtration; Chemical disinfectants, and irradiation by gamma rays. Growth Media: Supplemented media, Selective media & minimal salts media. Maintenance and preservation of microbial cultures. Bacterial Growth: Growth curve doubling time, factors affecting growth (pH, temperature, oxygen & agitation). Chemostat, continuous & synchronous cultures.
	Unit II Viruses	Discovery and general characteristics of viruses.
February 7 (3 extra)	Unit II Viruses	Structure & composition of TMV, Cauliflower mosaic virus. One-step growth, single burst & eclipse experiments. General features of host-virus interactions- permissive and non-permissive hosts. Lytic verses lysogenic life cycles of λ Phage. Assay methods (Plaque assay, Pock assay, heme agglutination assay, transformation assay). Purification methods (ultrafiltration, ultracentrifugation & affinity methods). Cultivation of viruses in animals & tissue culture. Life cycles of animal viruses (Poliovirus, Retroviruses (RSV/ HIV).
March 1	Unit II Viruses	Virusoids and viroids & prions.

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Sainikpuri, Secunderabad-500 094

Department of Biochemistry

Academic Organiser (2019-20)

M.Sc Biochemistry

Semester IV

Skill enhancement course (SEC): Seminar

Schedule for student seminars

2019-20

S.NO	Month	Date	Day	Names of the students
1	December	12th	Thursday	Lakshmi Pavani, Deepthi, J.Nagajyothi Aishwarya,
2		19th	Thursday	Surya lalitha, Tirumala, Ramakrishna, Rohit,
3	January	2rd	Thursday	Kaviya Poornima, P.Sreevyshanavi, M.Suraj, O.Vaishnavi
4		9th	Thursday	D.Nagajyothi, Bhavya Harika, Ravi Kumar, M.Chandana
5		16th	Thursday	Sai Tejaswini, Rama Sai, Juweriya Parameshwari
6		30th	Thursday	Rahul Naik , S.Vyjayanthi, Shaista, Sai Teja, V.Vaishnavi
7	February	6th	Thursday	S.Pushpa, L.Gayatri, Sreekar, Sai Chandana, Roshni,
8		13th	Thursday	Shivani, Sowmya, Sucharita, cheSubhash Chandra Bose

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(2019-20)
MBA II YEAR (CBCS)

Semester - IV
Interdisciplinary Course (IDC): Nutrition & Diet Planning
Name of the lecturer: S. Vanitha

Month & no of teaching days	Unit	Name of the topic
November 2 (1 extra)	Unit I Introduction to Nutrition	Food as source of nutrients, functions of food. Relationship between food, nutrition and health, Basic food groups and food pyramid, BMI (Body mass index) and nutritional status. Glycemic index, Nutritive value of Foods: Cereals, Legumes, Nuts and Oil seeds.
December 9 (5 extra)	Unit I Introduction to Nutrition Unit II Nutrition in health and disease	Nutritive value of Foods: Milk and milk products, Egg and egg products, Meat, fish, vegetables and fruits. Role of fiber in human nutrition. Anti-nutritive factors, Trans fatty acids in food substances. Common approved food additives, Food allergens. Nutrition - Fitness, Athletics & Sports. Diet Plans for individual's daily food intake in health conditions of anemia and hypertension.
January 5 (1 extra)	Unit II Nutrition in health and disease	Diet Plans for individual's daily food intake in health conditions of cardiovascular diseases and diabetes, Diet plan in pregnancy and lactation,
February 7	Unit II Nutrition in health and disease	Diet plan for child health, Calculation of calorific and nutritive value of foods, Good cooking practices for preserving nutritive value of foods. Food sanitation and hygiene, Common Food adulterants, Food Laws and standards.

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