

**ACADEMIC ORGANISER FOR 2016-17
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	TOPICS COVERED
AUGUST 14	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, Primary structure, GN Ramachandran plots Secondary structure and motifs, α helix, β sheet, 3-10 helix Leucine zipper, Zinc finger, Trans-membrane regions, β LHL Tertiary & Quaternary structure (myoglobin, hemoglobin) Protein-protein interactions (actin, tubulin) Small peptides (glutathione, peptide hormones), Cyclic peptides (Gramicidin)
SEPTEMBER 16	I II Metabolism of Amino acids, & Proteins	Classification of proteins-globular, fibrous, membrane, metallo-proteins, SCOP, CATH Denaturation (pH, temperature, chaotropic agents), refolding 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 Nitrogen cycle - Biological nitrogen fixation dehydrogenase-& glutamine synthetase
OCTOBER 13	II III: Chemistry of Lipids & Porphyrins	Nitrate & ammonia utilization, Biogenesis of organic nitrogen Classification & biological significance of lipids & fatty acids. 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

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		Prostaglandins, Prostacyclins Thromboxanes, Leukotrienes
NOVEMBER 5	IV: Metabolism of Lipids & Porphyrins	Fate of 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, ω – 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

A. Lai Jada
23/6/16.

Academic Organizer (2016-17)

M.Sc Biochemistry

Semester-I

Paper –II, BI 102T: Chemistry and Metabolism of Carbohydrates, Vitamins and Nucleic Acids

Lecturer: Dr. A.Sai padma

Month/ No of Teaching Days	Unit	Name of the topic
August 13	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, 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.
September 12 +4	Unit – II: Metabolism of Carbohydrates Unit – III: Chemistry and Metabolism of Nucleic Acids:	Chondroitin 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, 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

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<p>October 18</p>	<p>Unit – IV: Chemistry and Metabolism of Vitamins</p>	<p>Structure of mRNA, tRNA, rRNA, siRNA / miRNA Properties of NA – denaturation and renaturation T_m (factors affecting T_m) and Cot curves Heteroduplex mapping – D loops and R loops Biosynthesis of purines and pyrimidines Degradation of purines and pyrimidines Regulation: <i>de novo</i>, salvage, nucleotide analogs Purines, pyrimidines, nucleosides, nucleotides, unusual bases.</p> <p>Discovery of vitamins, classification, RDA Vitamin A – source, biological role, deficiency</p>
<p>November 8+ 5</p>		<p>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</p>

A. Sai Dady
23/6/16.

Academic organizer, 2016 – 2017
M.Sc Biochemistry, Semester-I
Paper-III
Bioanalytical Techniques

Lecturer: Dr.M.K.Sukumaran

Month & No of teaching Days	Unit	Name of the topic
August 30	Unit I	Spectroscopy Beer Lambert's Law, Molar extinction coefficient, Absorption maximum UV-Vis: Spectroscopy, Colorimetry – principle, instrumentation, application Fluorescence Spectroscopy – principle, instrumentation, application Atomic Absorption Spectrometry – principle, instrumentation, application NMR – principle, instrumentation application ESR – principle, instrumentation application CD – principle, instrumentation, application ORD – principle, instrumentation, application Mass spectroscopy – principle, instrumentation, application X-ray crystallography.
	Unit II	Chromatography Partitioning and counter current distribution PC – principle, instrumentation, application. TLC – principle, instrumentation, application GC – principle, instrumentation, application 5 Ion-exchange – principle, instrumentation, application Gel filtration (Gel exclusion chromatography) – principle, application Affinity chromatography – principle instrumentation, application; immunoprecipitation HPLC and RP-HPLC – principle, instrumentation, application FPLC, LC – principle, instrumentation, application Peptide mapping and N-terminal sequencing of proteins.
	Unit III	Centrifugation and Electrophoresis: Introduction
October 30	Unit III	Centrifugation, RCF and types of rotors Ultracentrifugation – principle, instrumentation, application CsCl density gradient and sucrose gradient centrifugation – principle, application 4Electrophoresis – moving boundary and zonal electrophoresis Native and SDS PAGE, IEF and 2D PAGE Agarose Gels, PFGE 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 IV	Tracer Techniques Stable and radioactive isotopes, Radioactivity theory, half life and emission spectra of half life of biologically useful isotopes - 2H, 3H, 14C, 18O, 32P, 35S, 125I 2 Isotopes used for labeling proteins (3H 14C, 35S, 125I) and nucleic acids (3H, 32P) 3 Detection of radioactivity by Scintillation counting Autoradiography.

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ACADEMIC ORGANISER 2012-13
SEMESTER-I, PAPER-IV
BIOPHYSICAL & MISCELLANEOUS METHODS

Dr.M.K.Sukumaran,
Dr.P.Uma

Month	Unit	Name of the topic
July 5	Unit-II	Centrifugation Techniques Principles of centrifugation, Concept of RCF, Types of rotors
1	Unit I	Spectroscopic Methods-I Concepts of spectroscopy
Aug 16	Unit-II	Differential centrifugation, Density gradient centrifugation. Analytical ultra centrifuge design & application to macromolecular analysis. Preparative ultra centrifuge Methods of cell disruption (homogenization).
	Unit-III	Tracer Technique Stable & radioactive isotopes, Concept of half-life & decay Units of radioactivity.
4 +3 extra	Unit I	Principles & applications UV-Visible spectrophotometry. Concepts of colorimeter & spectrophotometer. Co
Sept 13	Unit-III	Application of isotopes in biochemical analysis (isotope dilution technique, precursor- product relationship, turnover studies, autoradiography). Measurement of radioactivity-GM counter, liquid scintillation & γ - counters. Radiation hazards. Methods of radioactive disposal.
	Unit-IV	Miscellaneous Methods Basics of Microscopy, Phase contrast microscopy, Dark Field, Polarization. Confocal microscopy.
4		Beer-Lambert's Law Concepts of colorimeter & spectrophotometer, Fluorimetry,
Oct 11		Atomic Force Microscopy. Flow Cytometry, FACS, Dialysis, Ultra filtration, Polarimetry. Manometry.
3		Atomic absorption spectrophotometry & their application.

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Academic Organizer (201~~5~~-1~~6~~)
M.Sc Biochemistry II Year, Semester-III

Paper-I: BI 301T: Gene Regulation and Genetic Engineering
Lecturer: Dr. A.Sai padma

Month/ No of Teaching Days	Unit	Name of the topic
June 3	Unit – I: Gene Regulation in Prokaryotes and Viruses	Operon concept for gene regulation Positive (+ve)&Negative (-ve) control – Lac operon
July 15	Unit-III: Recombinant DNA Technology	Attenuation – Trp operon Dual promoters – gal operon: Dual function of repressor – ara operon Phase variation in <i>Salmonella</i> flagellar protein synthesis Sporulation gene expression in <i>Bacillus</i> Riboswitch Anti – termination in lambda phage Lytic / lysogenic switch in lambda phage Control of plasmid copy number Enzymes in rDNA technology: Restriction endonucleases (discovery, properties) Enzymes in rDNA technology: DNA and RNA polymerases
August 17	Unit – IV: Genetic Engineering:	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. Yeast 2 hybrid Phage display

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<p>September 15</p>	<p>Unit – II: Gene Regulation in Eukaryotes</p>	<p>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</p> <p>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</p>
<p>October 10</p>		<p>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 <i>Trypanosoma</i></p>
<p>November 4</p>		<p>Revision classes</p>

U. Lai Dodi
23/6/16

Academic organizer (2016 – 2017)
M.Sc Biochemistry
Semester-III, Paper-II
Immunology and Immunotechnology

Lecturer: Dr. M.K. Sukumaran

Month & No of teaching Days	Unit	Name of the topic
June 5	Unit I	Components of the Immune System: 1 History of immunology 2 Natural & acquired immunity, Specific & non-specific immune response. Cells of immune system.
July 14	Unit I Unit II	Organs of immune system Antigenic determinants, Epitopes, Haptens, Properties of strong antigens Adjuvants – types, mode of action, and applications. 6 Classification, structure, and biological properties of immunoglobulins Isotypes, allotype, idiotypes. Theories of antibody formation, genomic arrangement in T cell receptor. Events in Immune Response: Humoral & cell-mediated immune response activation of T cells & B cells 3 Kinetics and regulation of primary and secondary immune response. MHC proteins structure & functions
August 17	Unit II Unit III	Antigen processing & presentation, Transplantation immunology; Graft Versus Host Disease Complement fixation: pathways and biological consequences. Discovery and action of Interferons, Cytokines; Inflammation; Role in obesity, cancer Tumor immunology. Immune Disorders: Hypersensitivity; Coombs classification Type I-V hypersensitivity. Tests for diagnosis of hypersensitivity (Coombs), Tuberculin test. Auto immune diseases; classification
September 15	Unit III Unit IV	Study of selected auto – immune disorders of types I – V Immuno- deficiency disorders – primary and secondary deficiencies Gene therapy for ADA deficiency Immunology of AIDS Immunosuppressive drugs/agents & their mechanism of action Immunotechnology: Production of polyclonal antibodies; Animals models for production of antibodies. Methods of antibody purification: Salt precipitation, Affinity chromatography Antigen-antibody binding (Equilibrium dialysis, Surface Plasmon Resonance); Affinity, Avidity. Immunoprecipitation methods - gel diffusion (Ouchterlony; Mancini); Immunoelectrophoresis (Rocket, counter-, 2-D).
October 9	Unit IV	Agglutination tests (Direct and indirect), Inhibition of Agglutination, Complement fixation test, Inhibition of complement fixation ELISA, RIA Western Blots; use of antibody staining for FACS Hybridoma technology – production of monoclonal antibodies; applications in research and immunotherapy; antibody engineering History and types of Vaccines; Conventional vaccines - killed, attenuated, and subunit vaccines Modern vaccines; peptide, DNA, recombinant / vector, and anti-idiotypic vaccines Schedules of common vaccination, Benefits and adverse consequences of vaccination.

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Advance Academic Organizer
M.Sc Biochemistry, 2016-17
Semester III, Paper - III
Virology, Nutrition and Clinical Biochemistry

Lecturer: D. Rajani

Month and No of teaching days	Unit	Name of the topic
June 4	IV	Clinical Biochemistry Specimen collection and automation in clinical labs, examination of CSF
July 16	IV III	Examination of blood, urine , sputum. Anemias, thalassemias, pregnancy test, PND, isoenzymes, LFT, RFT interrelationship between CV, respiratory system and renal system. Balanced diet, macro and micro nutrients, BMR, RDA nutritional assessment, anthropometric and biochemical testing.
August 14	III I	Nutrition Organs of digestive system, enzymes and hormones in digestion, control of food intake, malnutrition, obesity, IDDM and NIDDM, cholesterol, sodium and BP, anorexia, bulimia, diet and longevity and ageing. Prokaryotic viruses Discovery of bacteriophages, ICTV and Baltimore classification of viruses. Phages in industry.
September 10	I	Life cycle of bacteriophages T4, T7, M13, lambda phage, Mu phage, Q β phage.
October 14	II	Eukaryotic viruses Discovery and classification of plant and animal viruses, cultivation and propagation, assays, TMV, CaMV, SV40, poliovirus, adeno virus, influenza virus, HBV, HPV and their replication mode and life cycles.
November 2	II	Viruses and human cancer

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		risk. Selected examples – c-Myc and leukemia, BRCA and breast cancer.
SEPTEMBER 15 +3 extra	III Protein Sorting, Targeting and degradation	Signal peptide (ERLS), role of SRP in translocation of secreted proteins. Protein transport from golgi to lysosomes. Lysosomal pathways (endocytosis, crinophagy, macroautophagy, microautophagy, direct translocation from cytosol) Protein targeting to Mitochondria. Protein targeting to chloroplast. Protein targeting to nucleus. Ubiquitin-proteasome pathway, N-end rule, PEST sequences and proteolysis Chaperones, HSPs in protein folding Immuno-proteasomes, Misfolded proteins in neurodegenerative diseases.
OCTOBER 3+1 extra	IV Unit – IV: Signal Transduction in Bacteria and Plants	Introduction of signaling components in bacteria Chemotaxis Protein kinases in bacteria His-kinases: structure and role Plant signaling system an over view Stress signaling in plants (biotic) Stress signaling in plants (abiotic)
NOVEMBER 2	IV	Plants hormones and their mechanism of action Signaling in yeast STAT pathway in yeast

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Academic organizer (2016 – 2017)
M.Sc Biochemistry
Semester-II, Paper-I,
Enzymology

Lecturer: Dr.A.Sai Padma

Month & No of teaching Days	Unit	Name of the topic
December 10 + 2	Unit I	Basic Enzymology: Properties of enzymes, protein conformation & catalyses, Thermodynamics of catalysis, Energy of activation, Relation of ΔG and K_{eq} 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.
January 16	Unit I Unit II	Chemicals to identify active site residues: Arg, Cys, Lys, His, Site-directed mutagenesis to identify active site residues: Triose Phosphate Isomerase. Enzyme Kinetics: Single substrate assumptions, Michaelis-Menten kinetics (derive equation and transformations) Steady state, Briggs -Haldane equation. Lineweaver Burk, Eadie-Hofstee, 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) Enzyme inhibition: Types of reversible inhibitions – competitive, non-competitive, un – competitive and mixed inhibition.
February 13 + 5	Unit II Unit III	Irreversible inhibition-covalent modification (suicide inhibition). Substrate inhibition, feedback inhibition and allosteric inhibition. Catalytic Mechanisms: 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.
March 14	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

13/12/16,

		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-LDH. Multi-enzyme complexes & significance-Fatty acid synthase complex.
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Academic Organizer (2016-17)
M.Sc Biochemistry, I Year Semester II
 Paper II – 202T Molecular Biology., Name of the Lecturers: Dr.A.Sai Padma

S.No	UNIT	TOPIC
December 10 +3 extra	Unit-I 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, 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,
January 12	Unit-III Transcription	Amplification – Polytene and double minute chromosomes, <i>In vitro</i> replication - PCR, 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.
February 13 + 5 extra	Unit-II DNA Repair	Polymerase-III, 5s and tRNA. Post-transcriptional modifications - capping, Poly A addition, Splicing and RNA editing; Inhibitors of transcription 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, Holliday junctions and repair of collapsed forks, SOS and bypass repair, Diseases due to defects in DNA rep.
March 14 + 3 extra	Unit-III Translation	Roles of ATM, BRCA in DNA repair. 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, Translational controls., Non-ribosomal protein synthesis- antibiotic peptide, <i>In vitro</i> translational systems- Wheat germ, rabbit reticulocyte lysate and Xenopus Oocyte, Post translational modifications of proteins. Role in targeting (isoprenylation)

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M.Sc- Sem-II Biochemistry

Paper-III- Biochemical Genetics and Model Organisms

Name Of the Lecturer: M.Usha

Month & No. of teaching days	Unit	Name of the Topic
January 17+11 extra	Unit-I Mendelian Genetics Unit – II: Linkage and Mapping	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), 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) Pedigrees of AR, AD, XR, and XD inherited traits, Mobile genetic elements – Zea Ac, Ds and Spm elements
February 15+ 2 extra	Unit – III: Bacterial Genetics	<i>Drosophila copia</i> , 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: Complementation analysis Fine structure of rII locus: Deletion mapping
March 14+1 Extra	Unit – IV: Model Organisms	<i>Dictyostelium</i> to study cell – cell communication and differentiation. <i>Saccharomyces</i> to study homologous recombination in mating type switch; site of formation of buds, <i>Neurospora</i> to study one gene – one enzyme hypothesis. <i>Drosophila</i> to study embryonic development (homeotic mutations) <i>C. elegans</i> to study development and nervous system, <i>Danio</i> to study vertebrate development, GLO fish, <i>Xenopus</i> to study embryogenesis, <i>Mus</i> inbred and knockout strains, NOD and nude mice, <i>Zea mays</i> to demonstrate cytological proof of crossing over, <i>Arabidopsis</i> to study flower development

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ADVANCED ACADEMIC ORGANISER FOR 2016-17

SEMESTER II

Paper- IV: BIostatistics AND CLINICAL BIOCHEMISTRY

Lecturer:Dr.S.Padma

MONTH/ No of Teaching days	Unit	Name of the topic
DECEMBER 11	I Biostatistics-I	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
JANUARY 18	I Unit II: Introduction to Clinical Biochemistry	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, 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.
FEBRUARY 18	II Unit III: Pathophysiology	QA in clinical laboratories QA in clinical laboratories Examination of Urine, Blood, Sputum & CSF Storage of specimens, Clinical laboratory informatics, Renal function tests, osmolarity and free water clearances, acute and chronic renal failure, Liver function tests Gastric function tests and pancreatic function tests.

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		Free radical metabolism, ROS in disease Plasma proteins in health and disease, Paraproteinemias, proteinuria, Hyperlipoproteinemias and lipidemias
MARCH 13	III IV: Molecular diagnosis of genetic defects	Jaundice, cholesterol, sodium, Blood pressure, Anorexia, Bullimia 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. 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

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Academic Organiser (2016-17)

M.Sc- Sem-IV

Biochemistry: Paper-I: BI 401T: Endocrinology and Metabolic Disorders

Name Of the Lecturer: M.Usha

Month & No. of teaching days	Unit	Name of the Topic
January 14+ 5 Extra	<p>Unit – I: Hormones and Endocrine glands</p> <p>Unit – II: Endocrine regulation</p>	<p>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 axis, Chemistry, physiology, and disorders related to thyroid and parathyroid glands, Glycoprotein hormones (LSH, FSH, TH, hCG, POMC), Growth hormone family (GH, hCS, Prolactin), Adrenal hormones, Gonadal hormones</p> <p>Regulatory pathways (positive, negative, feedback loops), Regulation of biosynthesis of steroid hormones by peptide hormones (LH, FSH, ACTH) Endocrine regulation of growth</p>
February 13+ 5 Extra	<p>Unit – III: Disorders of Amino Acid and Carbohydrate Metabolism</p>	<p>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), Endocrinology of fertility (changes in menstruation, pregnancy, and menopause), Medical uses of steroid hormones (contraception, HRT, hydrocortisone, anabolic steroids), Erythropoietin, Adipo-cytokines, Orexins</p> <p>Disorders of aromatic amino acid metabolism, 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),</p>
March 13+10 Extra	<p>Unit – IV: Disorders of Lipids and Nucleic Acids Metabolism</p>	<p>Genetic defects in metabolism of urea (Argininemia, ArignosuccinicAcidemia, Carbamoyl Phosphate Synthetase-I deficiency), Disorders of glycogen storage, Disorders of fructose and Galactose metabolism Pentosuria, Diabetes</p> <p>Disorders of acid Lipase deficiency, Farber’s disease, Neeman-Picks disease, Goucher’s disease, Krabbe disease, Sulphatide-lipdosis disease, Fabry disease, Downs and Turner’s syndrome, Hyperuricemia and Gout, Hereditary Xanthinuria and Lesch-Nyhan syndrome</p>

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ACADEMIC ORGANISER FOR 2016-17

SEMESTER IV

Paper-II: BIOINFORMATICS

Lecturer:Dr.S.Padma

MONTH	Unit	Name of the topic
DECEMBER 13	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), 2 nd and 3 rd Generation DNA sequencing methods (Next Generation Sequencing), 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),
JANUARY 17+2 extra	II Transcriptomics	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, 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)
FEBRUARY 14+1 extra	III: Proteomics	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,

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Academic Organizer
(2016-17)
M.SC II YEAR

Semester IV: Paper III - Biotechnology

Name of the lecturer: S.Vanitha

Month & no of teaching days	Unit	Name of the topic
December 12 (3 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 and directed enzyme evolution, top 7 (Kuhlman <i>et.al</i>), 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.
January 14 (2 extra)	Unit III Animal biotechnology	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. Gene knockout , transgenic animals and application, human gene therapy, humanized animals as organ farm.
February 14	Unit II Plant biotechnology	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, virus resistant plants, roundup ready, golden rice.
March 15	Unit I Microbial biotechnology	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.

H. Sai Dadi
13/12/16.

ACADEMIC ORGANISER FOR 2016-17

SEMESTER IV

PAPER IV: PHYSIOLOGY AND XENOBIOTICS

Lecturer: Dr.S.Padma

MONTH	Unit	TOPICS COVERED
December 15	I Neurophysiology	Types of neuronal cells – Neuroglia, microglia, astrocytes, oligodendrocytes, Schwann, satellite and epididymal cells 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, Electrical synapse and giant neurons, Division of vertebrate nervous system: CNS, PNS, ANS, regions of the brain, Sensory 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, Similarity between vision, olfaction and gustation
JANUARY 18	II: Structure and Physiology of Muscle IV/II	Structure of various types of muscle: striated, cardiac, smooth, fast twitch, slow twitch, Mechanism of muscle contraction, regulation of contraction, Role of actin and myosin in non-muscle cells., Cytochalasins and cytokinesis. Muscle gene expression, regulation at transcriptional and posttranscriptional level. Role of muscle proteins in cell locomotion, Neuro-muscular transmission, Electromyography, Sherrington starling Kymograph (recording drum), Disorders of muscle (dystrophy, myopathy, monocytosis, myotonia, paralysis, Myasthenia gravis), Detection and treatment of muscle disorders Disorders of muscle (dystrophy, myopathy, monocytosis, myotonia, paralysis, Myasthenia gravis), Detection and treatment of muscle disorders
FEBRUARY 15	III: Human Reproductive Biology	Female reproductive system: anatomy and endocrinology, Causes of female infertility (acquired and genetic), treatments, Male reproductive system: anatomy and endocrinology, Causes of male infertility (environmental and genetic), treatments, Puberty, reproductive aging (menopause and andropause), Gametogenesis and fertilization (natural and assisted (<i>in vitro</i>)), implantation and

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		placenta, Milestones in first trimester of pregnancy (http://www.ehd.org/virtual-human-embryo/), Milestones in second trimester of pregnancy. Milestones in third trimester of pregnancy, child birth, Placenta as source of stem cells, cord banking
MARCH 15	IV: Liver and Xenobiotics	Liver functions, pharmacopeia drug deposition and mechanisms of drug detoxification, Cytochrome P450 enzymes, molecular biology, catalytic cycle, isozymes, inhibitors. Dose response relationship, drug-receptors interactions, Pharmacodynamics; pharmacokinetics, Phase I reactions – modifications, Phase II reactions - conjugation Phase III reactions - modifications and elimination, Environmental factors influencing drug metabolism Effects and metabolism of model toxins: aflatoxins, bacterial exotoxins (types I, II, and III), Nutrient drug interactions – I and II

A. Lai
13/12/16