Detailed syllabus for M.Sc. course in Microbiology
Total course credit – 100 **Total Marks :1200**
SEMESTER I **Total Credit: 24**
MCBMT1.1: (Credit 4) **Marks-50**

Paper	credit	Class hour/week	No of classes /week	marks
T-1.1 Microbial cell biology	4	4.5h	6	50
T-1.2 Environmental microbiology & Microbial Ecology	4	4.5h	6	50
T-1.3 Biomolecular structure, RDT & Plant Biotech	5	6h	8	50
T--1.4 General & Microbial metabolism	3	3h	4	50
P1.5 practical	8	15 hr	20	100
Total Credit	24	33	44	300

Microbial Cell biology

Unit I

Cell membrane and cell wall:

Constitution of cell membrane, membrane proteins and lipids, ultra-structure of cell membrane (both prokaryotic & eukaryotic), fluid mosaic model, asymmetry in membrane, domains in membrane- natural & artificial membranes, modern methods for the study of cell membranes- FRAP, scanning calorimetry, PAS reaction, Enhanced Chemiluminescence (ECL), freeze-etching, freeze-fracturing. Hydrophobicity plot, Structure, function, diversity, synthesis and cell wall hydrolyzing enzymes of bacteria and fungus

Cellular structure and function:

Flagella, Pili, Capsules, bacterial Cell wall synthesis, Genetics of flagellar movement, two-component system, receptor methylation etc.

Spores of bacteria., introduction to mycoplasma, Biology of gliding bacteria , classification of proteobacteria, fruting body formation in myxobacteria.

Unit II

Intra Cellular Compartments & Protein Sorting:

The compartmentalization of cells, the transport of molecules between the Nucleus & the Cytosol, Transport of Proteins into Mitochondria & Chloroplasts, Peroxisomes, the Endoplasmic Reticulum. Membrane Cytoskeleton, Membrane Anchorage of Proteins, Vesicular Traffic in the Secretary & Endocytic Pathway, Transport from ER through the Golgi Apparatus, Transport from the Trans Golgi network & maintenance of Compartmental Diversity.

Cell cycle:

General strategies of the cell cycle; molecular mechanism of cell-cycle control;

Unit III

Cell signaling:

Principles of cell signaling, extra cellular signals: hormones, cytokines and growth factors, different types of receptors : G protein linked, ion channel linked, Enzyme linked receptors, receptors containing intrinsic enzymatic activity, tyrosine kinase receptor, intracellular receptors of extracellular signals, Protein phosphorylation, kinases, phosphatase: serine threonine kinase, tyrosine kinase, MAP kinase with special relevance to yeast mating and glycerol synthesis, histidine kinase activity in bacterial chemotaxis, serine, threonine and tyrosine phosphatase, cyclic nucleotides, lipid signaling: inositol phospholipids pathway, NO signaling, molecular mechanism of apoptosis.

Quorum sensing in bacteria- Role of acyl homolactone serine in quorum sensing in bacteria, types of quorum sensing, regulation of quorum sensing, cell signaling in myxobacteria.

References - Molecular biology of cell- Bruce Alberts, Cell Biology – Karp, Cell signaling by John T Hancock (Oxford), Darnell, Prescott, Stanier.

MCBMT1.2: (Credit 4) **Marks-50**

Environmental Microbiology & Microbial Ecology

Unit I

Microbiology of hydrosphere: The aquatic environment - major environmental conditions influencing microflora. Distribution of microorganisms in the aquatic environments - freshwater environment, estuaries and marine environment. Microbiology of drinking water-pollution, purification of water for human consumption. Assessment of microbial status in water and waste water. Biomonitoring of harmful microorganisms in water. Wastewater characteristics, treatment processes (like trickling filter, activated sludge, oxidative pond, anaerobic digestion and chemical disinfection).

Microbiology of atmosphere: Source and kinds of microorganisms present in the atmosphere, techniques for microbiological sampling of air. Air-borne disease and their control.

Unit II

Microbiology of lithosphere: General description of soil as culture media for microbes. Soil as a habitat for microorganisms, methods of studying microorganisms and their activities in soil. Biology and biochemistry of N_2-fixation, Biochemical transformation of inorganic and organic nitrogen compounds. Microbial degradation of cellulose, hemicellulose, lignin, xylans, starch and pectin. Biodegradation of petroleum hydrocarbons, pesticides, herbicides and xenobiotics. Biofertilizers, Nitrogen fixation.

Microbiology of extremophiles: Existence of extremophiles and their evolution. General account of thermophiles, halophiles, acidophiles, alkaliphiles and barophiles: their adaptations for the extreme environment

Unit III

Control of pollution by microbes: Metal-microbe interactions, Microbial control of heavy-metal pollution

Microbial interaction with root and shoot system of plant: Rhizosphere and phyllosphere microorganisms and their interactions with plants. Plant pathogen (bacterial and fungal) Mechanisms of plant pathogenicity, symptoms of plant diseases, transmission of plant diseases. Signalling events in pathogenesis and resistance to pathogens. Control of plant diseases – cultural practices, chemical control and biological control. Microbial control of insects. Beneficial association between plant and microorganisms (association of plants with cyanobacteria, actinomycetes and fungus).
Biopesticides and biocontrol agents.

References: An introduction to Microbiology- Brock., Stanier

MCBMT1.3: (Credit 5) **Marks-50**

Biomolecular structures and their interactions, Recombinant DNA technology and production of recombinant proteins and Plant Biotechnology

Unit I

Biomolecular structures and their interactions:

Structure of protein: Four levels of protein structure, Shape of Protein molecules, Three-dimensional Protein Structure determination, X-ray, Crystallography and NMR Spectroscopy in relation to protein structure, Concepts of Protein Structure Motif, Idea of Prosthetic Groups, Chemical Modification of Proteins.

Structure of nucleic acid: Physical and chemical nature of DNA, DNA as hereditary material, size of natural DNA molecule, difference between DNA and RNA, Presence of phosphodiester linkage in DNA and RNA, anti parallel nature of Two strands of DNA. Denaturation and renaturation of DNA, Tm, Determination of GC content from Tm. Renaturation kinetics of DNA and complexity of DNA, Cot Curves, C- value paradox, Separation of Single stranded and double stranded DNA.

Chemistry of amino acids and proteins: Chemistry of Amino Acids, the building blocks of proteins, synthesis, classification and reactions of amino acid, Asymmetric synthesis of amino acids utilizing retro- synthetic approach

Protein folding and chaperones: Protein splicing, unfolding of protein structure, effect of heat, pH and chemicals , denaturation and refolding of proteins, in vivo protein folding, , concept of chaperones, disease related to protein misfolding.

References: Adams, Voet and Voet, Van Holde, Stryer, Lehninger, Benjamin and Lewin.

Unit II

Principles and methods of recombinant DNA technology: hybridization, cloning, sequencing, polymerase chain reaction, genome projects, gene manipulations, cloning in *E.coli*, Plasmids, bacteriophages and cosmid vectors, cloning strategies, genomic and cDNA library, expression of cloned genes in E.coli, products made in *E.coli* by genetic engineering, enzymes used in RDT: Ligases, Nucleases, Restriction endonucleases and modification methylases, Phosphatases and polynucleotide kinase, DNA polymerases, RNA polymerases

Production of recombinant proteins: Requirement of recombinant molecules in pharmaceuticals, health and industrial sectors, in research laboratories; criteria of purity and determination of purity and activity of over expressed proteins in prokaryotes and eukaryotes; rationale of the design of vectors for over expression of recombinant proteins, selection of suitable promoter sequences, ribosome binding sites, transcription terminator, fusion protein tags , purification tags, protease cleavage sites and enzymes, plasmid copy number, inducible expression system ; cre/lox recombination system, over expression condition, production of inclusion bodies, solubilisation of insoluble proteins, purification protocols and up scaling.

References: Primrose , Weaver , Russel.

Unit III

Plant Biotechnology:

Genetic engineering of plants: Transformation of plants, manipulating gene expression in plants, selectable markers and reporter genes, *Agrobacterium tumefaciens*; Genetic elements present on the Ti plasmid, genetic engineering of Ti plasmid, vectors used to introduce foreign DNA into plant cells-binary cloning vector, disarmed Ti plasmid, Cointegrate cloning vector, comparison of methods for transfer of DNA to plants, manipulation of gene expression in plants; production of transgenic plants without reporter or marker genes. Special features of plants; Micropropagation; Plant cell culture; Haploid culture and regeneration; Agrobacterium and genetic engineering in plants. Ti and Ri plasmids. Binary vectors, plant viruses as vectors; Specific promoters for plant; Light regulated *cis* elements; Incorporation of T-DNA into nuclear DNA of plant cells and transformation strategies**.**

MCBMT1.4 : (Credit 3) **Marks-50**

General and Microbial metabolism

Unit I

Bacterial Photosynthesis: Photopigments, Different types of photosynthetic bacteria- Cyanobacteria, Green and Purple Bacteria, paths of carbon assimilation and electron flow in bacterial photosynthesis, Classification of bacteria on nutritional basis.

Metabolism of energy reserve compounds: Polyglycans, Poly- and β-hydroxybutyrate, nitrogenous and non nitrogenous compounds- their synthesis and degradation in bacterial cells.

Unit II

Pathways of Glucose degradation : Glucose Metabolism – Embden- Meyerhof-Parnas (EMP) pathway, Warburg-Dickens or hexose monophosphate (HMP) pathways, Entner-Doudoroff (ED) pathway, Phosphoketolase (PK) pathway.

Unit III

Bioenergetics*:* Basic mechanism of ATP synthesis, Reverse and forward electron flow.

Chemolithotrophic bacteria: Different types namely ammonia oxidizers, nitrite oxidizers, hydrogen oxidizers, iron oxidizers and Sulphur oxidizers. General transport and photosynthesis.

Reference: Voet and Voet, L. Stryer, H.W Dolle, Nelson & Cox.

PRACTICAL

MCBM P1.5: (Credit 8) **Marks-100**

General Microbiology: (35)

Cultivation, culture characterization of microorganisms, Culture transfer techniques, techniques for isolation of pure culture, cultural characteristics of microorganisms, simple staining, Gram staining, spore staining, isolation of free living nitrogen fixers from soil, cellulose degrading bacteria, bacterial growth curve, effect of temperature & pH on microbial growth & techniques for cultivation of anaerobic bacteria.

Environmental microbiology: (30)

Microbiological examination of various food products, Determination of antimicrobial activity from various natural sources, Determination of MPN, BOD, COD & DO of water, Measurement of microbial activity in soil by soil respiration method, Demonstration for production of amino acid by soil fungi, Isolation of an antibiotic resistant bacteria from soil & its biochemical characterization, Isolation of an antibiotic producer from soil. Determination of phosphatase activity of milk & Casein hydrolysis, Methylene blue reduction test & soil enzyme assay. Isolation of phosphate solubilizing and cellulose degrading bacteria.

RDT : (35)

Bacterial DNA isolation, DNA isolation from blood, Ligation, Restiction mapping, Restriction digestion, PCR, Southern Blotting, GFP cloning, SDS PAGE.

Semester-II **CREDIT-24** **Marks- 300**

Paper	credit	Class hour/week	No of classes /week	Marks
T-2.1 Molecular Biology	5	6h	8	50
T-2.2 Biophysical chemistry & instrumentation	4	4.5h	6	50
T-2.3 Enzyme & reaction kinetics and evolutionary biology and biodiversity	3	3h	4	50
T-2.4 Computational biology, bioinformatics and biostatistics	4	4.5h	6	50
P-2.5 practical	8	15h	20	100
Total	24	33h	44	300

MCBMT2.1: **CREDIT-5** **Marks-50**

Molecular Biology

Unit I

Replication of DNA in prokaryotes and eukaryotes: General features and enzymology, detailed mechanisms of initiation , elongation and termination ; experiments underlined each steps and role of individual factors; telomerases, regulation of initiation of replication in yeast system.

Unit II

Transcription: RNA polymerase subunits, different sigma factors related to stress, viral infections, sporulations etc, initiation, elongation and termination (rho dependent and independent) of RNA synthesis, antitermination, attenuation and other influences of translational apparatus on the process of transcription ; eukaryotic promoters, enhancers, transcription factors, RNA polymerases, various protein motifs involved in DNA protein interactions during transcription. Regulation of gene expression at transcriptional level. various protein motifs involved in DNA protein interactions during eukaryotic transcription; Nucleoseome structure and gene expression, chromatin remodeling; RNA interference mechanisms and enzymology, regulation of gene expression by miRNP pathway, silencing of RNA and RNA interference.

Unit III: RNA editing and Translation in prokaryotes and eukaryotes: Different modes of mRNA, tRNA, splicing, general discussions on various snRNPs , capping , polyadenylation and other processing events in eukaryotes , RNA editing, discussions on ribozymes. Structure of ribosomes, processing of mRNA for translation and involvement of different translational factors at different stages of the process, experiments involving the initiation, elongation and termination of protein synthesis, non stop mRNAs. Prokaryotic translational control. Operone model (lac, trp and arabinose)

References: Weaver, Watson, Freifelder, Benjamin Lewin , Russel.

MCBMT2.2 : **CREDIT- 4** **Marks-50**

Biophysical chemistry and Instrumentation

UnitI

Thermodynamics: Extensive and intensive variables; mathematical description of a system with two or more variables, exact and partial differential; first law of thermodynamics, isothermal process, free energy and chemical potential; Gibb's free energy, osmotic pressure, Donnan equilibrium, methods for determining free energy changes, coupled reaction, kinetics of reaction, activation energy. Polar molecules, molar refraction and polarization, dipole moment; potentiometric determination of pK's of amino acids. Free energy of charged macro ions; Debye-Huckel theory; Hydration, solvation number.

Unit II

Spectroscopy: Principles of Light absorption, extinction coefficient, ultraviolet, visible and infra-red absorption spectrophotometer and their working principles; molecular vibrations, normal modes and group vibrations – hydrogen bonding effect on vibrational spectra; resonance Raman spectroscopy and its biological applications; circular dichroism (CD) and optical-rotatory dispersion (ORD) and their application in the study of macromolecules; fluorescence and phosphorescence, nuclear magnetic resonance; principles of chemical shift, spin-spin interaction, nuclear quadruple effects, electron spin resonance (ESR). UV-vis spectrophometer

Unit III

Microscopy: Image formation by convex lens, limits of resolution (Rayleigh's criteria)

Optical microscopes- Phase contrast, UV, Interference, fluorescence – their basic principles, optical systems and ray diagrams, their applications in cell biology. Electron optics- spherical aberration and chromatic aberration, Specimen interaction volume, Types of EM- Scanning Electron Microscope, Transmission Electron Microscope, Tunelling Electron Microscope, Atomic force microscope- their construction and basic principles. Specimen preparation techniques, applications of EM in cell biology and molecular biology. microspectrophotometry of cells & tissues; fluorescence activated cell sorter (FACS)

Physicochemical techniques: Liquid Scintillation Counter; pH meter, Ultracentrifuges; microspectrophotometry of cells & tissues; fluorescence activated cell sorter (FACS). Techniques for purifying and characterizing Proteins and Enzymes, Idea of all analytical techniques like Electrophoresis, Liquid Chromatography, Column Chromatography for enzyme protein analysis, crystallography.

References: Cantor and Shimmel, Van Holde , David Freidfelder, Lakowicz, Nakamooto- Principles of Raman Spectroscopy

MCBMT2.3: **CREDIT 3.0** **Marks-50**

Unit I

Enzyme and reaction kinetics

Definition of enzymes, active site, substrate, coenzyme, cofactor and different kinds of enzyme inhibitors (Competitive, noncompetitive, uncompetitive, mixed, partial, substrate). Determination of K_m and V_{max} (Lineweaver- Burk plot, Eadie-Hofstee, Hanes plot). Enzyme kinetics: two substrate kinetics, three substrate kinetics, deviation from linear kinetics, rapid kinetics. Ligand binding studies (Hill's equation).Types of catalysis(acid-base, covalent, electrostatic, metal ion activated). Use of isotopes in enzyme kinetics mechanism analysis. Effect of temperature, pH on enzyme activity. Allosteric model of enzyme regulation (**Aspartate transcarbamylase as example**). Active site determination studies.

Unit II

Origin of life and population genetics

Origin of life: aspects of prebiotic environment and molecular evolution, concepts of evolution, theories of organic evolution,

Population Genetics: Hardy Weinberg genetic equilibrium, genetic polymorphism and selection, genetic drift.

Unit III

Ecosystem: Concepts and dynamics of ecosystem, components , food chain and energy flow, productivity, and biogeochemical cycles: types of ecosystem, population ecology and biological control; community structure and organization, environmental pollution, sustainable development, environmental impact assessment, economic importance of microbes, plants and animals.

Diversification and speciation: Species concepts, biological nomenclature, theories of biological classification, structural, biochemical and molecular systematics, numerical taxonomy, mechanisms of speciation, biodiversity: characterization, generation, maintenance and loss, magnitude and distribution of biodiversity, economic value, wild life biology, conservation strategies, cryopreservation.

MCBMT2.4: CREDIT4.0 Marks-50

Computational biology, bioinformatics &biostatistics

Unit I

Computational Biology

Number system and codes: Binary, Octal, and Hexa-decimal number systems - Binary arithmetic, Binary code, Excess - 3 code Gray error detection and correction - Boolean algebra Computer Fundamentals: Block Diagram of a computer, CPU, Primary and Secondary Memory, Input and Output Devices. Introduction to operating Systems: WINDOWS, Linux operating systems; Computer Viruses. Computer Networking - LAN, WAN, MODEM; Security of the network, Fire-walls; Network Goals; Applications Network; Network structure; Network architecture; Use of INTERNET & w *Introduction to 'C' Language*

Character set, Variables and Identifiers, Built-in Data Types, Variable definition, Arithmetic operators and Expressions, Constants and Literals, Simple assignment statement, Basic input/output statement,

Simple 'C' programs

1. Introduction to Programming

The Basic Model of Computation, Algorithms, Flow-charts, Programming Languages, Compilation, Linking and Loading, Testing and Debugging, Documentation

2. Algorithms for Problem Solving

Exchanging values of two variables, summation of a set of numbers, Test whether a number is prime, Organize numbers in ascending order, Find square root of a number, factorial computation, Fibonacci sequence, Find largest number in an array, Print elements of upper triangular matrix, multiplication of two matrices, Evaluate a Polynomial.

3. Conditional Statements and Loops

Decision making within a program Conditions, Relational Operators, Logical Connectives statement, if-else statement loops: while loop, do while, for loop, Nested loops.

4. Arrays

One dimensional arrays: Array manipulation; Searching, Insertion, Deletion of an element from an array; Finding the largest/smallest element in an array; Two dimensional arrays, Addition/Multiplication of two matrices.

Unit II

Bioinformatics: Introduction of genomic data and data organization,. Sequence data bank: introduction to sequence data bank: protein sequence data bank, NBRF-PIR,SWISSPORT, signal peptide data bank, nucleic acid sequence data bank-gene bank, EMBL, nucleotide sequence data bank, AIDS virus sequence data bank, rRNA data bank. Structural data bank : protein data bank (PDB). The Cembridge Structural Data base (CSD). Geneome data bank: metabolic pathway data ; microbial and cellular data bank. Introduction to MSDN (microbial strain data network). Neumerical coding system of microbes. Hybridoma data bank structure. Virus information system, cell line information system. Other important data banks in the area of biotechnology / life sciences/ biodiversity.Sequence analysis – Analysis of Tools for sequence Data Banks. Pair wise alignment- NEEDLEMAN and Wunch algorithm, Smith Waterman. Multiple alignment – CLUSTAL, PRAS; BLAST. FASTA algorithm to analyze sequence data. Sequence pattern, motifs and profiles. Secondary Structure predictions; Prediction Algorithms. Chao-Fasman algorithm, Hidden- Markov model.

Unit III

Biostatistics

Probability and statistics- conditional probability, population, variables, collection, tabulation and graphical representation of data, frequency distribution, central tendency and skewness, Probability distribution- Binomial, Poisson & Gaussian distributions, additive and multiplicative laws of probability, concept of correlation, regression, method of least squares, random number generation, testing and use; probability density and cumulative distribution function, systematic and random sampling; accidental and systematic errors, error function, propagation of error. Testing of hypothesis- test for mean, chi-square test ANOVA . Prey predator model (numerical modeling)- An introduction. Basic idea of applied multivariate techniques.

References: Das and Das, Misra.

Practical **Credit-8** **Marks-100**

MCBMP2.5: Biochemical Techniques (35)

Paper chromatography of carbohydrates, use of inhibitors for active site determination, chromatographic techniques, purification of enzymes, chemical estimation of vitamins, minerals like Ca^{+2}, Fe^{+2}, determination of molecular weight by gel filtration.

Analytical microbiology (35)

Isolation of microorganisms from rhizosphere, phyllosphere, rhizoplane, phylloplane, calculation of rhizosphere effect. Isolation of endospore formers from soil, antibiotic sensitivity test of microorganisms, enzyme assay:amylase, urease, catalase, nitrate reductase, thiosulphate reductase, tryptophanase etc.,

Computational Biology and Bioinformatics: (30)

Use of Microsoft Office: Basic Features Full-Featured Word Processors, MS Word –Basics Starting MS Word, Menus and Toolbars Creating, Editing and Saving a Word Document.

Excel –Basics Starting Excel: Navigating in a Workbook Create, Name, and Save a New Workbook Data Entry, Creating a graph, Histogram, pie diagrams etc using char wizard.

Creating word file by using paragraphs, alignments, Working with spread sheet, Handling of different formula/function Using function wizard. Calculate regression and correlation use excel (to be used for the analysis of data taken in the laboratory) Searching scientific information using any search engine.

Practical: **Students have to submit a project report on biological database using bioinformatics.**

Semester III **Credit -22** **Marks-300**

Paper	credit	Class hour/week	No of classes /week	Marks
T-3.1 Virology (Plant & animal virus and bacteriophages) and yeast genetics	4	4.5h	6	50
T-3.2 Medical microbiology & microbial pathogenesis	3.5	3.75h	5	50
T-3.3 Microbial genetics	4.5	5.25h	7	50
T--3.4 Food & industrial microbiology	3	3h	4	50
P2.5 practical	7	15h	20	100
Total	22	31.5h	42	300

MCBMT3.1 **Credit 4** **Marks-50**

Virology and Lambda and yeast genetics

Unit I

Bacteriophages (Lamda, T4, T7. M13)

Bacteriophages lambda, T4, T7, M13, lytic cycle, lysogeny, viral replication, nucleic acid and protein synthesis,. **Unit II**

Plant & Animal Virus

Classification and modes of propagation, bacterial, plant and animal viruses: morphology and ultrastructure, assay of viral particle, cell culture, viral enzymes, nucleic acids, bacteriophages Classification of viruses, Herpes, hepatitis B, rhabdo virus, adenovirus, oncogenic viruses, RNA viruses, polio, VSV, influenza, molecular biology of genetic shift and drift in influenza virus, retroviruses: structure and lifecycle, cellular trophism of HIV, transformation, baculoviruses, Plant viruses: TMV.

Unit III

Yeast Genetics and cloning in yeast.:

Yeast Genetics, transformation in yeast, Yeast vector development, YEp, YRp, YCp and Yip, 2µ plasmid, yeast artificial chromosome (YAC), retrovirus like vector (Ty) in yeast/shuttle vector, features of yeast promoter, and expression of cloned gene in yeast, yeast two hybrid system, plasmid shuffling to explore interactive domains of multimeric proteins, the cassette model for mating type switches and silencing of genes, gene targeting.

References: Flint, Dimmock, Ptashney, Maniatis, Powar Daginawala, Subramanyam Sashtry. David Freifelder, Brock

MCBMT3.2 Credit 3.5 Marks-50

Medical Microbiology & Microbial Pathogenesis

Unit I

History of infectious disease: Koch's postulates, Molecular Postulates, Types of Pathogens- subcellular infectious entities, Prokaryotic and eukaryotic microorganisms.
Normal microflora in healthy human body.

Host- Parasite interactions: Basic Terminology of Infectiology, Determinants of Bacterial Pathogenicity and Virulence, Adhesion, Invasion and spread, Strategies against Nonspecific Immunity , Strategies against Specific Immunity, Regulation of Bacterial Virulence.

Bacterial Diseases: Mechanism of pathogenesis, prophylaxis, therapy, prevention and laboratory diagnosis of the diseases caused by *Staphylococcus, Streptococcus, Pneumococcus, Neisseria, Bacillus, Corynebacterium, Clostridium, Enterobacteriaceae, Shigella, Salmonella, E. coli, Vibrio, Mycobacterium, Helicobacter pylori etc*.
Other disease- Food Poisoning, Meningitis, Tuberculosis, Diphtheria, Leprosy, Typhoid, Enteritis [*Yersinia enterocolitica*],Gastritis, Cholera, Bacterial Pneumonia..

Unit II

Viral diseases: Host-Cell Reactions ,Cell Destruction (Cytocidal Infection, Necrosis), Virus Replication without Cell Destruction (Noncytocidal Infection), Latent Infection. Virus host interaction: virus infection, viral diseases and pathogenesis: Mechanism of viral pathogenesis.

Biology of obligate parasites : Rickettsia, Chlaymadia, Trypanosomes, Spirochetes etc
Common Mycotic infections in humans : Superficial, subcutaneous, cutaneous and systemic mycoses. General description of mycotic pathogens, diagnosis and prevention

Reference: Greenwood, Panikar

MCBMT3.3 Credit 4.5 Marks-50

Microbial Genetics

Unit I

Transformation: Natural Transformation, Discovery of Transformation, Competence, Uptake of DNA during natural transformation, Mechanism of DNA uptake during transformation, genetic evidence for single stranded uptake, Plasmid transformation and transfection of naturally competent bacteria, Mapping by transformation, Artificially induced competence, Calcium ion induction, Electroporation.

Conjugation: Interrupted mating and time of entry mapping, linkage mapping, Mechanism of DNA transfer during conjugation in Gram-negative bacteria, Chromosome transfer by plasmids, Genetic mapping with Hfr Crosses, Chromosome mobilization, Prime factors, Transfer systems of Gram positive bacteria, Interrupted mating and time of entry mapping, linkage mapping.

Transduction: Recombination and complementation tests with phages, Experiments with the rII genes of phage T4, Constructing genetic linkage map of a phage, Generalized transduction, Cotransduction and linkage, Mapping by Cotransduction, Properties of specialized transducing particle, Specialized transducing phage as a cloning vehicle.
Transposons: transposable elements in prokaryotes and eukaryotes (yeast, maize and fruitfly).

Unit II

DNA damage and repair: Factors affecting DNA bases**,** identification and molecular characterization of repair enzymes in photoreactivation, excision, recombination and SOS pathways.
Mutation: Mutation, spontaneous and induced, mutagenic agents, Luria-Delbruck fluctuation test; replica plating
Microbial recombination models: Holliday double strand invasion model(*E.coli*); Single strand invasion model; Double strand break repair model(*Saccharomyces cerevisiae*). Molecular mechanism of recombination in *E. coli;* X sites and RecBCD nuclease; RecA protein function; Ruv and RecG proteins and migration and cutting of Holliday junction; RecF pathway.
References: Larry Snyder and Wendy Champness, David Freifelder, Snyder, Russel, Griffth, Snustad and Simmons.

MCBMT3.4 Credit 3 Marks-50

Unit I

Industrial Microbiology

Biology of Industrial Microorganisms: (*Saccharomyces, Aspergillus*, Penicillia, Spore forming bacteria etc.).Idea of Fermentation, Cell growth, Metabolism, Regulation of Metabolism, Substrate Assimilation / Product Secretion. Different fermentative system. Batch & Continuous processes, Fermentor Design, Surface & Submerged liquid substrate Fermentation. Solid substrate Fermentations, Fermentation Raw Materials, Biofertilizers and biopesticide formulation, Down Stream Processing, Bio Mass Production,

Unit II

Food Microbiology

Food Fermentation(Alcohol, Cheese making, Bread making, Soya based food, Meat Fermentation, Vinegar, Lactic Acid, Industrial chemicals, Bio Polymers, Bio Insecticides, Food Additives(Amino acids, Nucleosides, Vitamins, Fats & Oils), Health Care Products(Antibiotic, Steroid, Vaccines). Production of Industrial Solvents(Alcohol, Acetone, Butanol, etc.)Industrial Enzymes(Amylase, Proteases, Lipases), Concepts of Immobilized Enzymes. Genetically modified food, organic food and food processing. Fermented food and its processing.

References: Casida, Prescott and Dunn, Waites.

Practical: Credit 7 Marks-100

MCBMP-3.5

Industrial Microbiology (50)

Microbial production of amylase by *Bacillus subtilis*, Production of antimicrobial compounds from soil isolates. Fermentative production of ethanol by *S. cerevisiae*, Wild fermentation- Saurkraut production.

Virology and microbial genetics (50)

Assay of bacteriophage, induction pattern of temperature sensitive lysogens, purification of bacteriophage, isolation of nucleic acids from bacteriophage.

Semester IV **Credit-30** **Marks-300**

Paper	credit	Class hour/week	No of classes /week	Marks
T-4.1 Immunology	4.5	4.5h	6	50
T-4.2 Cancer biology, animal cell culture & gene therapy	5.0	6h	8	50
T4.3 Eukaryotic microbiology & Antimicrobial agent	4.5	5.25h	7	50
T--4.4 Genetics and IPR	3.0	3.0h	4	50
P4.5 Immunology practical and grand viva	4	7.5	10	25+25=50
P4.6 Paper presentation and Summer project and seminar.	9			20+30=50
Total	30	26.25 (excluding project hours)		300

MCBMT4.1: **CREDIT-4.5** **Marks-50**

Immunology

Unit I

Immunoglobulins, Organization and expression of Ig genes; B-cell maturation, Activation and differentiation; MHC/HLA; Antigen-processing and presentation; T-cells; T-cell-Receptor; T-cell maturation, Activation and Differentiation; Cytokines; Cell-mediated and Humoral Effector responses, Autoimmunity, Immunodeficiency diseases, Transplantation Immunology, and immune System. Monoclonal and polyclonal antibodies. Monoclonal antibody techniques.

Unit-II

Immunology Course:

Protein Kinase C signaling relates to immunology via free radical generation, Immune cells, T and B cells functions, Humoral immune response and cell mediated immunity, Antigen presentation and processing. TCR signaling, Cytokines, Role of Immunomodulators, Toll Like Receptors, Immune diseases and its recovery, Ceramide generation and immune response, Autoimmunity and Cancer.

Hands on training in immunology practical.

Ref_ Abbas, Kuby

MCBMT4.2: **CREDIT-5.0** **Marks-50**

Cancer biology , animal cell culture and gene therapy

Unit I

Classification and Nomenclature, Signs and symptoms –

Causes of cancer: Chemical carcinogens , Ionizing radiation, Infectious diseases, Hormonal imbalances, Immune system dysfunction, Heredity, Other causes.

Pathophysiology of cancer: Epigenetics, Oncogenes, Tumor suppressor genes, cell signaling and cancer

Cancer cell biology: Clonal evolution, Biological properties of cancer cell.

Therapeutics: Antiangiogenesis, immunotherapy, gene therapy

Unit-II

Animal cell culture : Concepts in mammalian cell culture :Isolation of cells, Maintaining cells in culture, Manipulation of cultured cells ,_Media changes,_Passaging cells, Transfection and transduction, Established human cell lines, Generation of hybridomas, _Applications of cell culture, Tissue culture and engineering, Common cell lines, Screening of transfected cell lines.

Gene therapy:

Background, Basic process, Types of gene therapy: Germ line gene therapy, Somatic cell gene therapy, Broad methods, Vectors in gene therapy, Viruses: Retroviruses,_Adenoviruses, Adeno-associated viruses. Envelope protein pseudotyping of viral vectors, non-viral methods; naked DNA, Oligonucleotides,_Lipoplexes and polyplexes, Hybrid methods, Dendrimers, _Major developments in gene therapy from 2002 to 2007, Problems and ethics.

MCBMT4.3 **CREDIT-4.5** **Marks-50**

Unit I

Eukaryotic microbiology

Elements of algal studies :

General classification, cell structure; Nutrients and reproduction of important groups of eukaryotic algae.

Lichen :

Classification, identification; vegetative, asexual and sexual reproduction; economic importance of lichens.

Fungi, molds and yeast : general classification ,cell structure, structure and biology of fungal spores of different kinds, reproduction in fungi, mycotoxins.

Protozoa:

classification, general biology of protozoal cell, process of reproduction in common protozoal classes, importance of protozoa in soil and water ecosystem.

Unit – II

Antimicrobial Agents:

Definition, Concept of secondary metabolite, Role of antibiotics in producer organisms, Significance of antibiotic compounds in present world. Spectrum of action, efficacy, Assay of antibiotics- chemical versus microbiological assay system.

Mechanisms of action: Antibacterial compounds Cell wall inhibitors [penicillin, bacitracin], inhibitors of membrane function [polyenes, tunicamycin,ionophores] , inhibitors of ribosomal function [aminoglycoside, tetracycline, chloramphenicol, puromycin], inhibitors of nucleic acid metabolism[Actinomycin D, mitomycin C]

Antiviral compounds- Viral protein coat inhibitors, nucleotide analogs, Interferons

Generations of Antibiotics: Biochemical modifications for generation development of antibiotics taking example of antibiotic like penicillin etc.

Antibiotic resistance: The Problem of Resistance, Definitions, Incidence, Significance , Resistance Mechanisms, Evolution of Resistance to Anti-Infective Agents , Resistance Tests.

Combination therapy : Significance , side effects. Antagonism and synergism.

Bacteriocins: mode of action of some common bacteriocins; difference with antibiotics and uses.

Antifungal agents: examples and sites of action of some commonly used antifungal agents.

MCBMT4.4 **CREDIT-3.0** **Marks-50**

Genetics and Genetic information and concepts of & Bioethics, IPR, Biosafety

Unit I

Genetics and Genetic information

Physical basis of heredity; cell division, Mendel's Laws, gematogenesis, life cycle

(Yeast, *C.elegans);* structure and organization of some special chromosomes like polytene and lambhrush chromosome single gene inheritance, terminology, allelic relationship, single gene crosses, pedigree analysis; two or more gene, independent assortments, dihybrid cross, genetic interactions; two factor interaction, epistatic interaction, non epistastic interaction, interaction with three or more factors. Doses compensation and sex determination and sex linked inheritance, Linkage and chromosome mapping: linkage, cross over, chi square test for linkage, recombination frequency and map construction, tetrad analysis in yeast and recombination mapping with tetrad, mapping with molecular marker.

Unit II

Concepts of IPR, Biosafety and Bioethics

I) Intellectual Property Rights (IPR):

General idea about intellectual property (IP) and IPR. Different forms of IPR. Patents – basic concept, important features, protection and use. Criteria of patentability. Legal, technical, scientific and commercial aspects.

II) Biosafety:

General idea about risks of dealing with recombinant DNA technology and genetically modified organisms (GMO) in research and large-scale use. Biosafety rules – to avoid biohazards and protect environment. Regulations for biotechnology-based products and processes. Public perception.

III) Bioethics:

Science & Technology and Society – science & technology development in society; the bearing of science & technology on society. Ethical issues in experimentation on animals and humans; health and biomedical innovations; transgenic research and applications.

Practical **CREDIT-4** **Marks-50**

MCBMP 4.5 **Marks-25**

Immunology

Blood group determinations, ODD, Radial Immunodiffusion, Immuno Electrophoresis, Rocket Immuno Electrophoresis, Sandwich ELISA, Western Blotting, Lymphocyte Count from Blood.

Grand viva: **Marks-25**

Students will be evaluated on all the topics discussed in the two years programme by a panel of experts

MCBMP 4.6 **CREDIT-9** **Marks-50**

Project work (30)

A project performance report based on the summer research training in a reputed laboratory will have to be submitted. A presentation of the accomplishments will be required before a panel of experts. Evaluation will be based on both the project report and presentation.

Review or research papers and presentation (20)

Students will have to present a paper or review article from current journals and they will be evaluated by the panel of internal faculty members.

SEMESTER –I

Paper -1.1 Food Chemistry (Credit: 4)

Hours: 60 Marks: 50

Group A

1. **Food chemistry**: Introduction, general definition and importance.
2. Water in food, water activity and shelf life of food.
3. Basic Stereochemistry, Symmetry element and Symmetry operation, concept of configuration and conformation, DL & RS nomenclature, conformation of cyclic molecule, anomeric effect.
4. **Carbohydrates**: Introduction, definition, nomenclature, classification, Stereo chemistry general properties of sugar. Identification of common mono, di and polysaccharides. Determination of reducing and non reducing sugars. Chemistry of starch, glycogen, cellulose gums and mucilage, crude fibre. Physiological functions of carbohydrate. Functional properties of sugars and polysaccharides in food.

Group B

5. **Lipids**: Classification, physical and chemical properties of lipid, soap and fatty acid detergents, essential, fatty acids, fats and oil, saponification value ,acid value, iodine value, acetyl value. Reichert Meissal number, oxidative and hydrolytic rancidity, phosphoglycerides, sphingolipids, nonsaponifiable lipids, cholesterol, prostaglandin.
6. **Proteins and Amino acids**: Physical and chemical properties of amino acid and protein. Structure and conformation of protein. Distribution, amount and functions of protein in food. functional properties , effect of processing.

Group C

7. **Instrumentation:** Principles and application of Spectroscopy Lambert Beer Law, Extinction coefficient, UV, Visible and IR absorption Spectrophotometer.
8. **Principle of Microscopy:** and various kinds of Microscope. (SEM & TEM)
9. **Physicochemical Techniques:** Microspectrophotometry of cells and tissues, Fluorescence activated cell sorter, Techniques for purifying and characterizing Proteins and Enzymes.

PAPER -1.2 Biochemistry I (Credit: 4)

Hours: 60 Marks: 50

Group A

1. **Enzymes:** Classification, specificity, mechanism of action, kinetics, factors affecting enzyme activity, enzyme inhibition, coenzymes in metabolism, isozymes, enzymes in clinical diagnosis.

2. **Lipid Metabolism:** - Regulation of oxidation and biosynthesis of fatty acids. Metabolism of triglycerols, cholesterol, phospholipids, lipoproteins and eicosanoids (in brief). Inborn errors of lipid metabolism including hyperlipoproteinemias and ketosis.

Group B

3. **Carbohydrate Metabolism: -** Regulation and hormonal control of carbohydrate metabolism including Glycolysis, TCA cycle, gluconeogenesis, glycogenesis, glycogenolysis, HMP pathway. Glucose transporters. Inborn errors of Metabolism.

4. **Integration of Metabolic Pathways**

Group C

5. **Amino acid Metabolism:-** Transamination, deamination, transmethylation, decarboxylation, glucogenic and ketogenic amino acids, metabolism of lysine, phenylalanine, valine, glutamic acid, urea cycle, synthesis of serotonins, histamine, dopamine, GABA (brief overview). Inborn errors of amino acid metabolism.

6. **Nucleotide Metabolism:-** Characteristics, structure, classification, properties, metabolism ,synthesis & breakdown of purines and pyrimidines (overview). Comparison of denovo and salvage pathways.

PAPER 1.3 APPLIED PHYSIOLOGY Credit: 5

Hours: 75 Marks: 50

Group A

1. **Cell Physiology:** Membrane structure, fluid mosaic model of random diffusion of membrane component, Transport of nutrients. Active and passive transport mechanisms, compartmentalization of cells, transport of protein from the ER through the golgi apparatus. General strategies of the cell cycle. Cell communication: hormones and receptors, second messenger.

2. **Endocrinology:** Introduction to mechanism of action of steroid and protein hormones. Pancreatic hormones- functions in membrane transport, protein synthesis, growth and metabolism. Neuroendocrine regulation of hunger and satiety (Hypothalamus, Leptin, Ghrelin). Gastro-intestinal hormones-Site of origin, chemical nature and mode of action.

3. **Nerve-muscle physiology:** Elementary idea of nerve impulse propagation, action potential transmission through synapse and NM junction, different nutrients causing excitation and inhibition in neuromuscular physiology.

Group B

4. **Alimentation:**Mechanism of HCl secretion- physiological, nutritional and pharmacological aspects. Bile formation and secretion; Anatomy of liver and entero-hepatic circulation. Role of mucosa associated lymphocytes in health and disease.

5. **Blood** :Plasma protein, Properties and origin of Plasma Protein, relation of diet to plasma protein. Erythropoiesis, Regulation of erythropoiesis, Fate of Red Blood Corpuscles (RBC). Mechanism of haemoglobin synthesis, factors controlling haemoglobin synthesis, Varieties of Haemoglobin, Role of B12 & folic acid in haemoglobin synthesis.

Group C

6. **Homeostasis:** Role of kidney in maintaining electrolyte balance. Buffer system of body (lung, kidney and blood). Role of circulation (Systemic, Splanchnic, cerebral and coronary) in distribution of nutrients and excreta.

7. **Nervous system:** Organization of Nervous system: Structural & Fractional anatomy of nervous system. Elementary feature of the anatomy of the central & peripheral nervous system (cerebral cortex, cerebellum, Thalamus, hypothalamus, spinal cord.

PAPER-1.4 Advanced Nutrition I Credit: 4

60 Hrs 50 marks

Group A

1. **The nutritional role of macro- nutrients**:- Requirements, sources, functions, deficiency and excesses of the different nutrients –carbohydrate, protein, fat. Their general properties, estimation by colour reaction, Different method of estimation of the nutrients. Estimation of protein quality.

2. **Dietary modification in extreme conditions**: Flood, Femine, Draught, alteration in temperature and altitude.

Group B

3. **The nutritional role of micronutrients** :Requirements, sources, functions, assessment, deficiency and excesses of the different nutrients –vitamin (Vitamin A,D,E,K, Thiamine, Riboflavin, Niacin, Pantothanic acid, Pyridoxine Folic Acid, , Cyanocobalamin, Lipoic acid, Biotin), and mineral (Na,K, Cl, Ca, P, Mg Fe, I, Cu, Zn, Mn, Se, F).

4. **Metabolic interrelationship:-** Metabolic interrelationship between nutrients- Vitamin-Vitamin, Vitamin-Minerals & Minerals- Minerals.

Group C

5. **Recommended dietary allowances**:- Basis for computing nutrient requirements - latest concepts in dietary recommendations,: their uses and limitations.RDA of different age groups (2010)-Requirements & RDA, references men and women. Determination of RDA of different nutrients. Methods of deriving RDA.

6. **Energy:** ACU, REE, energy balance, calculation of energy requirements by factorial method, BMR, direct and indirect calorimetric, SDA.

PAPER – 1.5 Applied Physiology PracticalCredit Point 4

Total Marks 50 Total Hours 60

1.Estimation of haemoglobin using kit.
2.Determination of haematocrit value.Packed cell volume, RBC and WBC count.
3.Determination of blood pressure , pulse rate . heart rate before and after Harvard step test.

4. Demonsration of tissue preparation (fixation, embedding, mounting etc)
5. Immunoelectrophoresis. (using kit)
6.Quantitative estimation of sugar(fasting blood sugar)
7. Quantitative estimation of Na+/K+, HDL, Cholesterol.

PAPER -1.6 FOOD CHEMISTRY PRACTICAL Credit Point 4

Total Marks 50 Total Hours 60

Group A

1. Identification of Protein.
2. Identification of Fat.
3. Identification of Amino Acids.

GroupB

1. Quantitative estimation of carbohydrate in foods.
2. Quantitative estimation of Protein in food.
3. Quantitative estimation of amino acid.
4. Analysis of Proximate constituent like crude fibre, crude protein etc.
5. Measurement of pH, acidity and moisture content, ash content etc.
6. Analysis of some food products.
7. Chromatographic separation techniques.

SEMESTER II

BIOCHEMISTRY II (Paper 2.1) Credit: 5

Hours: 75 Marks: 50

Group A

1. **Neuclic acids**: structure of DNA and RNA. Different types of DNA , RNA, their functions and mutation.

2. **Nutrigenomics :** Nutritional regulation of gene expression .Role of specific nutrient in controlling gene expression.

Group- B

3. **Transcription**: RNA polymerase subunits, different sigma factors related to stress, initiation, elongation and termination (Rho dependent and independent) of RNA synthesis: Antitermination, eukaryotic promoters, enhancers, transcription factors, RNA polymerase: various protein motifs involved in DNA protein interaction during transcription.

4. **Translation**: in prokaryotes and eukaryotes and their regulation, processing of m RNA for translation (eg., 5' capping and splicing) and involvement of different translation factors at different stages of the process.

Group- C

5. **Antioxidants :** Definition of free radicals and **a**ntioxidants, production and effects of free radicals, role of **a**ntioxidants in reducing the free radicals. Natural and synthetic **a**ntioxidants.

6. **DNA Replication in prokaryotes and eukaryotes:** General features and enzymology, mechanisms in initiation, elongation and termination, role of individual factors, telomerases, mechanism of replication, maintenance of integrity and role in cancer, DNA damage and repair: factors affecting DNA bases, identification and molecular characterization of repair

enzymes in photoreactivation, excision, recombination and SOS pathways, models for homologous recombination, site specific recombination and transposition.

Food Processing and Biotechnology (Paper -2.2) Credit points: 4

Total marks: 50 Total Hours: 60

Group A

1. History and development of Biotechnology.
2. Improvement in processed food by the application of various biotechnological processes.
3. Technology of conventional and nonconventional fermentation based food products from cereals, legumes, fruits, vegetables.

Group B

4. Fermentation production of modified carbohydrate, lipid and protein and their purification techniques. Studies on changes in colour, flavour and organoleptic test during processing and storage of the fermented food and chances of spoilage of the products due to process defects.
5. Antibiotics : Production ,principle and structure of some important antibiotic.
6. Production of microbial biomass and its economic aspects.

Group C

7. Regulatory and social aspects of biotechnologically modified foods.
8. Technological aspects of some fermented foods from milk, fish and meat, origin, sources, scope and development.
9. Immobilization of enzymes; Different technique and use in food industry.
10. Application of new techniques like Extrusion, Nano technology etc

ADVANCED NUTRITION-II (PAPER 2.3) Credit points: 4

Total marks: 50 Total Hours: 60

Group A

1. Body Composition: - Significance, Different level of body composition, changes in body composition throughout life cycle. Measurement of body composition. Changes & clinical signs.

2. Growth And Develpoment: Definition, differences between maturation and learning, pr.inciples of development, stages of development, physical growth of features, reflexes of new born baby

3. Sports Nutrition: - Aerobic and anaerobic energy system in brief, nutritional requirement. Pre–event & Post-event meal. Importance of Supplement. Carbohydrate loading.

Group B

1. Eating Disorder: - (Anorexia nervosa, Bulimia nervosa)-Causes, clinical features, epidemiology, counseling and management. Brief idea of food fads & fallacies

2. Deficiency Disorders Of Some Common Nutrients : Vit-D, Vit- B12, Folic Acid, & Iron.

3. Vegetarianism:-Concept of vegetarianism, reasons behind the development of vegetarianism. Types of vegetarianism. Health benefits and risk factors present with vegetarianism.

4. Geriatric Nutrition: Physiological and psychological changes during old age, Nutrition- disease interrelationship in old age, Diet and life style modification in old age.

Group C

1. Physiological changes during Pregnancy & Lactation
2. Antenatal care during Pregnancy
3. Lactogenesis – Definition, Phases, & Hormonal control
4. Special conditions – Thalassaemia, Sickle Cell Anaemia, NTD, Down Syndrome, Parkinson's Disease, Alzheimer's Disease

Food Commodities And Packaging(Paper 2.4) Credit points: 4

Total marks: 50 Total Hours: 60

Group A

1. Introduction to packaging. Packaging operation, package function and design. Principle in the development of protective packaging.
2. Deteriorative changes in foodstuff and packaging methods for preservation. Shelf life of packaged food stuff, method of extended shelf life.
3. Food containers –rigid containers, corrosion of containers(tin plate).

Group B

4. Flexible packaging materials and their properties.
5. Food Packaging. Bags, pouches, wrappers, carton and other traditional packages.

6. Containers : wooden boxes, crates, plywood & wire based boxes corrugated & fibre based boxes, textile & paper sachet.

7. Special problems in packaging of food stuff , consideration in the packaging.
   of perishable & processed foods.

Group C

8. Evaluation of packaging material & package performance, packaging equipments , package standards& regulation.

9. Bar coding, aseptic & retortable pouches. Flexible & laminated pouches. Aluminium as packaging material.

10. Biodegradable packaging, active packaging.

Food Processing and Preservation Practical (Paper 2.5) Credit points: 4

Total marks: 50 Total Hours: 60

1. Preparation of jam, jelly squash nectar and their Preservation
2. Preparation of pickles, chutneys and sauce.
3. Preparation of fermented vegetables
4. Preservation of foods by canning, freezing, drying, cooling.
5. Production of wheat products including flour, bread, cake, and other confectionary products and their preservation.
6. Quality assessment of processed product. Testing of frozen products.
7. Preparation of Dairy products and preservation by heat treatment and pasteurization.
8. Detection and identification of food spoilage organism.
9. Packaging of food products, machinery and equipment.
10. Visit to Food Industry.
11. Sensory evaluation.

Nutritional Biochemistry Practical (Paper 2.6) Credit points: 4

Total marks: 50 Total Hours: 60

1. Preparation of Buffer.
2. Use of Dialysis, salting out, gel chromatography, gel electrophoresis in protein purification.
3. Analysis of Urine, glucose, protein, blood, acetone, bilirubin.
4. Estimation of blood glucose, lipid profile, bilirubin, uric acid, urea, creatinine, SGOT, SGPT, alkaline phosphatase, Hb, PCV, T3, T4, TSH, ferritin, vitamin A.
5. Estimation of salivary amylase.

SEMESTER-III

PAPER 3.1 Food Microbiology Credit: 5

Hours: 75 Marks: 50

Group A

1. Historical introduction of Microbiology. General introduction of Micro-organism Bacteria, Yeast and Fungus: Morphologyand composition of cell wall.

2. Bacterial Growth:Different types of culture media, its composition and function of individual ingredients. Kinetics of growth. Batch culture, continuous culture, synchronous culture (definition & brief description). Factors affecting growth.

3. Stains and staining Techniques.:Definition of dyes and stains. Classification of dyes. Principle, theory & different method of staining - Gram Staining, acid-fast staining, spore staining, capsule staining & flagella staining.

4. Control of microbial growth.: Sterilisation and disinfection, by physical & chemical agents. Application of dry heat, moist heat, sound wave, radiation, gases & filtration - physical methods .Application of acids, alkali, alcoholic salts, phenols, soaps & detergents - chemical methods.

Group B

5. Bacteriology of water .Portability of water. Number & kinds of micro-organisms present in water sample. Coliform bacteria - detection & configuration and its classification. Differentiation of feacal & non-feacal coliform bacteria by chemical test. Purification of water.

6. Microbiology of Milk and Milk product.: Different micro flora present in milk, determination of gradation of Milk, curdling of Milk. Pasteurization of milk & Phoshatase test.Microbial involvement in making cheese & butter, development of typical aroma, ripening of cheese.

7. Microbial food Product: Production of wine & other alcoholic beverages (whisky, rum etc.). Activities of lactic acid & acetic acid bacteria. Production of vinegar, sorbic acid, dihydroxy acetone. Microbial production of organic acids. Microbial production of vitamin B_2 and $B_{12.}$. Methanogenic bacteria and biogas production.

Group C

8. Food Spoilage. Role of microorganisms in spoilage of different kinds of food - cereal & cereal products, sugar and its product, vegetables & fruits, milk & milk products, fish, eggs & meat products, canned food.Sources of contamination, factors responsible & chemical changes due to spoilage.Common techniques applied to prevent spoilage of food.

9. Food Hazards. Food Borne infections and intoxication - their symptoms, mode of action & methods of prevention.

10. Food sanitation, control & inspection.:Microbiology of food plant sanitation. Personal hygine of food handelers. Water & milk testing, food testing - final product.

PAPER 3.2:CLINICAL NUTRITION & DIETETICS Credit 4 Hours 60

Group A (10 marks)

1. Introduction to diet therapy, therapeutic nutrition & dietetics. Adaptation of normal diet into therapeutic diet giving special reference on modification in feeding technique and constituent. Special feeding methods.
2. Factors influencing patient care, assessment of patient need proper method of feeding the patient.
3. Energy modification including obesity and under weight.
4. Fever and febrile condition.

Group B (10 marks)

5. Incidence, aetiology, pathology, clinical manifestations, complications & nutritional management of the following:
    a) Lower GI tract disorder (Peptic ulcer, Dumping syndrome, flatulence, constipation, diarrhea & dysentery, Malabsorbtion syndrome, Tropical sprue, Irritable Bowel Syndrome, Inflammatory bowel disease, Gluten sensitive enteropathy, ulcerative colitis).

b) Liver, pancreas & gall bladder disease.

Group C (10 marks)

6. Incidence, aetiology, pathology, clinical manifestations, complications & nutritional management of the following:
    a) Metabolic disorder (Gout, Diabetes, Dyslipidemia).
    b) Cardiovascular diseases (Hypertension, MI, angina, IHD, hyperlidemia).

PAPER 3.3Research Methodology, Computer Application and Statistics

Credit 4 **Hours 60**

Group A (10 marks)

Introducing Research

1. Concept, Objectives and Types of Research
2. Stages of Research
3. Structuring of Research: The Research Design
4. Concepts of variable and attribute
5. Levels of measurement: Nominal, Ordinal, Interval and Ratio
6. Writing a Research Proposal

Group B (10 marks)

Collection and Analysis of Data, Report Writing

1. Primary and secondary data. Sources of different types of data
2. Sampling: basic types, their merits and demerits
3. Methods and techniques of data collection: Observation, Interview, Questionnaire and Schedule

4. Hypothesis and testing of hypothesis: Null and alternate hypothesis, types of errors (Type – I and II), Normal Probability Curve (Basic idea), Confidence interval and levels of significance
5. Report writing: guiding principles

Group C (10 marks)

Basic Statistics and Computer Application

1. Frequency Distribution: Tally marks, Class Limit, Class Boundary and Frequency Density, Cumulative Frequency Distribution
2. Graphical Representation of Data: (a) Line Diagram, (b) Bar Diagram, (c) Histogram and Frequency Polygon, (d) Pie Chart
3. Measures of Central Tendency: Mean (Only Arithmetic Mean), Median and Mode (Grouped and Ungrouped Data), Relative advantages and disadvantages of different measures of Central Tendency, Relation among the different measures of Central Tendency
4. Measures of Dispersion: Importance of the concept of Dispersion in Research, Absolute and Relative measures of Dispersion. Absolute measures: Range, Mean Deviation , Quartile Deviation and Standard Deviation. Relative measures: Coefficient of Mean Deviation, Coefficient of Quartile deviation and Coefficient of Variation, Students t-test, Analysis of Variance (ANOVA).
5. Application of Computers in Research

PAPER 3.4 : COMMUNITY NUTRITION Credit 5 Hours 75

Group A (10 marks)

1. Concept of community nutrition & community health –Characteristics. Meaning of extension education- scope, importance and characteristics. Formal & Non-formal education.
2. Assessment of Nutritional Status of the Community: -Anthropometric measurement, clinical signs and symptoms, diet survey.
3. Agricultural Production, storage, distribution. Role of science & technology in increasing food production. Nutritional Crisis & Food security.

Group B (10 marks)

4. Nutrition Monitoring & surveillance: - Nutrition surveillance, food surveillance, surveillance technique & methods, tools for surveillance, objectives of surveillance, uses of surveillance.
5. Nutritional problems: - different prophylaxis programmes, National Nutritional Policy 2010-main features.

Group C (10 marks)

6. Malnutrition: -Economics of malnutrition, causes, vicious cycle of Malnutrition & poverty, Malnutrition & infection. Strategies to combat malnutrition.(National Agencies- ICDS,ANP,SNP,MDM)

7. Nutrition Education: Objectives, imparting nutrition education through Audio-visual Aids. Different types of audio (lectures, radio) visual(poster, charts, exhibitions, pamphlets, bulletins) & audio-visual aids(Workshop, Television, films, puppet show, drama) –Importance and drawbacks

Paper 3.5 Food Microbiology Practical Credit 4 Hours 60

1. Preparation of culture media for bacteria, yeast and fungus.
    a) Bacteria - nutrient agar medium
    b) Yeast – YEPDA medium

c) Fungus – Czapekdox agar medium & PDA medium.

2. Inoculation of bacteria, yeast (S.cerevisie) & fungus.
3. Staining of bacteria – simple & gram staining.
4. Staining of yeast using methylene blue & cotton blue lactophenol.
5. Staining of fungus using cotton blue lactophenol.
6. Isolation of pure culture of bacteria from foods by
    a) Streak Plate Method
    b) Spread Plate Method
    c) Pour Plate Method

7. Microbiological examination of water
    a) Total colony count
    b) Test for coliform bacteria
    c) Tests for foecal and non Foecal colioform bacteria.
8. Microbiological examination of air tablewares, & equipments in food plant organization.
9. Methylene Blue Reduction Test of milk.

PAPER 3.6COMMUNITY NUTRITION & DIETETICS (Practical)

(50 Marks) Credit 4 Hours 60

Group A (25 marks)

COMMUNITY NUTRITION

1.Introduction to community nutrition.

2.BMI, Ponderal Index,Broka's Index

3.Assessment of Nutritional Status

4.School Children-Health Assessment

5. Conicity Index

6. Calculation of body frame size

Group B (25 marks)

DIETETICS

1.Planning of menus by using exchange list

2.Calculation of ACU for the family- Importance & drawbacks

3. Calculation of REE during different disease conditions-

a) Peptic ulcer
b) Febrile condition
c) Diabetes

4. Calculation of TPN

5. Framingham checklist for determining CHD risk in men & women

6. Diet for weight management

SEMESTER IV

PAPER FNTM 4.1Human Resource and Institutional Management Credit 4 Hours 60

Unit A: Understanding catering operations:

1. **A) Introduction to the Catering Industry**
   - **a)** History and the present status
   - **b)** Types of catering
   - **c)** Types of catering establishment
1. **B) Menu**
   - **a)** Importance of menu
   - **b)** Types of menu
   - **c)** Factors affecting menu planning
   - **d)** Menu management
1. **C) Basic understanding of Catering Operation**
   - a) Food production and food service basics
   - b) Types of service
   - c) Catering cycle and material management
   - d) Fuels
   - e) Food commodities – basic idea
1. **D) Cost control**
   - a) Understanding food cost
   - b) Factors affecting cost
   - c) Budgetary aspects and cost control in catering operations
   - d) Framing a budget
   - e) Basics of accounting

Unit B: Design Infrastructure and Hygiene

2.A) Design and lay out of Catering Premises

a) Infrastructure – Hospital kitchen, hostel kitchen and other intuitional kichen

b) Layout of kitchen and the restaurant (commercial and noncommercial)

2.B) Equipments

a) Importance of selecting the correct equipment.
b) Selection criteria of equipment.
c) Different modes of classification of equipment.
d) Equipment maintenance procedure.
e) Safety in handling equipment.
f) Emphasis on details of some equipment of bulk cooking

Hygiene

a) Importance of hygiene for food handlers.
b) Cost of poor hygiene
c) Food contamination and its classification
-Bacterial and nonbacterial infection

-Chemicals (agricultural , chemical, rodentiside, hormones)
- Metals
-Miscellaneous – Nuclear contamination

d) Prevention of contamination in catering operation
e) HACCP

UNIT C: 15 MARKS

Managing Human Resource

Understanding the importance of Human Resource Management (HRM)
Various procedures involved in HRM.

a) Recruitment- selection process
b) Hiring
c) Orientation-on the job performance
d) Performance appraisal
e) Career growth
f) Grievance Redressal and disciplinary action
g) Employee motivation and morale
h) Motivation theories
i) Employee benefits and perquisites
j) TNA, Training and development
k) Industrial relationship
l) Laws pertaining HRM

PAPER FNTM 4.2 Public Health Epidemiology Credit 4 Hours 60

Group A (10 marks)

1. Basic concept of health- Definition, Dimension & Determination of Health. Spectrum of health.
2. Epidemiology: Definition, aims and tools of measurement (rate etc.)
   Descriptive Epidemiology: time, plan- person, concept of epidemic and epidemic curve.
   Analytical Epidemiology: (case control, cohort studies)
   Experimental Epidemiology: (clinical, community based trials)
3. Natural health disease level of prevention . health indicator special reference to nutritional indicator, vital statistics, morbidity, mortality Epidemiological triad, Iceberg phenomenon of disease. Source of health & nutritional information- Primary & secondary data, demography

Group B (10 marks)

4. Causation of disease -communicable and non communicable diseases:

a) Infectious disease epidemiology-concept, special reference to food and water borne disease.
b) Noncommunicable disease- Epidemiology, role of nutrition

5. Overview of Food and water borne disease-epidemiology, prevention & control. Nutritional waste management.

Group C (10 marks)

6. Quantitative Research Methods (observation, PGD, IDI)
7. Evaluation of national nutritional programme (ICDS, Vitamin A, IDD, Anaemia, Mid day meal etc.

PAPER 4.3a Clinical nutrition (special paper) Credit 4 Hours 60

Incidence, aetiology, pathology, clinical manifestations, complications and nutritional management of the following:

Group A (10 marks)

1. Burn & Trauma
2. AIDS
3. Inborn error of metabolism (PKU, Lactose intolerance, Maple Syrup disease, Galactosomia, Albinism, Alkaptonuria)
4. Cancer

Group B (10 marks)

1. Upper GI tract disorder
2. Liver cirrhosis and transplantation, Hepatic Encephalopathy
3. Surgery

Group C (10 marks)

1. Renal disorder: Kidney function test, Glomerulo nephritis, nephritic syndrome, Acute & Chronic renal failure, Renal calculi, Dialysis
2. Role of diet in communicable disease: Dengue fever, Mumps and Measles.
3. Role of diet in endocrine disorder: PCOD, Thyroid malfunction.

PAPER 4.3b (Food Safety Spl. Paper) Credit 4 Hours 60

Group A (10 marks)

1. Food allergy: Definition, Hypersensitivity, Mechanism reaction
2. Food Laws, Agencies- ISI, AGMARK, BIS, PFA, MMFPO etc.
3. Food Additives: Food Colours, flavours, emulsifiers, flour improver, stabilizer etc.

Group B (10 marks)

4. Food Safety: FSSAI, Hazard Analysis and Critical Control Point (HACCP), Sanitation, GMP (Goods manufacturing practice)

5. Food Adulterants: Definition, types, common adulterants, health hazards of food adulteration, detection of common adulterants in foods.

6. Genetically modified crops, overview, techniques involved, advantages and disadvantages.

Group C (10 marks)

7. Techniques related to Food industry: Rheology & viscometry. Basic idea of Fermenter (Designing & its working)

8. Basic idea of downstream processing of food and waste.

9. Application of Nanotechnology in Food Industry.

PAPER 4.4 Credit:4

Dissertation **Total Hours: 60**

PAPER 4.5a Credit:4

Seminar & Journal club **Total Hours: 60**

PAPER 4.5b Credit:4

Grand Viva

B.Sc First Year

FOOD & NUTRITION (HONS)

(Paper I UNIT I)

HUMAN NUTRITION

1. Concept and definition of the terms "Nutrition", "Malnutrition" and "Health"
2. Brief history of nutrition science. Basic concept and definition of terms related to nutrition.
3. Minimum nutritional requirement and RDA. Formulation of RDA. Dietary guidelines. Reference Man and Reference Woman. Drawbacks of RDA.
4. Energy in human nutrition. Idea of energy and it unit. Energy balance. Deficiency and excess of energy. BMR. Factors influencing BMR. SDA.
5. Concept of Body composition. Body composition at different level. Brief idea about "Body composition and its change through life cycle".
6. Physiology of pregnancy. Nutritional requirement during pregnancy and modification of existing diet. Antenatal care and schedule. Deficiency of nutrient (energy, protein, iron, folic acid, calcium, iodine) and its impact on pregnancy. Non-nutritional factors affecting pregnancy outcome. Importance of adequate weight gain during pregnancy. Adolescent pregnancy. Common complications during pregnancy (nausea, vomiting, pica, hypertension, obesity, food aversions, diabetes etc).
7. Nutritional requirement during lactation. Dietary management. Hormonal control of lactation. Preparation for lactation. Breast feeding. Colostrum, its composition and its importance in feeding. Basic principles of breast feeding. Advantages and complications of breast feeding. Galactogogue.
8. Nutritional requirement during infancy. Advantages of exclusive breast feeding during infancy. Duration of breast feeding. Introduction to supplementary foods. Initiation and management of weaning. Preparation of formula. Bottle feeding. Mixed feeding. Artificial feeding. Circumstances

at which bottle feeding is to be given. Nutritional problems during infancy and practical approaches to combat the problem.

9. Concept of growth chart. Use of growth chart.
10. Nutritional requirement and management of preterm and low birth weight baby. Feeding problems LBW baby.
11. Nutritional requirement and management of toddlers, pre-school, school going children, adolescents. Common nutritional problems of pre-school, school going children, adolescents.

(Paper- I, Unit-II)

FOOD SCIENCE

1. **CARBOHYDRATES:** General Definition, Classification according to C- no, Saccharides- Definition as a special group of carbohydrates.

a) Monosaccharides (Glucose, Fructose, Galactose) Structure (anomers, epimers, Fischer Projection St., Ring St.) properties - oxidation, reduction, mutarotation,acylation,reaction with compounds like NH X(Osazone), Glucose to Fructose Conversion & vice versa, reducing properties of sugar

b) Disaccharides (Sucrose, Maltose, Lactose) Glycosidic linkage, Structure, Properties – inversion of sugar, reducing & non-reducing sugars.

c) Polysaccharides (Dextrin, Starch, Glycogen) 1,4 & 1,6-glycosidic linkage, monomers, structures of amylose & amylopectin, differences in structure of the polysaccharides, hydrolysis of polysaccharides (enzymatic & chemical) Sources of carbohydrates, daily requirements, function, hypo-& hyper-effects on human health, Digestion & absoption, blood glucose & effects of different carbohydrates on blood glucose, Glycemic index.

2. **PROTEINS:** General structure of amino acids, essential amino acids (structure), first & second class protein, Classification of proteins, Classification of amino

acids according to chemical nature, Polypeptides, primary & secondary structure of proteins, Zwitter ion, isoelectric point, chemical denaturation. Sources of proteins, daily requirements, function, hypo- & hyper-effects on human health, Digestion & absorption, assessment of protein quality (BV,PER,NPU).

3. **LIPIDS:** Definition, FFA, essential fatty acids, fatty acids & their importance, PUFA, MUFA, SFA, Properties - Iodine value, Saponification value, Acid value, hydrolysis, rancidity, hydrogenation. Sources of proteins, daily requirements, function, hypo- & hyper- effects on human health, Digestion & absorption.

4. **DIETARY FIBRE:** Classification, sources, composition, properties & nutritional significance.

5. **MINERALS & TRACE ELEMENTS:** Physiological role, requirement, source, deficiency and excess (calcium, phosphorus, iron-absorption and factors affecting iron absorption, fluoride, zinc, selenium, iodine, chromium)

6. **VITAMINS:** physiological role, requirement, sources, deficiency & excess.

7. **WATER:** Function, requirement, water balance, positive & negative water balance, water loss& gain, obligatory water loss, regulation of water balance.

(Paper II Unit I)

HUMAN PHYSIOLOGY

1. Introductory studies on structure and function of **cells**: Nucleus, cell membrane, mitochondria, golgi body, ribosome, lysosome, endoplasmic reticulum.
2. Introductory studies on structure and function of **tissues**: connective tissue, epithelial tissue.
3. **Blood** and its composition. Blood group, Rh factor. Blood clotting. Basic mechanism of blood clotting. Blood transfusion.
4. **Cardiovascular system**: Anatomical structure of heart. Brief idea about circulation. Cardiac cycle. Heart rate and factors affecting it. Cardiac output and factors affecting it. Blood pressure and factors affecting it.
5. **Gastro-intestinal system**: Anatomical structure and function of G I system.
6. **Reproductive system**: Anatomical structure and function of sex organs. Spermatogenesis. Oogenesis. Role of hormones. Menstrual cycle. Pregnancy. Parturition. Lactation. Menopause.
7. **Excretory system**: Structure and function of kidney. Brief idea about the role of kidney in homeostasis. Formation of urine. Normal and abnormal constituents of urine. Role of skin in regulation of body temperature.
8. **Respiratory system**: Brief idea about respiratory system. Different capacities and volumes. Mechanism of respiration. Transport of O_2 and CO_2 in blood. Acclimatization. Respiratory dead space.
9. **Nervous system**: Elementary idea about anatomy of Nervous system. Introductory idea about central nervous system, peripheral nervous system, autonomic nervous system. Regulation of hunger, thirst. Anatomical structure of eye.
10. **Musculo-skeletal system**: Anatomical structure and function of skeletal, smooth and cardiac muscle. Mechanism of muscle contraction. Histology of bone and teeth. Anatomical structure of teeth.

11. **Endocrine system**: brief idea and definition of endocrine secretion. Different glands and their secretions: Pituitary gland, thyroid gland, parathyroid gland, adrenal gland, pancreas, sex hormones. Excess and deficiency symptoms.

HUMAN PHYSIOLOGY PRACTICAL (Paper II Unit II)

- Measurement of blood pressure and pulse rate.
- Determination of Haemoglobin by Sahli's method.
- Preparation of blood film and identification of WBC.
- Determination of bleeding time and clotting time of blood.
- Blood grouping.
- Identification of prepared slides
  (a) Lungs. b) suprarenal gland, c) thyroid, d) pituitary, e) testis, f) ovary, g) kidney, h) liver, i) pancreas, j)small intestine k) large intestine, l) spinal cord, m) cerebellum.

Second Year

(PAPER III – UNIT I)

COMMUNITY NUTRITION

1. **Introduction to community nutrition**. Concept of community. Characteristics of community, Types of community. Different factors affecting health of the community (like social, cultural, economic, political and environmental factors).

2. **Direct nutritional assessment of human**: Nutritional anthropometry, Clinical signs, Biochemical and Biophysical methods.

3. **Nutritional Anthropometry**: its need and importance in brief. Parameters of nutritional anthropometry and techniques of measurement. Growth chart and its usage.

4. **Clinical Signs**: its need and importance in brief. Clinical signs of PEM, vitamin A deficiency, IDD, Anaemia.

5. **Diet Survey**: its need and importance in brief. Important factors for diet survey in brief (like trained personnel, sampling, method etc). Different methods for conducting diet survey. Concept of consumption unit. Adequacy of diet with respect to RDA. Food security.

6. **Malnutrition**: its sociological factors. Food production and availability, socio-economic factor, cultural influence, food consumption, population problem with respect to food production and availability, medical and educational services, psychological factor, emergency and disaster condition. Prevention of malnutrition.

7. Concept of **surveillance** : food and nutrition surveillance, need for surveillance, objectives of surveillance, indicators of nutritional surveillance, importance and use of surveillance

8. International, national, regional **Agencies and Organisations** : WHO, FAO, CARE,UNICEF, International Red Cross, NIN, ICMR, ICAR,CFTRI, FNB, NNMB, Indian Red Cross, CSWB, Nutrition Foundation of India.

9. **Nutritional intervention program** to combat malnutrition

10. **Nutrition Education**: (elementary idea) Reason for Nutrition Education, objectives.

(PAPER III UNIT II)

PUBLIC HEALTH & EPIDEMIOLOGY

1. **Health & its dimensions:-** definition of health, different dimension of health. Positive health versus absence of disease.
2. **Secondary sources of community health data:-** Sources of relevant vital statistics of infant Child & maternal mortality rate. Brief idea about of epidemiology of nutritionally related diseases (amoebiasis, hyperlipidaemia, clotting disorder, beriberi, rotaviruus infection).
3. **Public health & epidemiology:-** definitions, Components of epidemiology and aims, different tools & measurements of epidemiology. Brief idea about epidemics. Epidemiological methods: analytical epidemiology - case control & cohort study, epidemics and its types) vital statistics, epidemiological triad, demography and life expectancy.
4. **Communicable & infective disease control:** - definitions related to communicable diseases. Infection, contamination, decontamination, disinfection, transmission (direct & indirect) brief idea about different vector borne diseases- brief idea about AIDS, malaria, poliomyelitis, dengue, tuberculosis, MMR,

chicken pox, pertussis, chikungunya, epidemiological principles of disease prevention and control

5. **Immunization:-** Definition. Host defenses and immunity. Immunizing agents: its types. National immunization schedule- its importance. Immunization for adults & foreign travelers. Hazards of immunization. Health advice to the foreign travelers.
6. **Community water & waste management:** Importance of water to the community. Sources of water. Concept of water pollution. Purification of water in small & large scale. Drinking water handling & safe drinking water. Water borne diseases (diarrhea, dysentery, arsenic toxicity).

   Waste-Types and methods of disposal, sewage disposal and treatment, Treatment and disposal technologies of health care wastes.

7. **Community food protection**:- Epidemiology of food borne diseases. Mode of transmission. Prevention & control (Salmonellosis, Shigellosis, typhoid, botulism, Cholera, *E.coli* food poisoning, Staphylococcal food poisoning).

(PAPER IV UNIT I)

FOOD COMMODITIES

1. **Cereals & their products**: - Structure, nutritive value of cereals. Rice - composition, processing, Brief idea about different fermented rice products. Wheat: - composition, processing. Brief idea about different wheat products - millet like Jowar, Ragi, Bajra. Role of cereals in cookery. Gelatinization, Gluten formation. Breakfast cereal.

2. **Pulses**: - composition, nutritive value, processing (soaking, germination, fermentation). Toxic constituent present in pulses. Pulse cookery. Factors affecting cooking quality. Role of pulses in cookery.

3. **Milk and milk products**: - composition of milk. Nutritive value of milk. Physical properties of milk. Pasteurization of milk. Microbial spoilage of milk. Effect of enzyme, acid and heat on milk. Role of milk in cookery. Different fermented milk products like cheese, butter, curd. Brief idea about different non fermented milk products like ice cream, skimmed milk, toned milk, double toned milk, sweetened condensed milk, recombined milk etc.

4. **Egg:** - Structure, nutritive value, composition. Effect of heat on egg, and factors affecting coagulation of egg protein. Hard and soft egg. Egg foaming and factors affecting egg foaming. Preservation of egg, Role of egg in cookery.

5. **Meat, Fish, Poultry**:-classification of meat. Nutritive value of meat. Ageing, tenderization, artificial tenderization, curing of meat. Smoking of meat Fish:- composition, nutritive value, selection .spoilage of fish. Poultry:-processing, classification, composition.

6. **Vegetables and Fruits**:- classification of Vegetables. Nutritive value, composition of vegetables. vegetable cookery. Effect of cooking on pigments present in vegetables. Loss of nutrient during cooking. Prevention of loss of nutrient. Storage of Vegetables. Classification of Fruits. Nutritive value, composition of Fruits. Pigments present in fruit. Bitterness in fruit. Ripening of fruits: Browning reaction.

7. **Sugar and its products:** - Properties of sugar. Different sugar and their product. Crystallization of sugar. Factors affecting crystallization. Brief idea about different crystalline and non-crystalline candies. Caramelization. Role of sugar in cookery. Different natural and artificial sweeteners.

8. **Fats and Oils:**- Classification & Nutritive value of fats and Oils. Different fatty acids. Structure of fat. Composition of fat. Chemical properties. Analysis of fats & oils. Degradation of fat, factors affecting it & its prevention. Smoking temperature of fat.

9. **Food Preservation:**- Objectives of preservation in brief. Different methods of preservation. Basic idea of food spoilage. Preparation of preserved products like jam, jelly, squash, pickles etc.

10. **Food Additives:**- Brief idea about food additives.

11. **Leavening agent:**- Brief idea about different leavening agent like baking powder, egg etc.

12. **Food adulteration & Food Standards:**- Different food standards: BIS, Agmark, FPO, PFA, MPO etc. basic idea about food adulteration, quality. Factors responsible for food adulteration.

13. **Convenience Food:**- Basic idea, types, role of convenience food.

14. Spices:- Different spices, their composition, medicinal value & use. Basic idea about herbs.

15. Beverages:- Classification. Tea: nutritional aspect, classification, processing of tea, different types of tea. Coffee: composition, processing, nutritional aspect of coffee. Bitter substances present in coffee, different coffee products. Chocolate & cocoa: processing, composition & nutritional aspect. Alcoholic beverages: beer, rum, wine- their processing. Carbonated beverage.

(Paper – IV, Unit-II)

Community Nutrition (Practical)

Marks : 50

1. Anthropometric Measurement of infant- Length, Weight, Circumference, Chest, Med- upper arm circumference, precautions to be taken.
2. Comparison with norms and interpretation of the nutritional assessment date and its significance.
3. Weight for age, height for age, weight for height, Z scores body Mass Index (BMI), Waist-Hip Ratio (WHR).
4. Growth charts-plotting of growth charts, growth monitoring and promotion.
5. Clinical assessment and signs of nutrient deficiencies, Anaemia, Rickets, B-Complex deficiencies.
6. Estimation of food and nutrient intake- Household food consumption date, per consumption unit, 24 hours dietary recall, 24 hours record.
7. Weighment method, food diaries, food frequency data, use of each of the above, information available through each individual, collection of data, estimation of intakes.
8. Community field survey.

THIRD YEAR SYLLABUS

Paper V

Unit I:-Nutritional Biochemistry (50).

Unit II:-Food Microbiology (50).

Paper VI

Unit I:-Diet therapy I (50).

Unit II: - Diet therapy II (50).

Paper VII

Unit I:-Biochemistry Practical (50).

Unit II:-Food Preparation & Preservation Practical (50).

Paper VI II

Unit I:-Diet therapy Practical (35).

Unit II: - Microbiology Practical (30).

Unit III: - Project and seminar (35).

Paper V

Unit I:-**Nutritional Biochemistry (50)**

1. ENZYMES & COENZYMES:

ENZYMES: Definition & Classification, Kinetics (Gibbs free energy change, Reaction initiation energy), Michalies-Menten equation, Reciprocal plot & its significance, Vmax & Km, substrate specificity, enzyme inhibition (irreversible-Penicillin inhibition, reversible explained from Reciprocal plot, allotter-ribonucleotide reductase inhibition by nucleotides), isozymes-ex. LDH.

COENZYMES: Definition, Biochemical Functions of: NAD, NADP, FAD, CoA, Tetrahydrofolate, TPP. Names of the Vitamines present in those coenzymes, 8+2 = 10

2. CARBOHYDRATES: Glycolysis, Citric acid cycle, Electron transport chain (brief idea), glycogenesis, glycogenolysis, gluconeogenesis.HMP Shunt. 8+2 = 10

3. LIPID: Beta-Oxidation, (alpha and omega oxidation-definition only), Synthesis & utilization of ketone bodies, Ketosis, Causes of fatty liver. 6 ↳ Synthesis of FA.

4. PROTEIN: Tertiary & Quartinary structures of protein with Haemoglobin & Collagen as examples, Deamination & Transamination, amino acid metabolism. 8+2 = 10

5. NUCLEIC ACID : Structure of Purines & Pyrimidines, Nucleosides & Nucleotides, Formation of Nucleic Acid Chain from Nucleotides, Importance of Thymine in DNA structure, Types of RNA & their functions (in brief), Structure of t-RNA, Codons, Definition of Central Dogma(Replication, Transcription, Translation - elementary idea only) & Machineries needed in each step(only names of the enzymes and coenzymes). 6

6. VITAMINES: Structure & Biochemical roles, Deficiency disorders of Vitamin **A, D, E, K, B_1, B_2, B_6,** Folic acid, Pantothenic acid, Niacin & Vitamin C. 4

MINERALS: Biochemical functions of Na, K, Ca, P, I, Fe, Se - Disorders related to Hyperactivity & Deficiencies of those elements.

J. CELLULAR TRANSPORT: Preliminary idea about membrane permeability, Active & Passive transport, Facilitated transport, a brief idea about gated-channels & membrane-bound transport protein.

Paper V

Unit II: Microbiology (50)

1. **Microscope:** - Different parts of microscope and its functions.

2. **Cultivation of Bacteria**: - Nutritional requirements of microorganisms, types of growth media (selective, differential, enriched media-definition with example), Pure culture methods (streak plate, spread plate pour plate, slant culture), Anaerobic cultivation of bacteria.

3. **Growth of Bacteria**: - Definition, growth phase, direct and indirect measurement of growth, Factors affecting growth (pH, temp and oxygen).

4. **Stains and staining techniques**: - dye (Chromophore, auxochrome - definition with example). Classification of stains, principles of staining, simple staining, negative staining, differential staining (Gram staining and acid fast staining).

5. **Morphology of Bacteria**:- slime layer, capsule, cell wall, flagella, pili,fimbriae,cell membrane, ribosome,cytoplasmic inclusions(inorganic), endospore (structure, formation and germination)..

6. **Control of microbes**:-Sterilization, Disinfection, Antiseptics, detergents, Methods of sterilization-Physical (heat, low temp, radiation, filtration). Chemical (alcohol, phenol, halogen, heavy metals, formaldehyde).

7. **Food Microbiology**:-milk as a growth medium of bacteria, normal microflora in milk, undesirable microbes in milk, Pasteurisation, phosphatase test, Methylene blue reduction test.

Normal microflora of vegetables & fruits, meat, fish, egg, canned food, cereal &cereal products, enumeration of microbes present in food & milk. Outline of methods for detection of microorganisms in drinking water (presumptive, confirmatory and completed test).distinction between faecal and non faecal coliforms-IMVic test.

Extrinsic & intrinsic parameters affecting growth & survival of microbes.

8. **Food borne diseases**: - Food borne infection & intoxication. Different food borne diseases like Shigellosis, salmonellosis, *Clostridium Perfringens* food poisoning, Typhoid, *E.Coli* food poisoning, *Bacillus cereus* food poisoning-causative agent, symptoms, pathogenicity & preservation.

Paper VI

Unit I : DIET THERAPY I (50)

1. **Basic concept of diet therapy:** - different definitions related to diet therapy.

2. **Routine Hospital Diet:-**Modification of normal diet into therapeutic diet. Purpose of diet therapy. Different modifications.

3. **Diet with Energy Modification: -** Energy modification & nutritional care for weight management, identifying the overweight obese, aetiological factors contributing obesity, prevention & treatment of obesity. Low energy diet & balanced energy reduction. Underweight - aetiology, an assessment, high energy diets for weight gain.

4. **DIET FOR FEBRILE CONDITION**:-
   - Different causes of fever.
   - Metabolic changes during fever (elementary idea).
   - General dietary consideration.

   Causes, clinical features, treatment& dietary management of-
   - o Short time fever(influenza)
   - o Chronic fever (tuberculosis).
   - o Intermittent fever (Malaria).

5. **DIET DURING SURGERY:-**
   - General introduction
   - Pre & post operative diet (brief idea).
   - Dietary management.

6. **DISEASES OF LIVER:-**

- General introduction
- Symptoms of liver diseases.
- Reasons of liver diseases.
- Basic idea of liver function tests.
- Causes, clinical features, treatment& dietary management of-
    - Infective hepatitis & jaundice.
    - Cirrhosis of liver.
    - Hepatic coma.
    - Infantile billiary cirrhosis.

7. **GALL STONE DISEASE:-**
    - General introduction
    - Type of stones.
    - Dietary management.
8. **PEPTIC ULCER:-**
    - General introduction of peptic ulcer disease.
    - Causes of peptic ulcer disease.
    - Mechanism of ulcer formation.
    - Symptoms of peptic ulcer disease.
    - Treatment & dietary management.

9. **INTESTINAL DISORDERS:-**
    - General introduction and dietary management of different intestinal disorders-

- **Constipation**:-causes, complication, type (in brief), Dietary management.
- **Flatulence:**-causes, treatment, dietary management.
- **Diarrhoea:**-causes, physiological disturbance in the body during Diarrhoea.

  Different types of Diarrhoea, Symptoms, Complication. Prevention & treatment.ORS.
- **Steatorrhoea:** - causes, treatment, dietary management.

- **Ulcerative colitis**-causes, symptoms, treatment & dietary management.
- **Irritable bowel syndrome**: - causes, symptoms, dietary management.

Paper VI Unit II: DIET THERAPY II (50)

1. CARDIO VASCULAR DISEASES:-

- General information & brief idea.
- Causes or factors of CHD in brief.
- Dietary management.

Causes, symptoms in brief& dietary management of the following:

Atherosclerosis, hypertension, hypercholesterolemia, IHD, Congestive cardiac failure.

2. RENAL DISEASES:-

- General introduction.

Causes, symptoms in brief & dietary management of the following:

- Type I or Glomerulonephritis.
- Type II or Nephrotic Syndrome.
- Acute & chronic renal failure.
- Renal calculi.

3. DIABETES MELLITUS:-

- General introduction & classification.
- Factors responsible for diabetes.
- Role of hormones.
- Characteristics of type I &type II diabetes
- Treatment & dietary management of diabetes.
- Complications associated with it.

4. FOOD ALLERGY:-

- Introduction & definition related to food allergy.
- Predisposing factors of food allergy.
- Reasons for allergy.
- Classification of allergy.
- Allergic reaction (elementary idea).
- Symptoms of allergy.
- Role of food as allergen.
- Treatment & dietary management of food allergy; with elimination diet.

Paper VII

Unit I & II, (F M 100)

PAPER VII UNIT I BIOCHEMISTRY PRACTICAL (50)

GROUP A:-QUALITATIVE ESTIMATION

1. Qualitative estimation of Carbohydrate(Mono,di and poly saccharides) Glucose, Fructose, Sucrose, Lactose, Starch, Dextrin.
2. Colour reactions of Protein.
3. Qualitative estimation of Fat.

Solubility test, Unsaturation test, Saponification test, Test with soap & acrolin layer.

4. Chromatographic separation of Amino Acids from mixture of amino acids & determination of Rf value.

GROUP B:-QUANTITATIVE ESTIMATION

1. Standard curve of Protein by Biuret method using BSA.
2. Standard curve of Protein by Folin Phenol method using BSA.
3. Estimation of unknown Protein from egg or serum protein.
4. Standard curve of PNP
5. Preparation of Buffer.
6. Quantitative estimation serum acid phosphatase.
7. Quantitative estimation serum alkaline phosphatase.
8. Quantitative estimation of vitamin C in lemon juice.
9. Quantitative estimation of glucose using fehling solution.
10. Determination of acid value of fat.

PAPER VII

UNIT II:- FOOD PRESERVATION AND PREPARATION (50)

1. Introduction to food preservation and different methods of food preservation. Purpose of food preservation.
2. Use of natural and chemical preservatives in preparation of different preserved products: Jam, Jelly, Squash, Pickles, Murabba etc.
3. Use of sun drying for preservation of food.
4. Preparation of fermented food product.
5. Visit:- Milk industry visit
   Food testing lab visit.

Paper VIII

Unit I, II, III (F M 100)

Paper VIII: Unit I:-Diet therapy Practical(35)

1. Introduction to therapeutic nutrition, its objectives. Different modification techniques (demonstration).
2. Planning and preparation of normal diet.
3. Planning and preparation of clear fluid and full fluid diet.
4. Planning and preparation of soft diet.
5. Planning and preparation of diets for the following condition
   - o Jaundice.
   - o Peptic Ulcer
   - o Diabetes.
   - o Fever.
   - o CHD.
   - o Gout.
   - o Renal Failure(acute or chronic).
   - o Obesity.

Paper VIII Unit II: - Microbiology Practical (30)

1. Basic idea of process of sterilization.
2. Preparation of Nutrient agar media.
3. Inoculation of one gram positive and one gram negative bacteria
4. Gram Staining.

Paper VIII Unit III: - Project and seminar(35)

1. Review and project work.
2. Seminar presentation.

West Bengal State University

Revised Curriculum for Philosophy
Three Years B.A. Honours and General Course
Recommended in the BOS (UG) Meeting on 11.04.2012
w.e.f. 2012-13

It is notified for information that the Vice-Chancellor has been pleased to approve the revised Curriculum of three Years B.A. Honours and General Course in Philosophy, under 1+1+1 system of examination under this University .This revised Curriculum for Philosophy will effect from 2012-13 academic session.

Dated the 17th April, 2012

Dr. Sabita Samanta
Chairperson
U.G Board of Studies

Content: Page no.

PART-I

Honours Papers

Candidates are required to answer
i) Ten objective-type questions covering the entire syllabus of this paper, within two sentences each, carrying two marks each.
ii) Four short-answer type questions covering the entire syllabus of this paper, within one fifty words each, carrying five marks each.
iii) Four broad-answer type questions covering the entire syllabus of this paper, within six hundred words each, carrying fifteen marks each.
Full Marks=100
2x10= 20
5x4=20
15x4=60

PAPER-I
History of Indian Philosophy

The Basic Philosophical Concepts of the Vedas and *Upanis□ad*s:
The concept of the *R□ta*, *R□n□a*, the concept of *Ātman*, *Brahman□* in the *Upanis□ad*s, *Jīva*, *Śreya, Preya, Moks□a* (in brief).

Cārvāka System:
Epistemology- Perception as the only source of knowledge, Refutation of Inference .Metaphysics–Causality -*yadricchavāda / svabhavavāda* / *akasmikatāvāda*, *Jagat* and *Bhutacaitanyavāda*.

Jaina System :
Anekāntavāda and *Syādvāda*.

Bauddha System:
Four noble truths, *Pratityasamutpādavāda*, *Ks□n□abhangavāda* or Momentariness, *Nairātmavāda*, Basic tenets of four *Bauddha* schools- *Vaibhāsika* and *Sautrāntika* (in brief), *Yogācāra* and *Madhyamika* (in details).

Nyāya System:
Four *Pramāna-s: Pratyaks□a*- definition, classification into *savikalpaka nirvikalpaka* and *pratyabhijñā* and *laukika* and *alaukika*.
Ānumāna: definition, *paks□a, sādhya, hetu, vyāpti, vyāptigrahopaya, svartha-pararthānumāna*.
Outlines of *Upamāna* and *Śabda*. Nature of self and liberation, Arguments for the existence of God.

Vaiśesika System :

The Basic Outlines of *Dravya, Gun□a, Karma* and detailed analysis of *Sāmānya, Viśes□a, Samavāya* and *Abhāva, Paramān□uvāda* (in brief).

Sāmkya System:
Satkāryavāda as opposed to *Asatkāryavāda*, *Prakriti* and its constituents, Arguments for its existence, Theory of Evolution, *Purus□a*, Arguments for its existence, Plurality of *Purus□a*.

Yoga System :
Citta, Cittavrtti, Cittabhumi, As□tāngayoga and Concept of God.

Mīmāmsā System:
Pramān□a-s with special reference to *Arthāpatti* and *Anupalabdhi* (*Prābhakara* and *Bhatta's* view).

Advaita Vedānta Philosophy of Sankara :
Brahman□, *Jīva*, *Māyā*, The Relation of *Brahman□* with *Jīva* and *Jagat* , Three grades of *Sattā*.

Visistadvaitavada of Ramanuja :
Brahman□, Relation of *Brahman□* with *Jīva* and *Jagat*, Criticism of Sankara's doctrine of *Māyā*.

TEXT BOOKS

Hiriyana, Outlines of Indian Philosophy.
Dipak Kumar Bagchi**,** Bharatiya Darsan.

Suggested Readings:

C.D. Sharma, A Critical Survey of Indian Philosophy.
D.M. Dutta**,** Six Ways of Knowing.
D.M.Dutta and Chatterjee, An Introduction to Indian Philosophy.
Debabrata Sen, Bharatiya Darsan.
Debiprasad Chattopadhyaya, Lokayata Darsan.
Dinesh Chandra Bhattacharya Shastri, Sadadarsana:Yoga
J.N. Mohanty, Classical Indian Philosophy.
Kanak Prabha Bandyopadhyaya, Sankhya Patanjali Darsana
Karuna Bhattacharya**,** Nyaya Vaisesika Darsan.
Panchanan Shastri, Carvaka Darsan.
Prodyot Kumar Mondal**,** Bharatiya Darsan.
Roma Choudhury, Vedanta Darsan.
S.C. Chatterjee, Nyaya Theory of Knowledge.
S.N. Dasgupta, History of Indian Philosophy.
S.Radhakrishnan, Indian Philosophy. (Vol I and II)
Sadananda Bhaduri**,** Nyaya-Vaisesika Metaphysics.
Samarendra Bhattacharya, Bharatiya Darsan.
Sukhamoy Bhattacharya, Purvamimamsa Darsan.
Sukomal Choudhury, Goutam Buddher Dharma Darsan.
T. R.V. Murti, Central Philosophy of Buddhism.
Aditya Kumar Mohanty, Concepts and issues in Indian Philosophy(Utkal Studies in Philosophy)
S.K.Moitra, Fundamental questions of Indian Metaphysics and Logic
Anil Kumar Roychouri, Doctrine of Maya

PAPER -II

Psychology and Social Political philosophy

Group A

Psychology

Definition and Methods of Psychology:
Subjective, Objective and experimental.

Sensation and Perception:
Definition, nature, classification and attributes of sensation, Nature of perception and its relation with sensation, Gestalt theory of perception, Illusion and Hallucination.

Memory:
Information-Processing Theory (Atkinson and Shiffrin's theory), Forgetting: Its types and causes.

Learning:
Theories of Learning – Gestalt Theory or Insight Theory, Classical Conditioning Theory (Pavlov's Theory), Operant Conditioning Theory (Skinner's Theory).

Intelligence:
Nature of Intelligence, Unifocal Theory, Multifocal Theory, Measurement of Intelligence, Binet-Simon test, and Weschler.

Consciousness:
Levels of consciousness, Conscious, Sub-conscious and unconscious, Proof for unconscious and Freud's Theory of dreams.

GROUP – B

Social and Political Philosophy

Definition:
Social Philosophy and Political Philosophy and their interrelation.

Some Basic Concepts:
Society, Community, Association, Institution, Caste and Class.

Social Change:
The Marxist View and the Gandhian View.

Social Ideals:
Plato's Theory of Justice and Rawl's Theory of Justice.

Concept of Political Philosophy:
Scientific theory and Philosophical theory.

Political Ideals:
Democracy and its different forms, Socialism and its varieties, Sarvodaya , Gandhiji's concept of Non-violence and Trusteeship.

Family:
New Vision and Challenges – Marxist and Feminist approaches.

Recomended Books:

Morgan, King and others, Introduction to Psychology
Paresnath Bhattacharya, Monovidya
Pritibhusan Chattopadhyaya, Monovidya
Nihar Ranjan Sarkar, Monovijnan o Jiban (Jnankosh Prakasani,Dhaka)
MacIver and Page, Society
Pritibhusan Chattopadhyaya, Samaj Darsana Dipika
Frederick Engels, Origin of the Family, Private Property and the State
Frederick Engels, Parivar, Byaktigata Malikana O Rashtrer Utpatti (Bengali Translation)
Shefali Moitra, Naitikata O Naribad
August Babel, Women in the Past, Present and Future
August Babel, Nari: Atit, Bartaman Bhabishyat (Bengali Translation By Kanak Mukhopadhyaya)
Satyabrata Chakroborty, Bharater Rashtra Bhaban.

Further Readings:

Ira Sengupta, Manovidya
Amal Kr Mukhopadyaya, (translated by Arun Kr. Roy Choudhury) Pascatya Rastra cintar Dhara- Plato theke Marx.
Madhabendra Mitra & Pushpa Misra, Manasamikhsa
V I Lenin, The State: An Essay
Parimal Bhusan Kar, Samaj Tatva
Sudarshan Ray Chaudhury, Rashtra
Frederick Engels, Principles of Communism
Frederick Engels, Communism-er Mul Niti
Gurudas Bandhyopadhyay, Sarvodaya Andoloner Itihaas
Humayun Azad, Dvitiyo Lingo
Susan Moller Okin, Justice, Gender and the Family

PART -II

Candidates are required to answer five short-answer type questions covering the entire syllabus of this paper within one fifty words each, carrying five marks each. And they have to answer five broad questions covering the entire syllabus of this paper within six hundred words each, carrying fifteen marks each.
Full Marks=100
5x5=25
15x5=75

Paper III
History of Western Philosophy

Plato and Aristotle:
Theory of knowledge (episteme) and Opinion (doxa) and its refutation by Aristotle, Plato's theory of idea.

Descartes:
Method of Doubt, *Cogito* Principle, Different types of Ideas, Criterion of Truth, God and the External world.

Spinoza:
Substance, attributes and modes, existence of God, Pantheism, Theory of Knowledge.

Leibnitz:
Monad, Truths of Reason, Truth of Fact, Pre-established Harmony, Innate Idea.

Locke:
Ideas and their classification, Refutation of Innate Ideas, Substance, Locke's realism and theory of knowledge, Degrees of knowledge, Primary and Secondary qualities.

Berkeley:
Rejection of Abstract Ideas, Rejection of the distinction between Primary and Secondary qualities, Esse est percipi; Place of God.

Hume:
Impression and Ideas; Association of Ideas; Judgement Concerning relations of Ideas and matters of fact, Causality, Scepticism.

Kant:
Conception of critical Philosophy, Copernican Revolution, distinction between apriori and aposteriori, distinction between analytic-synthetic judgement, possibility of synthetic-apriori judgement, space and time as apriori intuitions

Text Books:

F. Copleston, A History of Philosophy, vols. IV. V. VI. VII.

Suggested Readings :

P. Edwards, Encyclopedia of Philosophy.
B. Russell, History of Western Philosophy.
R. Falckenberg, History of Modern Philosophy.
F. Thilly, A History of Philosophy.
W. K. Wright, History of Modern Philosophy.
Bernard Williams, Descartes.
S. Hampshire, Spinoza.
J. Locke, An Essay Concerning Human Understanding.
Locke, Berkeley and Hume, C. R. Morris
G. Pitcher, Berkeley.
N. Reacher, Leibniz: An Introduction to his Philosophy.
T. E. Jessop and A. R. Luce (ed.), The Works of George Berkeley.
D. M. Dutta, Chief Currents of Contemporary Philosophy.
David Hume, An Enquiry Concerning Human Understanding.
D. Hume, A Treatise of Human Nature.
Immanuel Kant, N. K. Smith (tr. and ed), Critique of Pure Reason.
H. J. Paton, Kant's Metaphysics of Experience.
Rasvihari Das, A Handbook of Kant's Critique of Pure Reason.
D. J. O. Conner, A Critical History of Western Philosophy.
R. Scrution, A History of Philosophy from Descartes to Wittgenstein.
N. B. Chakraborty, Paschatya Darsaner Itihas (Locke, Berkeley, Hume).
Chandrodaya Bhattacharya (Part- I & II), Paschatya Darsaner Itihas.
Ramaprasad Das, Hume-er enquiry.
Rasvihari Das, Kant-er Darsan.

PAPER-IV

Western Logic

Question 1 is compulsory. Candidates have to answer 5 objective type questions (each carrying two marks) covering the entire syllabus of this paper. Candidates are required to answer any six questions taking two from group A, B, and C.

Full Marks: 100
For Group A,B &C: 15x6
For Group D :2x5

Group – A

Propositional Logic

Truth functions and truth functional connectives:
Symbols for Negation, Conjunction, Disjunction, Conditional Statements and Material Implication and Material Equivalence.
Argument Forms and Arguments.

Validity Testing by Truth Table Method and Truth-value assignment method.

Statement Forms and Statement.
Tautologous, Contradictory and Contingent Statement forms by Truth Table Method and Truth Tree Method.

Consistency by Truth Tree Method.

Method of Deduction:
Construction of Formal Proof of Validity by using Nineteen rules.
Proof of invalidity by assignment of Truth Values.

Proof by I.P. and C.P.
Logical Truths using I.P. and C.P.

Group – B

Logic of Quantification and Multiple-General Quantification

Boolean interpretation of Categorical propositions:
Review of the traditional laws of logic concerning immediate inference and syllogism. Venn Diagram technique for testing syllogisms.

Quantification Theory :
Need for Quantification Theory , Singular Propositions , Quantification. Translating traditional subject - Predicate Proposition into the logical notation of Propositional Function and Quantifier. Quantification rules and Proving Validity, Proving invalidity for arguments involving Quantifiers and Multiple General Propositions.

Group – C

Induction and Probability

Introduction to Induction:
Causal Connections: Cause and effect, Meaning of Cause: Mill's Method of Experimental Enquiry: Method of Agreement; Method of Difference; Joint Method of Agreement and Difference; Method of

Residues; Method of Concomitant Variation; Criticism of Mill's Method and Vindication of Mill's Method.

Probability:

Alternative Conceptions of Probability; the Probability Calculus; Joint Occurrences and Alternative Occurrences.

Science and Hypothesis:

Explanations- Scientific and Unscientific, Evaluating scientific explanations, the Detective as Scientist, the problem, preliminary hypothesis, collecting additional facts, formulating the hypothesis, deducing further consequences, testing the consequences, the application, the pattern of scientific investigation, crucial experiments and *ad hoc* hypothesis.

Text

I. M. Copi, Introduction to Logic.
I. M. Copi, Symbolic Logic
Jeffery, Formal Logic
Mill, A *System* of Logic

Suggested Readings

Ramaprasad Das, *Sanketik Yukti Vijnana*
Ramaprasad Das and Subir Ranjan Bhattacharya, *Samsad Yuktivijnana Abhidhan*
Samir Chakroborty*, Yukti Vijnaner Bhumika*
Sukla Chakroborty, *Tarka Vijnana*

PART -III

Paper – V

Indian Epistemology and Logic

It is a text-oriented paper and the recommended text is *Tarkasamgraha* with *Dipika* by Annambhatta (Selected portions)
Candidates are required to answer five short-answer type questions covering the entire syllabus of this paper within one fifty words each, carrying five marks each. And they have to answer five broad questions covering the entire syllabus of this paper within six hundred words each, carrying fifteen marks each.
Full Marks=100
5x5=25
15x5=75
.

Buddhi or Jnana :
Definition and classification .

Smriti :
Definition and classification of smriti into yathartha and ayathartha .

Anubhava:
Definition and its classification into yathartha and ayathartha .

Definition:
Yathartha anubhava or prama and ayathartha anubhava or aprama, Classification of ayathartha anubhava.

Definition:
Karana and kārana and kārya , kinds of kārana, concept of anyathasiddhi and its varieties.

Pratyaksa:
Definition and its two fold division: Nirvikalpaka and Savikalpaka pratyaksa, proof for the existence of Nirvikalpaka, Sannikarsa and its varieties - Laukika and Alaukika sannikarsa, problem of transmission of sound, solution of the problem of anupalabdhi as a distinct pramana .

Anumana:
Definition of anumiti , paramarsa , paksata, vyapti and vyaptigraha, svarthānumiti and pararāthanumiti, Analysis of Pancavayava Nyaya add classification of Linga or hetu, classification of paksa , sapaksa and vipaksa, marks of saddhetu, hetvabhasa : Definition and classification Two types of definition . Five kinds of hetvabhasa : Svavyabhicara and and its three kinds defined and illustrated, Viruddha - definition and illustration, Satpratipaksa - defined and illustrated, three kinds of Asiddhi - asrayasiddhi , svarupasiddhi and vyapatasiddhi . (Upadhi and its four kinds excluded).

Upamana:
Definition and illustration.

Sabda:
As a Pramana defined and analyzed, Sakti - as lsvara sanketa and as pada - padartha sambandha, How sakti can be known? Analysis of laksana - its three varieties. Gounivrtti , and Vyanjanavrtti, Conditions of sabdabodha, Two kinds of vakya - Vaidika and Laukika.

Suggested Readings

Anamika Roy Chaudhory - *Tarkasamgraha* with *Dipika*.
Dipak Kumar Bagchi - *Tarkasamgraha* O Dipika.
Kanailal Podder - *Tarkasamgraha* with *Dipika*.
Narayan Chandra Goswami - *Tarkasamgraha* with *Dipika*.
Gopinath Bhattacharya - *Tarkasamgraha* with *Dipika*.

PAPER-VI

Ethics and Philosophy of Religion

Candidates will have to answer question 1 and any six carrying 15 marks each (within 600 words) from the rest taking two from group A, B, and C. Question 1 will consist of six short questions covering the entire syllabus of this paper, each carrying 5 marks out of which candidates have to answer any two questions (within 150 words).

Group - A

Indian Ethics

Introduction:
Special features of Indian Ethics as opposed to western Ethics, Concept of Sthitaprajna, and Karma yoga - (From Srimad Bhagavat Gita 2nd and 3rd Adhyaya)

Purusartha-
Concept of the four purusartha-s and their interrelations.

Dharma:
Meaning of Dharma (Mimamsa and Nyaya view only), Sadharandharma and Visesa dharma (with special reference to Varna-asrama dharma and Svadharma).

Duties:
Pancasila, Brahmavihara , Anubrata , Mahabrata and ahimsa (Baudha and Jaina view only).

Group - B

Western Ethics

Nature of ethics and Ethical Problems:
Morality and Moral Problems, Moral-actions, Object of Moral judgment.
Theories of Morality:
Naturalism, Emotivism (Ayers' view only) , Prescriptivism . (Brief conception only)

Standards of Morality:
Hedonism: Ethical, Psychological. Utilitarianism: Act Utilitarianism and Rule utilitarianism, Deontological theory: Distinction between Act and Rule, Deontological theories: Kant's Moral theory.

Group - C

Philosophy of Religion

Origin of Religion:
Different theories (A) Anthropological and (B) Psychological, Nature and scope of Philosophy of Religion, Magic and Religion, Sacred and Profane.

Proof for the existence of God:
Ontological, Cosmological, Teleological and Moral arguments.

Grounds for disbelief in God:
Sociological theory and Freudian theory.

Comparative Religion:
Meaning and Scope (in brief).
Some Religions:
Hinduism, Islam and Christianity.(in brief)

Suggested Readings

S. K. Moitra - The Ethics of the Hindus
S. C. Chatterjee - Fundamentals of Hinduism
W. Frankena - Ethics
W. Lillie - An Introduction to Ethics
John H. Hick - Philosophy of Religion
P. K. Mahapatra (ed.) Studies on the Purusarthas
Surama Dasgupta - Development of Moral Philosophies in India
J. N. Sinha - History of Indian Philosophy (vol. I)
Samarendra Bhattacharya- Nitividya

Somnath Chakraborty- Nitividya
Rabindranath Das - Dharmadarsan
Madhusudan Saraswati - Bhagavatgita (Bengali)
Atul Chandra Sen - Bhagavatgita (Bengali)
Amita Chatterjee (ed.) - Bharatiya Dharmaniti (Selected Portions)
Dikshit Gupta - Nitishastra
Dilip Kumar Mohanta - Dharmadarsaner Katipaya Samasya.
Pritibhusan Chatterjee- Studies in Comparative Religion
Shekh Abdul Wahab- Binsha Satabdir Nitidarsan
Fred Feldman – Introductory Ethics
Beauchamb – Philosophical Ehics
Mial Edwards- Philosophy of Religion
Rahul Sankrityayana, Darsan-Dikdarsana
Nikhilesh Bandopadhyaya, Dharmadarsana

PAPER-VII

Western Metaphysics and Epistemology

Question 1 is compulsory. The candidates are required to answer 5(five) short-answer type questions within 150(one hundred fifty) words covering the entire syllabus of this paper and 5(five) broad questions carrying fifteen marks each (within 600 words) taking at least two from each group.

Full Marks=100
5x5=25
15x5=75

Group- A

Analytical Philosophy

Recommended Text: John Hospers, An Introduction to Philosophical Analysis

Meaning and Definition: Word-meaning, Definitions, Vagueness, and Sentence-meaning.
Knowledge: Concept, Truth, The Nature of Knowledge, and the Sources of Knowledge.
Our Knowledge of the Physical World: Realism, Idealism, and Phenomenalism.

Group – B

Problems of Philosophy

Recommended Text: Bertrand Russell – The Problems of Philosophy

Appearance and Reality
Knowledge by Acquaintance and Knowledge by Description

On Induction
The World of Universals
The Value of Philosophy

Suggested Readings

The Problem of Knowledge: A. J. Ayer
Language, Truth and Logic: A. J. Ayer
Readings in Philosophical Analysis: J. Hospers
The Central Questions of Philosophy: A. J. Ayer
Theory of Knowledge: A. J. Woozley
Darsanik Bishleshaner Ruprekha: Samarikanta Samanta .
Darsanik Bishleshaner Bhumika: Samarendra Bhattacharyya
Darsanik Jignasa (Bagarthatattva): Rama Prasad Das.
Darsanik Jignasa (Jnanatattva -2): Rama Prasad Das.
Darsanik Jignasa (Jnanatattva - 3) : Rama Prasad Das .
Paratattva O Bhanta Jagater Jnana: Rama Prasad Das.
Darsanik Bishleshaner Ruprekha: Rama Prasad Das and Shibapada Chakraborty.
Darsanik Bishleshaner Bhumika: Dikshit Gupta.
Sushil Chakraborti, Darshan Samashya
Debika Saha, Darshan Samashya
Samarendra Bhattacharyya, , Darshan Samashya

PAPER-VIII

Philosophical Classics

This Paper will consist of two groups, Group A and Group B each consisting of 50 marks. Group A consists of some classical texts out of which students will have to choose any one. Group B is allotted for Essay Paper .

Group A

(Anyone from the following groups)

1. **Sadananda Yogindra : Vedantasāra**

2. **Ryle -The Concept of Mind**
   Chapters Descartes' Myth
   Knowing How And Knowing That
   The Will
   Disposition and Occurrences
   Self Knowledge.

3. Logic

Group- I

Set Theory – Chapters 9, 10 and 11.
Introduction, Membership, Inclusion, the Empty Set, Operations on Sets, Intersection, Union and Difference, Domain Of Individuals, Translating sentences of everyday language into Set Notation, Venn diagram, Definition of Relations, Properties of Binary Relations, Definition of Functions and Operations on Functions.

Group-II

Truth-Tree for Quantification
Entailment –By P.K.Sen.

Suggested Reading:
R. Jeffery- Formal Logic - Its Scope And Limits (first ed)
P. Suppes – Introduction to Logic
P.K.Sen (ed.) Jadavpur Studies Vol. II

4. Practical Vedanta - Vivekananda
Topics : Man, Universal Religion, PracticalVedanta

Suggested Reading:
Vivekananda- Practical Vedanta

5. The Manifesto of the Communist Party – Karl Marx And Frederick Engels.

Suggested Readings:
Marx and Engels, Communist Manifesto, with notes By D. Riyazanov, edited by V.G.Kiernan. (Bengali Translation is also available) Translated by Ganendranath Bandyopadhyay, Pearl Publishers
Maurice Cornforth, Dialectical Materialism, National Book Agency
Shovanlal Duttagupta ,Marxiya Rastrachainta, West Bengal State Book Board.
Sudarshan Roy Chowdhury ,Communist Istaharer Bhumika
Sudhansu Dasgupta, Communist Manifesto Prasange, NBA
Surabhi Bandyopadhyay, Samajbijnaner Sabda Parichaya , West Bengal State Book Board .
Tarapada Lahiri , Marxiya Darsan O Samajbijnaner Bhumika , Lokayata Sahitya Chakra.
.

6. Dharma: Rabindranath Tagore
Manusyatva , Pracina Bharater Ekah , Prarthana , Dukhah, Utsaber Din , Tatah Kim

Suggested Reading:
Rabindranath Thakur- Dharma, Viswabharati Granthanvibhaga, Kolkata .

7. Practical and Environmental Ethics
Killing:
Suicide, Euthanasia, Animal Killing

Feminist Ethics: Radical and Liberal,

Human Rights And Discrimination.

War and Violence -Terrorism**.**

Concept of Environmental Ethics:
Anthropocentrism and Non- Anthropocentrism, Deep Ecology and Concepts of Management Ethics

Suggested Readings:
Peter Singer – Practical Ethics
Peter Singer (ed.) Applied Ethics
Rinita Majumder -A Short Introduction to Feminist Ethics .
D.J.O. Byrne – Human Rights: An Introduction
Peter Singer: Applide Ethics For Environmental Ethics
G. Geetha- Gender.
Dikshit Gupta-Nitividya O Phalita Nitividya
Shefali Moitra- Naitikata O Narivada
Samarendra Bhattacharya- Vyavaharika Nitivijnana (new edition)

Group: B

Group B is an essay paper. Candidates will have to write **two** essays from two broad areas in Philosophy a) **History of Indian Philosophy** and b) **History of Western Philosophy** within of 1500 to 2000 words. Each essay carries 25 marks.

West Bengal State University
Political Science (Honours)
Full Marks Each Paper – 100
Part-I
Paper I: Political Theory
Paper II: Colonialism and Nationalism in India
Part-II
Paper III: Indian Government and Politics
Paper IV: Comparative Govt. & Politics
Part-III
Paper V: International Relations and World Politics
Paper VI: Western Political Thought
Paper VII: Indian Political Thought
Paper VIII: Public Administration and Management

Part – I

Paper – I: Political Theory

Unit I: Politics & some basic concepts
1. Development and Definition of Politics and Political Science; Approaches: Normative and Behavioural – Empirical Political Theory (Basic features only); Systems Analysis and Structural-Functionalism; Modern Perspectives (Basic outlines): Feminist and Post-modern.
2. Basic Features: Political Power & Authority, Political Culture, Political Participation, Political Socialization & Political Communication

Unit II: State, Sovereignty & Society
1. Theories of State: Nature (Basic features) Idealist, Liberal and Neo liberal Theories and Its Critique.
2. Concept of Sovereignty: A General Overview including Monistic and Pluralistic Views of Sovereignty – Changing Concepts of Sovereignty in the Context of Globalisation
3. State and Civil Society - meaning (non-party political process, NGOs and VGs): Characteristics and Interrelationships

Unit III: Core Concepts (18)
1. Liberty: meaning; Liberty to Emancipation: Negative and Positive Aspects of Liberty – Marx on Freedom
2. Equality: Meaning & Justification of Equality in the Context of Inequalities
3. Justice: Meaning - Natural and Legal
4. Law: Meaning, State-Law Interface: Individual, Plural and International Law

Unit IV: Democracy and Other Concepts
1. Rights: Meaning; Natural, Legal and Moral Rights - Rights and

Obligations - Human Rights and Women Rights
2. Democracy: David Held on the Classification of Democracy: Protective (Bentham), Developmental (J.S. Mill) and Participatory Theories - Marx on Democracy

Unit V: Marx and Politics
1. Philosophical Foundations of Marxism: Sources
2. Dialectical Materialism and Historical Materialism
3. Capitalism: Growth, Nature and Decline – Transition to Socialism and its Critique
4. Marxist Theory of the State – Relative Autonomy of the State: Miliband-Poulantzas debate
5. Concept of Class and Class Struggle
6. Lenin's theory of Party – Lenin-Rosa Luxemberg debate
7. New Perspectives of Marxism: Antonio Gramsci on 'Hegemony' and Louis Althusser on 'False Consciousness'

Paper II: Colonialism and Nationalism in India

Unit I: Conceptual Framework
1. i) Imperialism, Colonialism and Nationalism: Definitions
ii) Nationalism in the colonial world: differences with the nationalism in the west
iii) Approaches to the study of colonialism and nationalism in India: colonial, nationalist, Marxist and subaltern interpretations.
2. Phases of Colonialism: i) early phase: influence of 'mercantile' capitalism: rule of East India Company;
ii) middle phase: influence of 'liberal' capitalism; legal-institutional experiments;
iii) influence of 'imperialist' capitalism

Unit II: Colonial Modernity and Social Components
1. Colonial rule and modernity in British India – Changes in the fields of - i) economy: agriculture, industry and commerce;
ii) Modern means of communication and rise of nationalism
iii) Introduction of modern education: role of middle class and professionals in the development of nationalism
iv) Culture: emergence of modern literature, theatre and art.
v) Emergence of new social classes: agrarian areas
vi) Industry: national bourgeoisie and workers
2.Social and religious reforms: Anti-Sutee and widow remarriage bills; foundation of Brahmo Samaj, Prarthana Samaj, Arya Samaj, Ramkrishna Mission; Role of Women
3. Rise of the lowercastes in colonial India (with spl. ref. to Bengal)

Unit III: Emergence of Nationalism, Political Organisations & Movements
1. Impact of the 1857 Rebellion – political consequences of the Rebellion – making of the modern Colonial State – Ref. to Govt. of India Act, 1858.
Changes in the government, administration and laws
2. Emergence of nationalist politics: discontent in the middle class elite against racial discrimination in colonial rule; economic nationalism: the 'drain theory'; cultural nationalism and the beginning of Hindutwa.
3.Social and Political Associations: i) Birth of Indian National Congress: 'Moderate'-'Extremist' division; Home Rule Movement; Govt. of India Act, 1919
ii) rise of Gandhian leadership in Congress: Khilafat & Non-cooperation, Civil Disobedience and Quit India movement;
iii) communal organisations: Muslim League and Hindu Mahasabha; foundation of the RSS;
iv) Left politics: foundation and development of the CPI–Socialists & Forward Bloc.

Unit IV: Movements in Bengal
1. Revolts: Chuar, Sannyasi, Titumir & Santhal;
2. Movements against partition of Bengal – Swadeshi Movement
3. Rise of militant nationalism - Anushilan and Jugantar
4. Workers' and peasants' movements - Tebhaga movement

Unit V: Final phase of colonialism and independence
1. Role of INA and RIN uprising
2. Conflict between the Congress and the Muslim League – emergence of the 'two Nation' theory and demand for Pakistan – failed negotiations between the Congress and the League - role of the British; Constituent Assembly, Partition and Independence: birth of India and Pakistan.

Paper III: Indian Government and Politics

Unit I: Basics of the Constitution
1. The Preamble
2. Fundamental Rights - new interpretation of Article 21 and rights of women (spl. ref. Domestic Violence Act and Bisakha Guideline against sexual harassment in the workplaces)
3. Fundamental Duties
4. Directive Principles : Enumeration and Significance
5. Indian Federalism : Basic features - Union – State Relation – Critical appraisal
6. Constitutional Amendment : Procedure - Important Amendments (42nd , 44th, 52nd, 86th)

Unit II: Institutions
1. Union Executive : President & Prime Minister – Power and Position - relationship between President and Prime Minister
2. State Executive : Governor & Chief Minister – Power and Position - relationship between Governor and Chief Minister
3. Union Legislature: Parliament – Organization and Functions – comparison between Rajya Sabha and Lok Sabha - Speaker
4. State Legislature: Assembly - Organization and Functions
5. Judiciary : Supreme Court & High Court – Composition and Functions – Judicial Activism; PIL
6. Electoral Process: Election Commission – Composition, Functions & role

Unit III: Political Process
1. Nature of Indian state – post independence
2. Party system in India: Principal features
3. Coalition Politics : Nature – Challenges and Responses
4. Religion and Politics
5. Caste and Politics
6. Media and Politics
7. Women in politics
8. Dalit Politics

Unit IV: Major Issues and Movements
1. Corruption in Public Life
2. Reservation and related movements
3. Regionalism: Roots and nature
4. Contemporary Maoist Movement: Ideology, Rise and Development
5. Movements for Alternative development

Unit V: Political Process in West Bengal (Post Independence)
1. Politics in the state (1947-67) [brief outlines] – Change of Govt. in West Bengal in 1967 – background
2. Naxalite Movement: Origin, Nature and decline
3. Political process (1972-77) in the all India context - Emergence of Left Front Govt. - Major Governmental Policies on Agriculture (Operation Barga) & Industry (1994) during the Left Front Rule
4. Gorkhaland movement in West Bengal: Rise and Development

Part - II

Paper – IV: Comparative Govt. & Politics

Unit-I
1. Comparative Politics – Meaning and Nature – difference with Comparative Govt. – Major approaches: i) Institutional & neo-institutional ii) Developmental
2. Different political and social systems – Liberal, Authoritarian & Socialist – Comparison between basic features of liberal and socialist systems

Unit-II
Constitutions: Salient features 1. UK – Convention, Rule of law, Parliamentary sovereignty 2. USA – Separation of powers, Checks and balances 3. China – Party system - Principles of Democratic centralism

Unit-III
1. Comparing the Executive: i) Presidents of USA & France ii)Prime Ministers of UK & India
2. Comparing the Legislative: i) Parliament of UK & India ii) Congress of USA & Parliament of UK iii) China – composition & function of NPC – its uniqueness

Unit-IV
1. Comparing the Judiciary: i) USA (spl. ref. to Judicial review) – comparison with India ii) Office of the procuratorate in China
2. Role of political parties & interest groups in liberal democracy: Comparison between UK & USA

Unit-V
Political culture (conceptual discussion) i) UK ii) Brazil iii)India iv) China v) Egypt

Part – III

Paper V: International Relations and World Politics

Unit – I: Theory
1. International relations: definition
2. Realism and Neo Realism
3. Liberalism & Neo liberalism
4. World system theory
5. Feminist theory

Unit – II: International Relations & Organisations
1. Cold war – Assumptions of Cold war – Marshal Plan- Truman Doctrine – Concept of bipolarity; End of the cold war
2. Post cold war world - unipolarity (Concept) – New World Order - Post American world (Concept, argument and counter-argument) – Flattening world (Concept, argument and counter-argument)
3. i) ASEAN ii) SAARC iii) OPEC iv) BRICS

Unit – III: Contemporary Global Issues
1. IPE – the post war world economy – the Bretton Wood System & its break down – post war trading system - the GATT - WTO)
2. Globalization: concept – Political, cultural and technological dimensions; Globalization as a process
3. Institutions governing globalization: i) IMF ii) World Bank iii)WTO
4. Role of TNCs in globalization

Unit – IV: Contemporary Global Issues (Contd…)
5. International terrorism : definition – causes – types – funding – global impact
6. Environment: International environmental cooperation
7. Poverty, Development and hunger: i) Poverty: concept/definition ii) Development: concept – orthodox view and the alternative view – millennium development goal iii) Hunger: orthodox, nature-focused explanation of hunger – the entitlement, society – focused explanation of hunger – globalization and hunger
8. Human security – concept and dimensions – promoting human security
9. Human Rights

Unit – V: Foreign Policy & IO
1. Determinants of Foreign policy
2. NAM – Basic Principles – Relevance today
3. Foreign policy of India – Basic features – post cold war [spl. ref. Indo Pak, Indo-China and Indo-US – India as an emerging power]
4. Foreign policy of USA: Post Cold war - contemporary position [spl. ref. West Asia, Palestine]
5. Foreign policy of China: Post Cold war - contemporary position – China as a power centre
6. UNO – Organs with special reference to General Assembly and Security Council (Composition, Powers and functions) – Peace keeping role of the SC - contemporary developments

Part-III

Paper VI: Western Political Thought

UNIT 1
1. Fundamentals of Greek Political Thought- **Plato**: Justice and communism – **Aristotle:** Critique of Plato- State - classification of government; Contribution of **Roman** Political Thought- Law and Citizenship
2. Overview of **Medieval** Political Thought with special reference to **Thomas Aquinas** and **Marsiglio of Padua**

UNIT 2
1. **Renaissance** and its features- **Machiavelli**: Secular foundation of politics- Political Realism
2. **Martin Luther** and Reformation Movement- **Bodin's** theory of state

UNIT 3
1. **Hobbes, Locke, Rousseau**- Grounds of Political Obedience
2. **Adam Smith**: Laissez Faire economy, human nature and non interventionist state; **Bentham**: Utilitarianism-state and economic ideas; **John Stuart Mill-** Critique of Bentham's Pleasure and Pain theory Autonomy and Liberty of individual- Position of women in democracy

UNIT 4
Hegel, Marx, Gramsci on Civil Society

UNIT 5
1. **Rawls, Nozick, Walzer**: Distributive Justice- challenge from **Multiculturalism**
2. **Postmodernism**- basic ideas with special reference to **Jean Francois** **Lyotard**

Part-III

Paper VII: Indian Political Thought

Unit I: Ancient & Medieval India
1. Key concepts of social and political life: *dharma, social/ethical laws* – divine origin of the state in 'Santiparva' of *Mahabharata*; influence of *Manusmriti*
2. Importance of *Arthasastra* in Indian political thought – seven elements of the State (*Saptanga*) and *dandaniti* as propounded by Kautilya; foreign policy of the '*Vijigishu*' king
3. Changing idea of legitimacy: from the Sultanate to the Mughal times – kingship duties of Muslim rulers
4. The evolution of the perception of India: Akbar and Abul Fazl – Elements of Social Justice in Medieval Islamic Thought

Unit II: Encounter with Colonial Modernity
1. Colonial Modernity and Bengal Renaissance
2. Influence of Western rationalism and the idea of freedom in Rammohun Roy's thought – social, economic and religious reforms; arguments for freedom of expression
3. Liberal ideals: Dadabhai Naoroji

Unit III: Encounter with Colonial modernity
1. Emergence of nationalist thought: contributions of Bankimchandra and Vivekananda
2. Emergence of 'modern' Islamic thought: Syed Ahmad Khan
3. Politics of extremism: Aurobindo's concept of Passive Resistance – comparison with the Gandhi's concept of Truth: Ahimsa & *Satyagraha*
4. The concept of community : Gandhi and Tagore

Unit IV: Idea of Socialism & Social Justice
1. Idea of Samyavada: Subhas Chandra Bose
2. M. N. Roy: Radical Humanism
3. Jayaprakash Narayan - Total Revolution
4. Fight against Untouchability: contributions of Jyotirao Phule
5. Social justice for backward castes: contributions of B. R. Ambedkar – Gandhi-Ambedkar debate over the caste issue

Unit V: Thesis of Communalism
1. Idea of Hindutwa: contributions of Savarkar; M. S. Golwalkar's notion of Hindu nation; Political thought of Shyamaprasad Mukherjee
2. Iqbal's concept of 'Pakistan'; Jinna's contribution to the development of the 'two-nation' theory – his 'secular' speech at the Constituent Assembly of Pakistan

PAPER-VIII PUBLIC ADMINISTRATION AND MANAGEMENT

UNIT: I : OVERVIEWS OF PUBLIC ADMINISTRATON

TOPICS
Meaning, scope and significance of Public Administration;
Wilson's vision of Public Administration: Politics-administration dichotomy; Max Weber's vision of Bureaucracy
New Public Administration (Minnowbrook I, 1968 & Minnowbrook II, 1988);
Public and Private Administration: Effect of Globalisation on Public Administration; State versus market debate - public- private partnership.
Public Choice approach; Concept of E- governance, Good Governance.

UNIT : II : **THEORIES OF ADMINISTRATION AND MANAGEMENT**

TOPICS
Taylor and the Scientific Managment Movement (**brief overview**)
Classical Theory of administration (**brief overview**)
Basic concepts and principles **:** Organisation, Hierarchy, Unity of command, Span of control, Co-ordination
Accountability & Transparency
Adminstration and Management: Paradigm shift: (**brief overview**)
Managerial State and New Public Management:
Basic concept of Participative Management: Rensis Likert
Strategic Management: Leadership; Communication; Control

UNIT III : PUBLIC POLICY AND FINANCIAL MANAGEMENT

TOPICS
Decision and Policy- Decision making with special reference to Herbert Simon .
Public Policy: Models of policy-making and their critique;
Policy implementation
Budget as a political instrument;
Parliamentary control on public expenditure
Role of Comptroller and Auditor General of India.
Machinery of planning; Role, composition and functions of the Planning Commission
National Development Council
Process of plan formulation

UNIT : IV : PERSONNEL ADMINISTRATION AND HUMAN RESOURCE DEVELOPMENT MANAGEMENT

TOPICS
Basic concept of Human Resource Development Management Paradigm shift: from Personnel Administration to Human Resource Development Management
Personnel management in India with ref. to All India Service and Civil service in administration of the State Government (BRIEF OVERVIEW) Women in Public Administration
Role of PMO and Cabinet Secretary in the Union Government in the changing perspective of administration in India
State Administration – Secretariat
District Administration – role of DM vis-à-vis Shavadhipati of Zilla Parishad

UNIT: V: LOCAL GOVERNMENT & PEOPLE

TOPICS
Development Administration (Fred Riggs)- Spl. Ref. India
Urban local govt. with ref. to 74th Constitutional Amendment –structure decentralization of power
Urban poverty alleviation initiatives: Jawaharlal Nehru National Urban Renewal Mission (JNNURM) – Special ref. WB – a critical assessment
Rural govt. - with ref. to 73rd Constitutional Amendment – structure – decentralization of power

Rural Poverty alleviation initiatives: NREGS-Special ref. WB – a critical assessment
Self-help groups -spl. ref.WB
Decentralized planning for economic development and social justice.
Citizen and Administration: Lokpal & Lokayukt Machinery for Redressal of citizen's grievances in India: Citizen's Charters: International scene(spl. Ref. UK)

SYLLABUS FOR PSYCHOLOGY HONOURS

PART I

Paper I: Psychological Processes & Human Development (Full Marks – 100)

First Half

Basic Psychological Processes

1. Introduction – Definition, Nature, Scope, Methods and Branches of Psychology.History of Contemporary Psychology: (a) Structuralism, (b) Functionalism, (c) Gestalt School, (d) Psychodynamic, (e) Behaviouristic School, (e) Cognitive School.

2. Information Processing Approach: Attention, Sensory processes and Perception.

a) Attention process – Determinants of attention; shift and fluctuation; Divided Attention, Sustained Attention, Distraction.

b) Concepts of sensory thresholds. Psychophysics – Weber- Fechner Law. Classical Methods:
(i)Constant Method, (ii) Gradation Method, (iii) Method of Average Error.

c) Perception and its determinants; Perception of form, space, movement and time. Optical illusions.

3. Learning: Learning processes: Nature and factors of learning. Laws of Learning; Theories: Trial & Error; Conditioning – Classical & Operant; Insight, Social Learning Theory. Transfer of training. Programmed learning.
Bandura (Ziglar)

4. Memory: ~~Factors~~, Encoding, Storage & Retrieval, STM, LTM. Types of Memory. Forgetting – Nature, Curve of forgetting, Causes of forgetting.

5. Emotion – Nature; Theories; James-Lange; Cannon-Bard, Lindsay, Schachter-Singer, and Lazarus.

6. Thinking and Reasoning: Nature of thinking; Inductive and Deductive reasoning; Problem solving approaches.

Second Half

Human Development

1. Concept and definition of development & Ageing. Role of genetic and environmental factors in development. Influence of cultural factors and socialization. Child Rearing Practices and Influences of Family.

2. Prenatal and Infancy: Physical Development, Language Development, Social Development. Developmental Hazards.

3. Childhood: Moral, Emotional, Social, Cognitive development(a) Early Childhood; (b) Middle Childhood; (c) Late Childhood and their respective developmental Hazards.

4. Puberty and Adolescence: Moral, Social, Cognitive development. Hazards.

5. Adulthood: Moral, Social development, Interpersonal partnership, Marriage, Divorce. (a) Early, (b) Middle, (c) Late.

6. Old Age: Theories, hazards of old age.

PAPER II: Biopsychology, Education and Assessment (Full Marks – 100)

First Half

Biopsychology

1. Biological foundation of behaviour: The cellular and genetic basis of behaviour.

2. Structure and function of neurone, Nerve impulse, Synapse and neurotransmitters.

3. Nervous System and Brain:

   a) CNS - Brain: (a) Forebrain, (b) Midbrain, (c) Hind Brain.

   b) Spinal Cord-Structure, functions, Reflex Arc.

   c) Peripheral Nervous System-Introduction to Spinal nerves, Cranial Nerves and Autonomic Nervous System.

4. Neurophysiology of learning and memory: Role of Synaptic facilitation and inhibition on STM, LTM; Consolidation of memory.

5. Emotional behaviour: Physiological correlates of emotion: Electrical, Circulatory changes, Respiration, and Peripheral measures. The role of Cortex in emotion. Emotion and endocrine glands.

6. Motivation: Concept of Homeostasis, Physiological basis of Hunger, Thirst (Central and Peripheral theories) and sleep.

Second Half

Education & Assessment

1. Introduction – Role of Psychology in Education; Methods of Educational Psychology; Concept of Assessment.

2. Motivation – Definition; Theories of Motivation – Maslow, McClelland, Murray. Application, Role of motivation in Education.

3. Intelligence, Aptitude, Interest:

   a) Intelligence – Definition, Nature, Classification, Theories: Spearman, Thurstone, Guilford, Cattell; Assessment of Intelligence.

   b) Aptitude – Definition, Nature, Relation between intelligence and aptitude, Assessment of aptitude.

   c) Interest – Definition, Nature, Relation between interest and intelligence, Assessment of Interest.

4. Personality – Definition and meaning. Determinants. Introduction to Trait, Type, Type cum Trait, Psychodynamic and Humanistic Approaches; Personality and Education; Assessment of Personality.

5. Understanding exceptional children – Classification; Gifted, Mental Retardation, Problem Children, backward children; Characteristics, Education of different classes of exceptional children.

6. Application of Educational Psychology: Programmed Learning, Tip-of-Tongue, Vocational Guidance and Instruction.

SYLLABUS FOR PSYCHOLOGY HONOURS
PART II

PAPER III: Psychometry and Methodology (Full Marks – 100)

First Half

Psychometry

1. Need for quantification in Psychology, Levels of measurement – nominal, ordinal, interval and ratio.

2. Processing of Data:
   a) Tabulation, Classification and frequency distribution of data.
   b) Meaning, types, uses and computational techniques of the measures of central tendencies.
   c) Meaning, types, uses and computational techniques of the measures of dispersion or variability.

3. Normal Probability Curve and its properties as well as its application.

4. Correlation – Meaning of bi-variate distribution, Coefficient of Correlation. Pearson's Product Moment and Spearman's Rank Difference Correlation – Computation and Use. Biserial, Point Biserial, Tetrachoric, Phi-Coefficient and Contingency Coefficient – Computation and Use.

5. Statistical Inference – Concepts and steps involved in drawing a statistical inference.

6. Concept of parametric and non-parametric statistics. Experimental hypothesis. Null hypothesis and its testing. Concept of standard error.

   Computation and uses of t-test and chi-square test.

Second Half

Methodolgy

1. Introduction – Common sense and scientific thinking, characteristic of scientific methods.

2. Variables and their classification, Major steps in psychological research.

3. Problems and Hypothesis – Characteristics of problems. Definition, sources and criteria of good hypothesis. Hypothesis and Theory.

4. Experiment:

    a) Experimental method and Field Study

    b) Design of experiments: Controlling subjects, situation and sequence related variables. Single group and separate group designs. Quasi-experimental design and time series.

5. Development and standardization of Psychological test:

    a) Concept of Item Analysis

    b) Reliability

    c) Validity

    d) Norms

6. Application of Computer in different fields of Psychology.

PAPER IV: PRACTICALS

(Full marks-100; Experiments-70; Lab.Note Book-10 & Viva-Voce – 20).

1. Experimental determination of the rates of fluctuation of attention.
2. Experimental estimate of the rates of perceptual reversibility by standard structural figures (flower vase/human profile; Rubin's cross).
3. Experimental determination of errors of temporal perception – filled and unfilled.
4. Determination of the two-point tactual threshold by appropriate psychophysical methods (Gradation and Constant).
5. Determination of the effect of (a) Whole vs Part learning (b) Unspaced vs Spaced learning on memorization.
6. Determination of the effect of (a) Retroactive and (b) Proactive Inhibition on memorization.
7. Determination of (a) Muscular; (b) Natural ; (c) Sensorial reaction time by variation of : (i) quality of stimulus; (ii) intensity of stimulus; (iii) duration of fore period by any suitable instrument.
8. Determination of the effect of variation of task performing attentive states on emotional expression by using pneumographic reproductive instrument.

SYLLABUS FOR PSYCHOLOGY HONOURS

PART III

PAPER V: Social and Industrial Psychology and Organizational Behaviour
(Full Marks-100)

First Half

Social Psychology

1. Introduction- Definition and nature of Social Psychology. Methods of Social Psychology.

2. Person Perception, Attribution, Social Cognition.

3. Attitude: Definition, Formation of attitude, Theories; Measurement, Change of Attitude. Difference between Attitude and Belief, Balance Theory, Cognitive Dissonance.

4. Stereotype, Prejudice and Discrimination: Concept and origin. Measurement; Social Aggression and violence. Reduction of Prejudice.

5. Group Psychology: Definition and Classification of group; Group structure and function. Conformity and Compliance. Crowd and Mob. Leadership: Definition, Classification and Function. Leadership and Morale. Leadership Training.

6. Social Issues:
   a) Political Behaviour – Public Opinion and Propaganda.
   b) Antisocial Behaviour – Delinquency and Crime.
   c) Disadvantaged Groups. – physical orphans, casteism, poverty

21 - 1, 2, 3. 26 - Industrial.

Second Half

Industrial Psychology and Organizational Behaviour

1. Introduction. Scope and importance of Industrial Psychology and Organizational Behaviour. Brief history and development with special reference to India.

2. Personnel Selection and evaluation: Basis of selection; Job analysis methods, measurement and uses. Individual differences in abilities, aptitudes and personality, and uses of Psychological tests in selection practices. Personnel evaluation- its meaning and different methods. 4

3. Work motivation, job satisfaction and job involvement. 4
Process (VI, equity, goal setting, High ach) Content (Ach, need hierarchy, ERG, 2 factors)

4. Working conditions and Organizational climate – Physical (illumination, noise, colour, temperature, humidity and pollution), temporal (work schedule, shift work and rest period) and psychological (boredom and monotony , fatigue) conditions at work. Organizational climate and its impact on work. Industrial conflict and its reduction.

5. Training and human resource development.

6. Accident, safety and Health – Causes of accidents, individual and situational factors in accident occurrence. Alcoholism and drug use in the workplace. Accident prevention. 4

11 – final

PAPER VI: Psychopathology Health and Counselling Psychology
(Full Marks-100)

First Half

Psychopathology

1. Concept of normality and abnormality, Approaches to Abnormality.

2. Methods of studying abnormal behaviour – clinical observation, case history, interview, psychological tests. – EPQ, TAT, RIT, STAI, BDI

3. Signs and symptoms of mental disorders.
Introduction to Classificatory System, Classification of mental disorders – Distinction between psychotic, neurotic and psycho-physiological disorders.

4. Etiology of mental disorders:

   a) Anxiety disorder – panic phobia, obsessive-compulsive disorders. Generalized anxiety disorders. PTSD.

   b) Somatoform disorders – Conversion reaction. Dissociative disorders.

   c) Mood disorders – Dysthmic disorder, major depressive episode. Bipolar affective disorders.

   d) Schizophrenia – Paranoid, Disorganized, Catatonic, Undifferentiated, and Residual.

5. Substance related disorder (Drug and Alcohol).

6. Stress Disorder – Stress due to catastrophic event...

Second Half

Mental Health and Adjustment

1. Nature, scope and development of Health Psychology – Bio-Psycho-Social and Cultural models of Health Psychology.

2. Stress and Health – Nature and types of stress, causes and consequences of stress. Coping strategies and social support.

3. Theories of Personality: a) Psychodynamics – Freud; b) Behavioural – Dollard-Miller, Eysenck; c) Humanistic – Rogers.

4. Concept of Adjustment – Mental Health, Mental Hygiene, criteria and factors of adjustment, Frustration and Conflict.

5. Counselling: Meaning, purpose and steps.

6. Health promoting and health damaging life styles. Stress management.

1, 2, 5,

3, 4, 6

Paper VII: Practical

(Full Marks – 100)

(Lab.Expts. – 60, Psychometry – 20, LNB – 10, Viva – 10)

1. Determination of DL using kinaesthetic sense modality by appropriate psychophysical methods.

2. Experimental determination of: a) Discriminative, and b) Choice reaction time.

3. Computational exercises on hypothesis testing: 't' test and Chi-square test.

4. Computational exercises on correlation processes – product moment, rank difference, biserial, point biserial, tetrachoric, phi – coefficient, contingency coefficient.

5. Measuring Intelligence of an adult individual using any suitable test (Indian adaptation)- BKT. WAIS

6. Measuring Intelligence by (i) Koh's Block – Design test and (ii) Cube Construction test.

7. Assessment of memory function of an adult by any suitable test (Indian adaptation).

8. Determination of (a) Interest by Guilford – Zimmermen Interest Inventory, (b) Aptitude by Differential Aptitude Test (English version of Ojha).

Paper VIII: Practical

(Full Marks – 100)

(Lab.Expts. – 80,LNB – 10, Viva – 10)

1. Determination of ethnic prejudice by a suitable method.

2. Construction of an attitude questionnaire to determine attitude towards any social institution or ideas by Thurstone's Equal Appearing Interval.

3. (a) To determine the effect of group influence on problem solving.
   (b) To determine the cohesiveness of a small group by sociometric method.

4. Ergographic determination of the nature and amount of work and fatigue under conditions of: (a) Varying rhythm; (b) Varying rest pause; (c) Varying load; (d) Work motivation, competition.

5. Determination of neurotic evidence of personality using any standardized Indian test-EPQ.

6. Determination of personality types of Introversion and Extroversion using any standardized Indian test.

7. Determination of levels of Anxiety using any suitable test (Indian adaptation).

BARRACKPORE RASTRAGURU SURENDRANATH COLLEGE

SYLLABUS FOR M.Sc. IN GEOGRAPHY

(TO BE EFFECTED FROM THE ACADEMIC SESSION 2018-2019)

SEMESTER-I

Paper - 1.1: Geomorphology

5 credit course: 75-90 class of 45 minutes duration

Unit 1: Fundamentals of Geomorphology

1.1 Approaches to Geomorphology: Structural, Climatic, Applied and System approach.

1.2 Some basic concepts: a) spatial and temporal scales in Geomorphology, b) feedback mechanisms, c) concept of magnitude and frequency, d) concept of equilibrium and evolution and e) concept of threshold.

1.3 Principles of relative and absolute dating: Geological timescale, geochronological methods – documentary evidence, artifacts, major horizons, radiometric, dendrochronology, thermo luminescence.

Unit 2: Study of Geographical Processes and Forms

2.1 Slope processes and forms: Properties and behaviour of slope material, mass movement processes and slope stability, water erosion and solute transport on slopes, theories of slope development.

2.2 Drainage basin as a geomorphic unit: Linear, aerial and relief properties; channel forms and drainage patterns.

2.3 Evolution of coastal landforms in rocky, sandy and deltaic coasts.

2.4 The Periglacial environment: processes and landforms.

Unit 3: Applied Geomorphology

3.1 Application of Geomorphological knowledge in management ofDams, Barrages, Embankments, Ports and Urban drainage system.

3.2 Geomorphic approach to hazard and disaster studies and their management: Landslides and River bank erosion with special reference to West Bengal.

Paper 1. 2 : Hydrology and Oceanography

5 credit course: 75-90 class of 45 minutes duration

Unit1 :Hydrology

1.1 Emergence, Scope and Content of Hydrology; Global Hydrological Cycle and System approach

1.2 Global water balance.

1.3 Run off and Concept of Run off Cycle.

1.4 Hydrological Parameters: Instrumentation and measurement (Velocity, Discharge, Precipitation, Evaporation, Transpiration).

1.5 Concept and application of Hydrograph and Unit Hydrographs.

1.6 Ground Water Storage, movement (application of Darcy's law), Characteristics and Classification of ground water; Problems related to withdrawal of Ground water.

1.7 Problems and management of Tropical Wetlands

1.8 Sustainable use of water: Rain Water Harvesting, Surface water Conservation and Recharging of Ground water.

Unit2 : Oceanography

2.1. Structural & morphological features of the ocean basins with reference to Plate tectonics:

2.2. Coral Reefs and Atoll: Origin , distribution and vulnerability

2.3. Oceanic sediments: Origin, classification and movement.

2.4. Water mass: origin, evolution, physical properties and chemical properties; Air-sea interactions.

2.5. Waves, tides and currents: components, genetic classification and models of formation

2.6. Sea-level change: types, causes and implications

2.7. Ocean as a resource: anthropogenic utilisation of the oceans; Importance of EEZ and CRZ

Paper 1.3: Geography of Resources

5 credit course: 75-90 class of 45 minutes duration

Unit 1: Concept of Resource

1.1 Nature and Natural Resources; Resource classification with reference to time-space framework, Resource Conservation and Recycling.

1.2 Concept of Resource Region and Ackerman's classification.

1.3 Technological development and resource perception; Concept of Free goods, Economic goods and Common goods, Resource trading and WTO.

1.4 Sectors of economy with reference to innovation, value addition and utilization of resources: Primary, Secondary, Tertiary, Quaternary and Quinary.

Unit2 :Study of Environmental Resources

2.1. Land and Soil Resources: classification, utilization and management, Carrying capacity of land

2.2. Water Resources: quality and quantity with reference to availability, use and sustainable development; Global water crises and conflicts,.

2.3. Mineral Resources: Metallic and Non-metallic; Mining and Environmental hazards; Mineral Policy of India.

2.4. Energy Resources: Conventional and Non-conventional; Distribution and utilization in India; Crisis and National Energy Policy.

2.5. Biotic Resources: forest, animal and fishery; problems and prospects of production, conservation and optimal utilization with particular reference to India.

2.6. Agricultural Resources: pattern of diversity (Genetic and Environmental) and problems; Green Revolution and Food Security.

Paper 1.4: Social and Cultural Geography

5 credit course: 75-90 class of 45 minutes duration

Unit 1: Social Geogrphy

1.1 Concepts of Social structure and Social space; Concept of Race, Community and Society; Social stratification; Social distance and Concept of Social segregation.

1.2 Social problems and their alleviation: Social injustice; untouchability/ apartheid, racism; Social welfare measures

1.3 Social movements and politics: Religion and Caste; Caste politics; Social Determinism

1.4 Study of Social Thoughts: Marx, Lenin, Gandhi and Tagore.

1.5 Social entities with reference to language and gender discrimination.

Unit 2: Cultural Geography

2.1. Concept of Culture, Cultural area, Cultural landscape, Concept of Cultural Diffusion and Acculturation.
2.2. Cultural ecology, Cultural politics and hegemony.
2.3. Cultural tradition of tribes and non-tribal people with special reference to West Bengal.
2.4. Information and Communication Technology and Cultural Globalization; Post-modernism and crisis of Cultural Identity.
2.5. Race, Community and Culture; Role of the Nation-State in protection and preservation of Cultural Heritage

Paper – 1.5 Practical Geography

1.1 Topographical Map: Interpretation of Physical & Cultural landscapes with the following aspects: (20)

i. Morphometric Analysis:Hypsometric Curve,Slope analysis (Raisz Henry), Dissection Index,

ii. Stream Ordering (Horton andStrahler) and Bifurcation Ratio.

iii. Analysis of spatial co-relation of settlements by NNA.

1.2 Visual Interpretation of Satellite Images: Land use and Land cover mapping. (10 marks)

1.3 Soil analysis: Determination of pH (by pH Meter), NPK (10 marks)

1.4 Water analysis: Determination of BOD and COD (10 marks)

1.6 Sound level Measurement of an Urban Area and it's mapping (5 marks)

1.6 Mapping of (15 marks)

i. Geomorphic features using conventional symbols

ii. Soil quality

iii. Ground Water Level/Quality

iv. Urban Transport/Land Use

1.7 Viva-Voce (30 marks)

Suggested References:

Module 1: Geomorphology

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- Ahmed, E., 1972, Coastal Geomorphology of India, Orient Longman.
- Chorley, R., Schumm, S. and Sugden, D.E. 1994. Geomorphology, Methuen, London.
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- Dayal, P., 1995, A Text Book of Geomorphology, Shukla Book Depot. Patna
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- Melhorn, W.N. and R. C. Flemal, 1975, Theories of Landform Development, George Alen and Unwin.
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- Valdiya, K.S. 1998. Dynamic Himalaya, University Press (India) Ltd., Hyderabad.
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Module 2: Hydrology and Oceanography

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Module4: Social and Cultural Geography

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BARRACKPORE RASTRAGURU SURENDRANATH COLLEGE

SYLLABUS FOR M.Sc IN GEOGRAPHY SEM-II

Paper -2.1 CLIMATOLOGY

UNIT-I: ATMOSPHERIC PROCESSES AND DYNAMICS

1.1 The climate system; Nature of the atmosphere and its evolution

1.2 Radiation and its distribution in the earth-atmospheric system; Spatio-temporal variation of earth's temperature and its significance

1.3 Basic forces and equations of atmospheric motion; Atmospheric turbulence: transport of heat, moisture and momentum

1.4 Adiabatic and non-adiabatic processes; Barotropic and Baroclinic instabilities; Formation and classification of clouds

1.5 General Circulation Model (GCM) with special reference to tropical circulations: Hadley and Walker; Air masses: Types, sources and modification; Tropical jet streams: Westerly and easterly jet

UNIT-II: THE MONSOON AND APPLIED CLIMATOLOGY

2.1 Synoptic features associated with onset, withdrawal and break of active and weak monsoons in India; Monsoon trough and depressions

2.2 Ocean-atmosphere coupled models in relation to the Asian Monsoon; El Nino Southern Oscillation (ENSO); Numerical Weather Prediction (NWP) of the Indian Monsoon

2.3 Origin, character and mitigation of the following Weather hazards: Heat waves and Cold waves, Thunderstorms, Dust Storms ,Western disturbances

2.4 Theories of climate change; Paleo-climatology: Content and significance; Recent global warming and its consequences: Physical, Economic, Social and Political.

2.5 Impact of climate and climate change in India with special reference to the following: Water Resources, Agriculture and food security, Morbidity and health

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- Ramage, C. S. (1971)- Monsoon Meteorology; Academic Press; New York and London
- Robinson, P. J. and A. Henderson-Sellers (1999)- Contemporary Climatology; Prentice-Hall of India Private Ltd., New Delhi, 2nd Edition
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- Thompson, R. D. and A. Perry (Ed.1997)- Applied Climatology; Routledge, London and New York
- Trewartha, G. T. (1981)- The Earth's Problem Climates; University of Wisconsin Press, 2nd Edition

Paper -2.2 (Soil and Bio-Geography)

UNIT -I (SOIL &BIO-GEOGRAPHY)

1.1 Meaning and Scope of Pedology, Edaphology and Soil Geography; Soil as a dynamic substance; Concept, Nomenclature and Usefulness of soil profile; Concept of Pedon and Polypedon.

1.2 Concept of soil environment: Soil temperature, Soil humidity, Soil aeration and Soil organisms.

1.3 Soil formation in Humid Tropics with reference to Laterisation, Gleisation and Peat formation.

1.4 Physical properties of soils: Colour, Texture, Structure, Pore space, Density, Cohesiveness, Mechanical strength, Compaction and their inter-relations.

1.5 Chemical properties of soils: Soil acidity soil alkalinity; Soil pH and its significance; Soil organic matter: Decomposition and Humification with reference to Clay-Humus complex and C: N ratio.

1.6 Soil Classification: FAO; Soil and Land Classification of India.

1.7 Soil degradation:Hazards related to Erosion and Pollution; Soil Management: Fertility, Amelioration and Conservation.

UNIL - II (BIO-GEOGRAPHY)

2.1 Scope and content of Biogeography; Concept and Significance of Biodiversity; Dispersal and Concentration of animals; Theories regarding distribution of plants and animals.

2.2 Ecology and Ecosystem: difference in meaning and significance; Types of Ecology: Habitat approach: Fresh water, Marine, Estuarine and Terrestrial.

2.3 Biomes: Concept and Classification; Characteristics of Broad-leaved Evergreen Subtropical forest, Tropical Savanna, Tropical Scrub, Himalayan forest biomes, their degradation and problems of extinction.

2.4 Human Ecology: Deforestation, Urbanization and loss of biodiversity; Endangered species in India (20 species of flora and fauna being at least 10 from each group)

2.5 Policies and Programmed for Conservation of Biota; Concept of Spaceship Earth; Social Ecology and Gaia theory.

Paper -2.3 (Philosophy of Geography)

UNIT -I Foundations and Development of Geography

1.1 Schools of Geographical Thought: German, French, American, British and Indian.
1.2 Nomosthetic and Idiographic nature of Geography: Hartshorne and Schaefer Debate.
1.3 Quantitative Revolution in Geography
1.4 Radical Geography
1.5 Modernism and Post Modernism in Geography.

UNIT -II Explanation in Geography

2.1 Explanation in Geography : Cognitive description, cause and effect Analysis, Temporal models of explanation : Functional and Ecological analysis and models
2.2 Theories in Geography.

UNIT - III Contemporary Focus in Geography

3.1Geography of Crime and Social discrimination.
3.2 Geography of Gender.

3.3 Welfare Geography.

Paper – 2.4 *(*Population and Settlement Geography)

POPULATION GEOGRAPHY

Unit I: Population: Dynamics and Welfare

1.1 Nature, scope, subject matter and trends of Population Geography and its relation with Demography.

1.2 IMR, MMR with reference to India.

1.3 Migration Theories and measurement.

1.4 Quality of life: Parameters of Social Wellbeing.

1.5 Population policies in India: Critical appraisal.

1.6 Population related Millennium Development Goals.

SETTLEMENT GEOGRAPHY

Unit-II (Rural Settlement)

2.1 Concept of settlement: Rural and Urban settlement (census definition and categories), evolution and growth of rural settlement in India.

2.2 Concept of rural service centres and rural hierarchy, distribution, dispersion and segregation of rural settlement, rural house forms and types in different environmental conditions in India.

Unit – III (Urban Settlement)

3.1 Definition of urban centres: World and India, characteristics of urban settlement (metropolitan, conurbation, megacity, megalopolis, city, town).

3.2 Morphology of towns: classical and non-classical models, concept of urban re-development, urban renewal and new town.

3.3 Theories of spacing of urban settlement, urban hierarchy, concept of umland and rural- urban continuum.

3.4 Urban housing, policies, problems with special reference to slums and unauthorized shanties, concept of outgrowth and urban sprawl.

References (Population geography)

Agarwala,S.N India's Population Problem,McGraw Hill, New Delhi. 1977

Banerjee D. Family Planning in India: A Critic and a Perspective. Peoples Publishing House, New Delhi 1971.

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New York. 1969
Woods, R. Population Analysis in Geography, Longman, London. 1979
Zelinsky,W. A Prologue to Population Geography, Prentice Hall Inc,N.J. 1966

References (settlement geography)

1. Hopkinson. D. (1983): Geography of settlement, Oliver and Boyd.
2. Hudson, F.S. (1970): Geography of settlements, Machoeld and Evans Ltd.
3. Mandal, R.B.: Introduction to rural settlement (revised and enlarged editio
4. Ghosh, S.: Introduction to settlement geography
5. Long, G.C. & Morgan, G.C.: Human and Economic Geography.
6. Sing, R. Y.: Rural Settlement.

Paper -2.5 (Practical)

UNIT -1 (SURVEYING) **(30marks)**

1.1 Determination of height of an object by Theodolite (Oblique Plane Method)

1.2 Plotting of Land features by Tacheometric Survey/Plane-Table Survey

1.3 Traversing and Plotting by Global Positioning System (Closed/open Traverse)

UNIT-2 (MAP PROJECTION) **(30marks)**

2.1 Classification of Map Projection, concept of Oblate Spheroid and Trigonometry of Spherical Triangle

2.2 Drawing of Graticule with maps on Azimuthal Gnomonic and Stereographic projections (Equatorial case), Interrupted Sinusoidal Projection, Universal Transverse Mercator Projection

UNIT -3 FIELD WORK AND REPORT **(40marks)**

The students should prepare a field report in groups (of not less than 5 and not more than 10 students in each group) under the supervision of the concerned teacher(s). They will conduct field study for collection of

primary data supported by secondary data for correlating physical and cultural features. The field work should be area and topic specific, and the report should consist of not more than thirty pages of A4 (220 X 270mm) size including about ten maps/ diagrams/ photographs. The matter should be neatly typed with 1.5 spacing duly certified by the supervisor(s) concerned. A board of examiners comprising of both internal and external will assess the students, on the basis of the field report and group discussion.

BARRACKPORE RASTRAGURU SURENDRANATH COLLEGE

SYLLABUS FOR M.Sc IN GEOGRAPHY SEM-III

Paper-3.1 : REGIONAL GEOGRAPHY OF SOUTH ASIA

5 credit course: 75-90 class of 45 minutes duration

1.Geographical Identity of South Asia:

1.1 Physical significance
1.3 Cultural significance
Economic significance
1.4 Political significance

2. Post colonial economic growth:

2.1 Economic situations at the end of colonial rule
2.2 Impact and extent of privatization
2.3 Impact and extent of globalization
2.4 Impact and extent of liberalization

3. Regional conflict and cooperation

3.1 Conflicting areas and issues
3.2 Pattern of conflict
3.3 Emergence of the concept of regional cooperation
3.4 Experience of cooperation with neighbouring regional blocks

4. Role of SAARC

4.1 Historical evolutions
4.2 Principles and objectives
4.3 SAARC summits and achievements
4.4 Present status, shortcomings and future prospects

5. Constraints for development of the region:

5.1 Bilateral issues
5.2 Political dynamics (regional and global)
5.3 Social and ethnic problems

Paper -3.2 WEST BENGAL WITH SPECIALREFERENCE TO GANGA DELTA

1. Physical background of West Bengal

1.1Geomorphological units and their characteristics

1.2 Climatic elements with special reference to cyclones
1.3 Hydro-morphological characteristics of rivers
1.4 Ground water: distribution and characteristics

2. Socio-economic background of West Bengal

2.1 Population Dynamics: Growth, Migration and Changing Population Composition
2.2 Technological Innovation, land reform and changing rural economy
2.3 Problems of industrialization and changing industrial scenario
2.4 Infrastructural development and urbanisation

3. Problems and prospects of West Bengal

3.1 Hazards and Disasters: Adjustment and Mitigation with special reference to landslides, flood and river-bank erosion
3.2Decay of Rivers and Its Effect on the Port- Industrial Economy
3.3 Ground Water Contamination and Its Impact
3.4 Human Development

4. Geomorphology of the Ganga Delta

4.1 Delineation and classification of landforms
4.2 Geomorphic problems of upper Ganga Delta: river-bank erosion and channel degeneration
4.3 Geomorphic problems of lower Ganga Delta: tidal characteristics, coastal erosion and estuarine sedimentation
4.4 Sea level change: characteristics and impacts

5. Cultural environment of Ganga Delta

5.1 Growth and distribution of population, migration and effects of partition
5.2 Land use and its planning: cropping pattern and irrigation, land capability and agriculture
5.3 Resources and their utilization: characteristics and distribution of surface and sub surface water and water crisis
5.4 Industrial scenarios: tourism and jute textile, problems and prospects

Paper -3.3 (POLITICAL GEOGRAPHY & GEOGRAPHYOF DEVELOPMENT)

A.POLITICAL GEOGRAPHY

1. APPROACHES OF POLITICAL GEOGRAPHY

1.1Whittlesey'sLaw Landscape Approach
1.1 Hartshorne's Functional Approach
1.2 Political Systems Model

2. CONCEPT OF NATION AND STATE

2.1 Concept of State, Nation, Nation-State
2.2 India- Location , Size, Shape, Territorial Sea

B.GEOGRAPHY OF DEVELOPMENT

1. CONCEPTUAL BACKGROUND

1.1 Concept of Development and Under Development
1.2 Debate on Development, Club of Rome and Limits To Growth, Classical Theory by Adam Smith, Modern Theories By Lewis and Capacity Approach By AmartyaSen

2. FORMS OF DEVELOPMENT

2.1 Economic Development: Impact of Globalisation and Liberalisation on Development, Employment Challenges in Developing Nation

2.2 Inclusive Development and Economic Reforms in India

2.3 Social Development: Inequalities in Health and Education, Gender Inequality and Inequality Trap forWomen, Community Participation and Property Rights

Paper –3.4 (ENVIRONMENTAL ISSUES IN GEOGRAPHY)

1. CONCEPT OF ENVIRONMENT

1.1 Environmental Geography: Approaches and Recent Trends, Concept of Monistic and Holistic Environment

1.2 Socio Cultural Aspects of Environment with Special reference to Demographic Characteristics, Housing and Sanitation, Availability of Safe Water, Health, Hygiene and Nutrition

2. ENVIRONMENTAL DEGRADATION : FORMS AND PROCESSES

2.1 Perception, Vulnerability, Risk, Social Response and Management Practices

2.2 Social Hazards: Atrocities against Children and Women, Old age Problems, Ethno-Cultural Marginalisation

2.3 Impact of Modern Agriculture, Industrialisation and Urbanisation on the Quality of Soil, Water and Air

3.ENVIRONMENTAL MANAGEMENT

3.1 Global Resource Crisis and Different Management Strategy: Energy and water Security

3.2 Major Earth Summits: Stockholm, Rio-de-Jeneiro, Johannesburg

3.2 E.I.A. and E.M.P.

3.3 Environmental Issues Related to Wetland Conservation Wasteland management India

3.4 Environmental Awareness and Movements in India ,The Role of NGOs

Paper –3.5 PRACTICAL GEOGRAPHY

1. QUANTITATIVE TECHNIQUES (35 marks)

Nature and types of geographical data

Sampling-Methods of sampling, sampling techniques: Purposive, Random, Systematic, Stratified and Multistage

- Hypothesis testing- Test of significance: Decision Error of 1st and 2ndkind , Chi- Square Test.
- Regression Analysis: Linear(including Residual Mapping) and Exponential.

Probability-concept and application

Random Variable and Probability Distribution(one dimensional)

Uniform distribution, Binominal and Poisson's Distribution.

Spearman's Rank Correlation Coefficient

- Lorenz Curve and Determination of Gini Coefficient.
- Index Number: Determination of Cost of Living Index.
- Spatial Analysis: Determination and Location of Mean Centre, Calculation of Standard Distance

2. COMPUTER APPLICATION IN GEOGRAPHY (10 marks)

Work on Microsoft Excel- Data entry, Tabulation and analysis (sum, average, median, and mode) Graphical representation of data Scatter Diagram with Trend Line, Time series with Trend Line and Histogram.

3. Remote Sensing and GEOGRAPHICAL INFORMATION SYSTEM (25 MARKS)

3.1.**Geographical Information System – Theory** -
Some Basic Concepts, Definition, Data Structure in GIS, Spatial Data, Attribute Data, Types of Spatial data (Raster, Vector, Real World Image), Types of Vector Data (Point, Line Polygon), Layer Concept, Areas of application.

3.2**. Geographical Information System – Practica**l -

Georeferencing, Digitisation (Polyregion creation, editing and correction of errors), Measurement of Areas, Attachment of Attribute Data,.

3.3**.Digital Image Analysis**:

Image Registration and rectification, Band combination techniques (FCC),Images subset and Image Enhancement techniques, Methods of Image classification (Supervised Classification accuracy assessment & class editing),NDVI , Change detection.

4. Viva - voce (30 marks)

BARRACKPORE RASTRAGURU SURENDRANATH COLLEGE

SYLLABUS FOR M.Sc IN GEOGRAPHY SEM-IV

Paper – 4.1

Special Paper (Optional) – Theoretical

Paper: 4.1A Environmental Geography - I

Unit I: Concept

1.1 Scope, Content and Recent Dimensions of Environmental studies in Geography

1.2 Symbiosis between Man and Environment; Effects of Environment on man: Bio-physical, Perceptional, Behavioral and that related to Resource Availability

1.3 Effects of Man on Environment with changes in Mode of Production

1.4 Physical, Ecological and Human Ecological Issues, Holistic and Reductionist Approaches to Environment

Unit II: Atmospheric Changes and the Biosphere

2.1 Climatic Factors shaping the Geographical, Zoning and its Periodicity

2.2 Changing Climate of the World

2.3 Climatic Hazards and Management, Social Response to Climatic Hazard

2.4 Biomes and their relationships to Climate and Hydrological Cycle

Unit III: Environmental Degradation and Hazards

3.1 Water, Air and Noise problems in urban-industrial Environment; Water and soil pollution in rural landscape

3.2 Impact of Green Revolution; Problems of Solid waste and nuclear fallout

3.3 Human response to Flood, Drought, Landslide, Earthquake and Cyclone

3.4 Disaster Management

Paper: 4.1. B. POPULATION GEOGRAPHY

Unit I : Basics of Population Studies

1.1 Concept and scope of Demography

1.2 Relation between Demography and other Social Sciences

1.3 Emergence and development of Population Geography

1.4 Sources of population data: Census, vital registration and sample survey

Unit II : Theories and Models of Population Studies

2.1 Malthusian Theory and Neo-Malthusianism

2.2 Social and Economic Theories :Marxian View of Surplus Population, Dumont,Leibenstein

2.3 Optimum Theory of Population: Carr Saunders and its criticism

2.4 Logistic Curve Theory by Pearl and Reeds, Mobility Transition Theory (MTT)

Unit III : Population Dynamics

3.1 Fertility: Concept of Cohort Fertility, Theories of Fertility- Bongaart's Proximate Determinants of Fertility, Davis and Blake's Intermediate Variable Framework; Factors of differential Fertility

3.2 Mortality: Concept of Morbidity and Life Expectancy, Significance of Maternal Mortality and Infant Mortality in Population Dynamics

3.3 Migration: Trends and significance of International Migration, Stouffer's Theory of Intervening Opportunities and Competing Migrants, Harris-Todaro Model of Migration, , Concept of Environmental Refugees

Paper: 4.1.C. FLUVIAL GEOMORPHOLOGY

Unit I : Drainage Basin Characteristics

1.1 Scope, concept of fluvial geomorphology
1.2 Drainage basin as a unit of study
1.3 Characteristics and aerial properties of drainage basin
1.4 Network evolution and Channel initiation
1.5 Hill slope processes and catchment denudation

Unit II : Fluvial Processes

2.1 Stream hydraulics (Geometric properties of Channel
2.2 Erosional processes – mechanics of erosion, thresholds of erosion, Channel development, valley shape and associated landforms
2.3 Sediment entrainment and transport – dissolved load, suspended load, bedload.
2.4 Flow regimes (laminar, turbulent), critical tractive force, critical erosion velocity.
2.5 Depositional processes – factors causing loss of transporting ability, laws of sediment deposition/ settling velocity, associated landforms

Unit III : Adjustment of Channel form

3.1 Characteristics of adjustment
3.2 Cross sectional form
3.3 Channel pattern: straight/sinuous /meandering/braided
3.4 Channel gradient and longitudinal profile

Paper – 4.2

Special Paper (Optional) – Theoretical

Syllabus for Special Paper: Environmental Geography
Paper: 4.2A Environmental Geography - II

Unit I: Anthropogenic Impacts

1.1 Agricultural and Industrial Planning and Environment

1.2 Man-animal Conflict in Forest-society Interface of Sundarbans

1.3 Human Impact of River Valley Planning

1.4 Urban Environmental Management: Local Self-governance and Community Action; Significance of Slum Development and Ecotourism

Unit II: Environmental Management

2.1 Global Resource Scarcity and Use of Oceans as International Commons.

2.2 Sustainable Development: Concepts and Models

2.3 Environmental Impact Assessment: Concepts and Indian Case Studies; Recommendations of Rio+20 Conference; Environmental Audit

2.4 Environmental Management: Case Studies of East Calcutta Wetland and Chilika; Environmental Management Plan

UNIT III: Environmental Policy and Management in India

3.1 Environmental Perception, Ethics, Laws and Policies

3.2 Environmental Movements in India*: Bisnoi, Chipko*, Silent valley and Narmada

3.3 Participatory Management of forests in India with special reference to West Bengal

3.4 Legal Intervention, Government Policy, Institutional set-up and Role of NGOs in Environmental Management in India, Bhopal Gas Tragedy and Ganga Action Plan

4.2. B. POPULATION GEOGRAPHY

Unit I : Growth and Structure of Population

1.1 World Growth of Population

1.2 Trend of Population Growth in India

1.3 Concept of Population Composition: Biological, Economic and Social

1.4 Population Composition in India: Spatial and Temporal Dimensions

Unit II : Socio-economic Development and Population in India

2.1 Enrolment Rate, School drop-outs and Child labour Problem

2.2 Problems of Disadvantaged Population: Women, Children and Ageing population and Physically Challenged population

2.3 Problems of Marginalized Population: Tribes and Internally Displaced Persons

2.4 Problems of Urban Population: Poverty, Unemployment and Quality of Life

Unit III : Population Policies and Projection

3.1 Population Policies and Programmes in India

3.2 Concepts and Techniques of population projection

4.2.C. FLUVIAL GEOMORPHOLOGY

Unit I : Channel changes through time

1.1 Evidences and causes of change : long and short term changes

1.2 Tectonic effect and fluvial response

1.3 Climatic effect and fluvial response

1.4 Effect of flood and fluvial response

1.5 Human interference and fluvial response

Unit II : Case studies of selected river valleys from India with special reference to structure, process, forms, hazards and their management

2.1 The Tista Valley

2.2 The Kosi Valley

2.3 The Narmada Valley

2.4 The Subarnarekha Valley

Unit III: Techniques for integrated watershed management

3.1 Concept and significance of watershed based development
3.2 Watershed resource appraisal – physical and cultural
3.3 Soil and water conservation – rain water harvesting and check dams
3.4 Role of Environmental Impact Assessment (EIA) in watershed management
3.5 Data required for watershed management : Lithology, Climate, Hydrology (surface and ground water use and quality) , sea level fluctuation, Soil, Vegetation, Land use-landcover;
3.6 Use of tools for watershed mapping : Maps, aerial photographs, satellite images, GPS.

Paper – 4.3 RESEARCH METHODOLOGY (Marks: 50)

Unit-I-Research Concepts

1.1 Objectives of research

1.2 Steps of research

1.3 Quantitative & Qualitative approaches

1.4 Research Problem

1.5 Research Design

1.6. Levels of Measurement

1.7 Writing Training: Writing a research proposal, report writing and Reference writing

Unit-ll- Methods of data Collection

2.1 Primary data- census and sampling methods, sampling size and sample frames, schedule and questionnaires

2.2 Secondary data-an appraisal of some basic secondary sources of socio-economic and demographic data with particular reference to India.

Unit -Ill- Data Analysis

3.1 Data classification
3.2 Standardization of data- Rank and Z-scores
3.3 Composite index
3.4 Construction and Testing of Hypotheses: a.Parametric: Pearson's Product moment Correlation coefficient, regression analysis (bivariate),Concept of Partial and multiple Correlation
b. Non-Parametric:, Chi-Square, concept of variance and covariance

Paper – 4.4

Special Paper (Optional) –Practical (50 Marks)

Syllabus for Special Paper: Environmental Geography
Paper: 4.4A Environmental Geography - III

Unit I: Laboratory Techniques to Detect Environmental Pollution

1.1 Acidity and Alkalinity of Soil and Water
1.2 Nitrate and Phosphate content in Water
1.3 Total hardness in Water
1.4 Dust fall and Measurements of Air-pollutants

Unit II: Environmental Survey and Mapping Techniques

2.1 Sampling Procedures
2.2 Preparation of Questionnaire for Perception Survey on Environmental Problems (Natural and Social Hazards)
2.3 Environmental Mapping Techniques, Population—Development—Environment interrelationship
2.4 Preparation and Interpretation of Environmental Maps in Micro-level

Unit III: Field Techniques

3.1 Identification and study of an Environmental Problem in field and preparation of the Structure of an EIA
3.2 Regression Analysis, Correlation and (bi-variate) Time Series Analysis of Environmental data, Concentration by Lorenz Curve
3.3 Cartographic presentation of Primary/Secondary data and collation of Environmental Maps

4.4b. Population Geography

1.1 Measures of Growth Rates: Decadal growth rate, arithmetic, geometric growth rate, exponential growth rate.
1.3 Fertility measurements: ASFR, TFR, SFR, Vital Index of Population, GRR,NRR
1.3 Mortality measurements: ASDR, SDR, IMR, MMR.

1.4 Measures of population composition: Age-sex Pyramid, Sex-ratio and Dependency Ratio, Work Participation rate.

1.4 Measures of Poverty: Head Count Ratio

1.6 Population Potential, Location Quotient

1.7 Population Projection

Application of software in Population Data Analysis

4.4c.Fluvial Geomorphology Practical

(i) Morphometric analysis

Ruggedness number of drainage basin, Constant of Channel Maintenance , Hypsometric Curve, Hypsometric Integral

(ii) Application of SRTM data / LISS image for drainage basin delineation

(iii) Field survey techniques – cross profile, wetted perimeter, hydraulic radius, velocity measurement by current meter,

(iv) Geomorphic mapping: Identification of geomorphic features based on satellite maps and validation of such features through field survey.

(v) Sediment analysis-Suspended sediment concentration, Textural analysis

Paper – 4.5

1.A. Dissertation based on Special paper (Seminar Presentation 10 marks) (50marks)

1.B. Grand Viva (50marks)

Honours Papers

Section 1: Course Structure

Part	Type	Paper	Subject	Marks	Exam Time
I	Theoretical	I	Geotectonics, Geomorphology & Hydrology	100	4 hours
		II	Economic & Population Geography	100	4 hours
II	Theoretical	III	Climatology, Soil Geography & Biogeography	100	4 hours
	Practical	IV	Applied Geographical Techniques	100	6 hours
III	Theoretical	V	Social, Political and Regional Geography	100	4 hours
		VI	Philosophy of Geography and Contemporary Issues in Geography	100	4 hours
	Practical	VII	Applied Geographical Techniques and Field Report	100	6 hours
		VIII	Statistical Techniques and Practical on Contemporary issues in Ggeography	100	6 hours

Section 2: Syllabus with Details of Marks Division

Part-I Papers

PAPER-I: GEOTECTONICS, GEOMORPHOLOGY & HYDROLOGY

Full Marks: **100**

Examination Time: **4 hours**.

Number of Questions to be answered

Marks division of each group	Category wise marks	Number of questions to be answered	
		Category A (10marks)	Category B (5 marks)
Gr A = 30 Marks	10 + 20	1 out of 4	4 out of 7
Gr B = 40 Marks	20 + 20	2 out of 4	4 out of 7
Gr C = 30 Marks	10 + 20	1 out of 2	4 out of 7

GROUP A: GEOTECTONICS (30 MARKS)

1. Geological timescale
2. Structure of the earth: crust and interior.
3. Isostasy: concepts postulated by Pratt and Airy.
4. Continental Drift, Sea Floor Spreading.
5. Plate Tectonics as explanation of mountain building, volcanism and earthquakes.

GROUP B: GEOMORPHOLOGY (40 MARKS)

1. Processes of weathering and mass wasting and their impact on landforms
2. Influence of lithology on landforms: Granite and Basaltic landforms.
3. Definition and classification of folds and faults.
4. Evolution of landforms in Uniclinal, Folded and Faulted Structures.
5. Development of landforms: Fluvial, Glacial, and Coastal.
6. Cyclic and non-cyclic concepts of landscape evolution: Davis, Penck and Hack.

GROUP C: HYDROLOGY AND OCEANOGRAPHY (30 MARKS)

1. Global hydrological cycle and its significance.
2. Aspects of runoff, infiltration, evaporation and transpiration, Runoff cycle.
3. Factors influencing ground water movement and storage.
4. Ocean sediments: origin, classification.
5. Salinity and temperature of ocean water.

PAPER-II : ECONOMIC & POPULATION GEOGRAPHY

Full Marks: **100**

Examination Time: **4 hours**.

Number of Questions to be answered

Marks division of each group	Category wise marks	Number of questions to be answered	
		Category A (10marks)	Category B (5 marks)
Gr A = 60 Marks	20 + 40	2 out of 4	8 out of 11
Gr B = 40 Marks	20 + 20	2 out of 4	4 out of 7

GROUP A: ECONOMIC GEOGRAPHY (60 MARKS)

1. Resource: Concept and classification. Economic and environmental approaches of resource utilisation.
2. Different sources of energy resources, production and consumption with special reference to coal, petroleum, solar and wind.
3. Characteristic of economies:
    a) Fishing, b) Agricultural, c) Manufacturing
4. Selected production systems:
    a) Intensive rice farming: India and South East Asia.

b) Extensive wheat farming: USA and Canada.

c) Plantation farming: Tea in India and rubber in SE Asia.

d) Cotton textile industry: India and USA.

e) Iron and Steel industry: India and Japan.

f) Petrochemical industry: India and USA.

g) Paper industry: India and Canada.

5. Economic models:
   a) Agricultural: Von Thunen
   b) Industrial: A. Weber
   c) Developmental: S. Myrdal

GROUP B: POPULATION GEOGRAPHY (40 MARKS)

1. Concept of Human resources.
2. Population structure — a) age and b) sex.
3. Population composition — a) economic and b) linguistic.
4. Population distribution and density: World and India.
5. Population growth and its related problems: India and China.
6. Fertility and Mortality.
7. Migration : Types, causes and consequences
8. Theories of population growth: a) Malthus, b) Marx, c) Demographic transition
9. Concept of optimum population, overpopulation and under-population. Population explosion and its impact on physical and cultural environment

Part-II Papers

PAPER-III: CLIMATOLOGY, SOIL GEOGRAPHY & BIOGEOGRAPHY

Full Marks: **100**

Examination Time: **4 hours**.

Number of Questions to be answered

Marks division of each group for examination	Category wise marks	Number of questions to be answered	
		Category A (10marks)	Category B (5 marks)
Gr A = 40 Marks	20 + 20	2 out of 4	4 out of 7
Gr B = 30 Marks	10 + 20	1 out of 2	4 out of 7
Gr C = 30 Marks	10 + 20	1 out of 2	4 out of 7

GROUP A: CLIMATOLOGY (40 MARKS)

1. Nature, composition and layering of the atmosphere.
2. Factors affecting insolation & heat budget of the atmosphere.

3. Horizontal and vertical distribution of temperature, inversion of temperature.
4. Green house effect on global environment, importance of ozone layer.
5. Planetary wind system with special reference to tri-cellular model, Rossby Waves, Jet Streams
6. Genesis of Monsoon and its relation with Jet Stream, El Nino and La Nina.
7. Processes of condensation and mechanism of precipitation: Bergereon-Fiendison, Collision-Coalescence theories. .
8. Tropical and mid latitude cyclones.
9. Climatic classification after Koppen and Thornthwaite.

GROUP B: SOIL GEOGRAPHY (30 MARKS)

1. Soil: Definition, factors and processes of formation.
2. Concept of zonal, azonal and intra-zonal soils, profile development under different conditions – Podzols, Chernozems and Laterites.
3. Physical properties of soil: texture, structure, colour and moisture.
4. Chemical properties of soil: pH and organic matter.
5. Soil erosion: types, factors and management.
6. Principles of soil classification: Genetic and Taxonomical – with special reference to India.
7. Principles of land classification: USDA

GROUP C: BIO-GEOGRAPHY (30 MARKS)

1. Definitions of biosphere and biogeography. Concept of ecosystem – basic ecological principles – ecotone, communities, niche, succession, and habitat.
2. Ecosystem and energy: Energy sources, laws of energy exchange, food chains and food web.
3. Concept of Biomes: study of Tropical rainforest, Taiga, Savannah, Desert, Tundra and Temperate grasslands.
4. Spatial distribution of world fauna.
5. Concept of Biodiversity and wildlife conservation in India, Projects and their importance – Project Tiger and Man and Biosphere Programme.

PAPER-IV (PRACTICAL): APPLIED GEOGRAPHICAL TECHNIQUES

Full Marks: **100**.

Examination Time: **6 hours**. Pattern of setting Questions: • *Topic 1 to 6:* Six compulsory questions are to be set, one from each topic • *Topic 7*: Evaluation of Practical Notebook: 5 marks. Viva-voce: 5 marks.

1. **Scales:** Linear, diagonal and vernier, enlargement and reduction of map (10 Marks)
2. **Megascopic analysis of minerals and rocks :** (10 marks)
    a) Rocks – Granite, Basalt, Dolerite, Shale, Sandstone, Limestone, Conglomerate, Slate, Phyllite, Schist, Marble, Quartzite, Gneiss.
    b) Minerals and ores – Talc, Gypsum, Calcite, Mica, Feldspar, Quartz,

Chalcopyrite, Hematite, Magnetite, Bauxite, Galena.

3. **Interpretation of topographical maps of Plateau region with R.F 1: 50,000:** (20 marks)
   a) Demarcation of drainage basin (not more than 4th order, based on Strahler)
   b) Construction of profiles: superimposed, projected, composite and long profile of river (length of the river not more than 10 km).
   c) The morphometric analysis to be done in 10 X 12cm grid
      i Drainage density (to be shown by isopleth)
      ii Average slope (Wentworth's method to be shown by isopleth)
      iii Relative Relief (to be shown by isopleth)
   d) Road density (to be shown gridwise).
   e) Interpretation of relief, drainage and vegetation characteristics.
   f) Interpretation of settlement, transport and communication systems.
   g) Relationship between physical and cultural elements (Transect Chart, not more than 8 km).
4. **Cartograms and thematic mapping :** (10 Marks)
   a) Choropleth showing density of population
   b) Dots and Spheres diagram showing distribution of rural and urban population.
   c) Proportional pie-diagrams representing economic data and landuse data.
5. **Projections**: (20 Marks)
   a) Concept, classification, constructions and suitability
   b) Construction and properties of:

      Zenithal Gnomonic and Stereographic (Polar Case), Simple Conic (with one standard parallel), Bonne's, Sinusoidal, Polyconic, Cylindrical Equal Area and Mercator's Projections.
6. **Survey:** (20 Marks)
   a) Closed traverse survey by Prismatic Compass.
   b) Levelling by Dumpy Level with at least one change point: Drawing of profile and determination of gradient.
7. **Laboratory Note Book + Viva voce** (5 + 5 = 10 Marks)

Part-III Papers

PAPER-V: SOCIAL, POLITICAL AND REGIONAL GEOGRAPHY

Full Marks: **100**

Examination Time: **4 hours**.

Number of Questions to be answered

Marks division of each group	Category wise marks	Number of questions to be answered	
		Category A (10marks)	Category B (5 marks)
Gr A = 60 Marks	20 + 40	2 out of 4	8 out of 11
Gr B = 40 Marks	20 + 20	2 out of 4	4 out of 7

GROUP A: SOCIAL, CULTURAL AND POLITICAL GEOGRAPHY (60 MARKS)

Social and Cultural Geography

1. Concept of culture and its components with special emphasis on India: language, religion and ethnicity.
2. Social geography of rural India: caste structure and social stratification; tribe – Santhals and Lepcha.
3. Urban social Geography — Social ecology and social space.
4. Rural settlements – its forms, site and situations.

   Urban settlement – morphology and hierarchy.

Political Geography

5. Concept of Political Geography and geo-politics; concept of frontier and boundary
6. Concept of cold war; bi-polarisation and unipolarisation.
7. Political geography of India: Administrative settings of India, problem of border states, partition and its geo-political implications.

GROUP B: REGIONAL GEOGRAPHY (40 Marks)

1. Concepts of regions; basis of regionalization with reference to India physical, economic and planning.
2. a) Physiographic Regions of India with special reference to Kashmir Himalaya

   b) Agricultural Region of India of India with special reference to Punjab-Haryana

   c) Industrial Region of India with special reference to Mumbai-Pune industrial belt
3. Regional disparities in India: causes and implications

PAPER-VI: PHILOSOPHY OF GEOGRAPHY AND CONTEMPORARY ISSUES

FULL MARKS: 100

Examination Time: **4 hours**.

Number of Questions to be answered

Marks division of each group	Category wise marks	Number of questions to be answered	
		Category A (10marks)	Category B (5 marks)
Gr B = 40 Marks	20 + 20	2 out of 4	4 out of 7
Gr A = 60 Marks	20 + 40	2 out of 4	8 out of 11

GROUP A: PHILOSOPHY OF GEOGRAPHY (40 MARKS)

1. Definition and nature of Geography.
2. Selected contributors in the evolution of geographical thought Humboldt, Vidal de la Blache, Carl Sauer and David Harvey
3. Major postulates: Determinism, Possibilism, Regional differentiation, location, time and space.
4. Changing approaches and methodology: Positivism, Quantitative Revolution, Welfare-Behavioural approach, Structural and radical approach

GROUP B: CONTEMPORARY ISSUES IN GEOGRAPHY (60 marks)

Section -1: Natural hazards and their management in the Indian Sub-continent:

5. Concept of hazards and disasters: Natural, quasi-natural and man-made hazards, different approaches in hazard management.
6. Climatic hazards: Flood, drought and cyclone mechanism – environmental impact and management.
7. Geomorphic hazards: landslide, river bank erosion, coastal erosion environmental impact and management.
8. Edaphic and biotic hazards: Deforestation, desertification, loss of bio-diversity — environmental impact and management.

Section-2: Economic and human development in the Third World

9. Concept of third world, concept of development and under development: Basic indicators of economic, human and gender development.
10. Problems of third world – Poverty, Population explosion, food security and hunger, unemployment, malnutrition and child labour.
11. Globalization and sustainable development.
12. Problem of urbanization.

PAPER VII: APPLIED GEOGRAPHICAL TECHNIQUES (PRACTICAL)

FULL MARKS: 100

Examination Time: **6 hours**.

13. Interpretation of geological maps and drawing of sections: Uniclinal, folds with unconformity and igneous intrusions (20 marks)
14. Interpretation of Indian Daily Weather Maps – Monsoon and Post Monsoon. (15 marks)
15. Remote Sensing (15 marks)
    a. Basic concept of remote sensing, EMR, Band
    b. Types of satellites and sensors with special reference to IRS series of satellites; types of resolutions and their applicability
    c. Principles of preparing standard false colour composite, landuse and land cover mapping from standard FCC with header information.
    d. Interpretation of aerial photograph – basic principles of aerial photography, side lap, end lap, flight line, air base, fudicial marks, .Principle Point, Nadir Point, Conjugate Principal Point,
    e. Preparation of aerial photo mosaics, demarcation of effective area, extraction of cultural and physiographic features within this area with preparation of interpretation key.
16. Geographical Information System. (15 marks)
    a. Concept of GIS and its applicability: Spatial and attribute data, raster and vector data structure and concept of information layers in GIS.
    b. Georeferencing of scanned maps and ascribing projection (Polyconic/ UTM)
    c. Digitisation of point, line and polygon layers; Attachment of appropriate attribute tables.
    d. Preparation of thematic maps from attached data: choropleth, pie chart and bar graphs.
17. Field Report: (10 report + 15 viva = 25 marks)

Guidelines for field report on rural mouza

- One rural mouza is to be selected and the followings are to be done:
- Landuse survey and preparation of landuse map
- Collection of socio-economic and physical data
- Classification and tabulation of data
- Preparation of maps and diagrams showing broad Physiography, drainage, settlement, demographic characteristics etc.
- The report is to be prepared preferably under the following sections:
- Introduction: Objective, extent and space relations, sources of information, methodology.
- Physical components: drainage, surface condition, slope, climate, soil vegetation, etc.
- Population: Number, literacy, occupational structure, religious composition, language, media exposure, per capita income (based on availability of data).
- Settlement: Number of houses, building materials, number and size of rooms, amenities (based on availability of data)
- Agriculture: irrigational facilities, general landuse, cropping intensity, production and marketing (based on availability of data).
- Other economic activities: Fishing, horticulture, brick-making industries (based on availability of data).

- Problems, prospects, suggestions and conclusion.
- Bibliography.
- Appendix

Guidelines for field report on urban area

- One urban area is to be selected and the followings are to be done:
- Landuse survey and preparation of urban landuse map
- Collection of socio-economic data
- Classification and tabulation of data
- Preparation of maps and diagrams showing urban morphology, communication networks, traffic flow, demographic characteristics, cultural and economic zonation etc.
- The report is to be prepared preferably under the following sections:
- Introduction: Objective, extent and space relations, sources of information, methodology etc.
- Physical components: Surface conditions, slope, drainage, climate etc.
- Population: Number, literacy, occupational structure, religious composition, language, media exposure, per capita income (based on availability of data).
- Town morphology: sectors of landuse.
- Economy: Economic individuality of the town, production and marketing patterns, spatial differences in occupation and per capita income characteristics (based on availability of data).
- Urban waste and its management: Types of wastes generated, network of drains, efficiency of waste removal and sewage treatment. peoples' perception of pollution problem (based on availability of data).
- Bibliography
- Appendix
- Maps and diagrams can be hand-drawn or done in computer
- Field report can be hand-written or computer printed.
- Page limit: maps/diagrams excluding photographs not to exceed 20 pages, text not to exceed 5000 words.

18. Laboratory Note Book and viva-voce (5 + 5 = 10 Marks)

PAPER-VIII: STATISTICAL TECHNIQUES AND CONTEMPORARY ISSUES IN GEOGRAPHY (PRACTICAL)

FULL MARKS: 50 + 50 = 100

Group-A: Statistical Techniques (50 Marks)

1. Nature of statistical data: discrete, continuous, parametric and non-parametric data.
2. Tabulation and classification of statistical data.
3. Frequency distribution: histogram, frequency polygon, ogive, normal and skewed distribution, measures of skewness.
4. Measures of central tendency: mean, median, mode, partition values : quartile, decile, percentile.
5. Measures of dispersion: mean deviation, quartile deviation, semi-quartile range, standard deviation and co-efficient of variation.

6. Simple bivariate correlation and regression trend line.
7. Time series analysis.
8. Laboratory Note Book and viva-voce (5+5=10 Marks)

Group-B: Contemporary issues in Geography (50Marks)
Section-A : Representation of climatic and hydrological data of the Indian Sub-continent.

1. a) Preparation and Interpretation of a climatic chart showing relationship between rainfall, temperature, pressure and relative humidity of a station for three months, preparation and interpretation of Taylor's Climograph and Hythergraph.

   b) Preparation of station models for different meteorological stations of India with the help of Synoptic chart.

2. Preparation and interpretation of rating curves, hydrographs and unit hydrographs of rivers flowing through the Indian Sub-continent.

Section-B: Economic and Human Development in Third World.

Questions to be set on any two items of the following exercises:

3. Computation of Human and Gender Development Index and ranking of countries/states/districts based on HDI and GDI.
4. Preparation of questionnaire schedule for assessment of development and for perception survey.
5. Measures of Spatial and size-class distribution.
6. a) Dominant-distinctive function.

   b) Rank-size rule.

   c) Lorenz curve.

7. Laboratory Note Book and via-voce (5+5=10 Marks)

Section 3: Suggested Readings

PAPER-I: GEOTECTONICS, GEOMORPHOLOGY & HYDROLOGY

Geotectonics

Cox, A. and Hart, R.B. 1986. Plate Tectonics: How it Works, Blackwell Scientific Publications, Oxford.

Duff, P.M.D. (Editor) 1994. Holmes' Principles of Physical Geology, English Language Book Society / Chapman & Hall, London.

Keary, P. and Vine, M. 1997. Global Tectonics, 2nd edition. Blackwell Scientific Publications, Oxford: ix+302p.

Powell, J. 2001. Mysteries of Terra Firma: The Age and Evolution of the Earth, Free Press, London: 272p.

Geomorphology

Ahmad, E. 1990. Geomorphology, Kalyani Pub. New Delhi.

Bloom, A.L. 1998. Geomorphology: A Systematic Analysis of Late Cenozoic Landforms, 3rd edition, Prentice Hall India Ltd. New Delhi.

Dayal, P. 1990. A Textbook of Geomorphology, Shukla Book Depot, Patna.

Fairbridge, S.W. Encyclopaedia of Geomorphology, Reinhold Corp. Ltd.

Faniran, A. and Jeje, L.K. 1983. Humid Tropical Geomorphology, Longman, London.

Kale, V.S. and Gupta, A. 2001. Introduction to Geomorphology, Orient Longman Ltd., Hyderabad.

Selby, M.J. 1985. An Introduction to Geomorphology, Clarendon, Oxford.

Singh, S. 2000: Geomorphology, 2nd edition, Prayag Pustak Bhavan, Allahabad..

Stahler and Strahler 2002: Geography and Man's Environment, John Wiely, New York.

Summerfield, M.A. (Editor) 1991. Global Geomorphology : An Introduction to the Study of Landforms, John Wiley and Sons Ltd., New York.

Thornbury, W.D. 1969. Principles of Geomorphology, 2nd edition, Wiley Eastern Limited, New Delhi.

Woolridge, S.W. and Morgan, R.S. 1959. Outline of Geomorphology: The Physical Basis of Earth, Longman, London.

Hydrology and Oceanography

Chorley, R,J. and Kates, R.W. (Editors) 1969. Water Earth and Man, Methuen, London.

Chow, V. T, Maidment, D. R. and Mays, L. W. 1988 : Applied Hydrology, McGraw Hill, New York

Meinzer, O. E. 1942 : Hydrology, Dover Publication Inc. New York.

Sharma, R.C. and Vatal, M. Oceanography for Geographers, Chaitanya Pub. House, Allahabad.

Todd, D. K. 1959 : Ground Water Hydro-logy, John Wiley and Sons, New York.

PAPER-II: ECONOMIC GEOGRAPHY & POPULATION GEOGRAPHY

Brock and Webb. Geography of Mankind.

Chand and Puri: Regional Planning.

Chandna, R.C. 2000. Population, Kalyani Publishers, New Delhi.

Clark, G.L., Gertler, M.S. and Feldman, M.P. 2003. The Oxford Handbook of Economic Geography, Oxford University Press, Oxford.

Guha, J .L. and Chattoraj, P.R. 1998. A New Approach to Economic Geography: A Study of Resources, 15th edition, World Press, Calcutta.

Guha, J. L. and Charraraj, P. R. 1992 : Human and Economic Geography, World Press, Calcutta.

Hartshorn, T.A. and Alexander, J.W. 1988. Economic Geography, 3rd edition, Prentice- Hall India Ltd., New Delhi.

Jones and Darkenwald: Economic Geography

Khullar India, Janasankha Bhugol. Rajya Pustak Parishad.

Leong, G. C. and Morgan, G. C. 1982 : Human and Economic Geography, Oxford University Press, Kuala-Lumpur.

Leong, G.C. and Morgan, G.C. 1982. Human and Economic Geography, 2nd edition, Oxford University Press, Oxford.

Mamoria, C. B. 1984 : Economic and Commercial Geography of India, Shivlal Agarwal Publication Co. Agra.

Sharma, T. C. and Coutinho, 1988 : Economic and Commercial Geography of India, Vikas Publishing House, New Delhi.

United Nations Populations Fund 1997. India Towards Population and Development Goals, Oxford University Press, New Delhi.

Weddell, B.J. 2002. Conserving Living Natural Resources in the Context of a Changing World, Cambridge University Press, Cambridge: 442p.

PAPER-III: CLIMATOLOGY, SOIL GEOGRAPHY & BIOGEOGRAPHY

Climatology

Barry, R.G. and Chorley, R.T. Atmosphere, Weather and Climate, 7th edition, Routledge, London.

Critchfield, H.J. 1983: General Climatology, 4th edition, Prentice Hall India Ltd., New Delhi..

Das, P.K. 1995. Monsoons, 2nd edition, National Book Trust, New Delhi..

Lal, D.S. 1993. Climatology, 3rd edition, Chaitanya Pub. House, New Delhi..

Sidhartha, K: Atmosphere, weather and climate

Trewartha, G.T: An Introduction to Climatology.

Soil Geography

Biswas, T.D. and Mukherjee, S.K. 1987. Textbook of Soil Science, Tata-McGraw-Hill..

Brady, N.C. and Weil, R.R. 1996. The Nature and Properties of Soil, 11th edition, Longman, London.

Floth, H.D. 1990. Fundamentals of Soil Science, 8th edition, John Wiley and Sons, New York.

Morgan, R.P.C. 1995. Soil Erosion and Conservation, 2nd edition, Longman, London.

Joffe J.S: ABC of soil, Pub Oxford Book Company

Biogeography

Chapman J.L. and Reiss, M.J. 1993. Ecology: Principles and Applications, Cambridge University Press, Cambridge.

Dash, M.C., 2001. Fundamentals of Ecology, 2nd edition, Tata McGraw-Hill, New Delhi.

Kormondy, E.J. 1996. Concepts of Ecology, 4th edition, Prentice-Hall, India, New Delhi.

Odum, E.P. 1997. Ecology: A Bridge between Science and Society, Sinaur Associates Inc. Publishers, Sunderland.

Sharma. P.D. 1996. Ecology and Environment, 7th edition, Rastogi Publications, Mirat..

Simmons I.J: Ecology of Natural Resource.

Simmons, I. G. 1980: Biogeographical Processes, George Alien and Unwin, London.

Spellerberg, I.F and Sawyer, J.W.D. 1999. An Introduction to Applied Biogeography, Cambridge University Press, Cambridge..

World Wide Fund for Nature-India (Eastern Region) 1995. Nature Conservation Handbook, Calcutta.

PAPER-IV (PRACTICAL) : CARTOGRAPHIC TECHNIQUES IN GEOGRAPHY

Kanetkar, T.P. and Kulkarni, S.V. 1988. Surveying and Levelling, Part I, Pune Vidyarthi Griha Prakashan, Pune: 608p.

Kellaway, G.P. 1979. Map Projections, 1st Indian edition, B.I. Publication, Delhi.

Monkhouse F.J. and Wilkinson, H.R. 1971. Maps and Diagrams: Their Compilation and Construction, B.I. Publications Private Limited, New Delhi: 527p.

Roy, P. 1988. An Analytical Study of Map Projections, Volume 1, Pub?, Kolkata.

Sarkar, A.. Practical Geography: A Systematic Approach, Orient Longman Ltd., Hyderabad: p.

Suggested Readings for Part III under preparation

West Bengal State University

(Barasat, North 24 Parganas)

Following is the syllabus finalized by the Under Graduate Board of Studies in Zoology, Fishery and Industrial fisheries, Sericulture of the W.B.S.U. for the 3-year B. Sc. Honours Course in Zoology. The Part I syllabus has been given in details here which is to be followed from the academic session of 2010-2011. A detailed curriculum on the Part I syllabus is also available now. The details of the Part II and Part III syllabus will follow.

Zoology Hons. **Full marks-800**

PART-I (200 Marks)

Paper-01: Diversity of Animals and Animal behaviours Theory (Full Marks 100)

Module ZH101 (10) : Living kingdoms and protozoans

1. Introduction to the modern classification of living organisms into Kingdoms, magnitude of diversity of living organisms: estimated species richness

2. Introduction to the Kingdom Protozoa: Classifications (up to Phylum only) and examples; Special topics (brief outlines only): contractile vacuoles, structures of cilia, reproduction in *Paramoecium*.

Module ZH102: Non-Chordates (35)

1. Species diversity and classifications of non-chordate phyla (upto the levels as mentioned below) with salient features and prominent examples of the animal groups:
Poriferans, Cnidarians, Ctenophorans, Platyhelminths, Aschelminthes, Annelids, Molluscs, Echinoderms, Arthropods (upto subclass),
Rotifera, Bryozoa, Hemichordata (only salient features of the Phyla)

2. Special topics to understand the diversity of non-chordate structures and functions:
2.1 Body planes and symmetries, coelom, deuterostome vs protostome (only preliminary conceptual outlines)
2.2 Polymorphisms in Cnidaria
2.3 Coral reef: types, formation, distribution, conservation significance
2.4 Torsions in Gastropods
2.5 Cyclomorphosis in Rotifers
2.6 Excretion in invertebrates with special reference to flame cells, nephridia, coelomoducts and malpighian tubules
2.7 Gas exchange by gills and trachea in Arthropods
2.8 Water vascular system and haemal system in Echinoderms
2.9 Brief overview of invertebrate larval forms

Module ZH103: Chordates (35)

1. Chordate Classifications : (up to orders with salient features and examples, except for birds and mammals only names and examples of the orders)

2. Chordates: special topics reflecting diversity of adaptations
2.1 Feeding in Cephalochordates and Urochordates
2.2 Larval form and metamorphosis in Ascidians
2.3 Experimental analysis of function of a vertebrate structure: study of feeding strike of a venomous snake
2.4 Biting, venom delivery and feeding in snakes
2.5 General features of vertebrate integument and its specialization with reference to exoskeletons
2.6 Evolution of aortic arches in vertebrates
2.7 Evolutionary trend in vertebrate brains
2.8 Tripartite concept of kidney organization
2.9 Ruminant stomachs- Digestive tract specializations as fermentation chambers in herbivore mammals
2.10 Dentitions in vertebrates
2.11 Vertebrae: different types

Module ZH104: Animal Behaviour (20)

1. Tinbergen's four questions on studying animal behaviour;
2. Definitions and examples of– habituation, instinctive behaviour, FAP, imprinting and other programmed learning, cultural transmission
3. Social animals- advantages and disadvantages of living in a group, examples of social animals and outline of their social structures
4. Definition and examples of altruism, eusociality, units of selection (just preliminary ideas)

Paper 02: Evolution and Preliminary Knowledge for Quantification in biology
Theory (Full Marks 50)

Module ZH201: Evolution (35)

1. Rise of evolutionary theories: the historical outline- conflict between creationists' idea and evolutionary theories, Lamark's theory, Theories proposed by Darwin and Wallace, modern form of Darwinian theory including modern synthehesis

2. H-W theorem and its significance in evolutionary theory, calculating gene frequencies for H-W and non-H-W populations (very simple problems only), Variations in natural populations.
3. Nature and actions of natural selection – evolution of industrial melanism in *Biston betularia* as example,
4. Genetic Drift, Gene Flow and Mutation Rate (only definitions and outlines of these processes, details of nature of actions by each, mathematical models not necessary)

5. Critical concepts (only preliminary and brief discussions)-

5.1 Application of the concept of adaptation- precise definition of adaptation in evolutionary sense, critique of `adaptationist program'
5.2 Trends in the evolution of modern horses- outlines only
5.3 Measurement of rates of evolution – with the example of equine teeth including allometry
5.4 Punctuationist vs. gradualist mode of evolutionary changes
5.5 Heterochrony – as a process of macroevolution, just definitions of the heterochronic processes and examples, including Neoteny and Progenesis
5.6 Process of speciation: concept of reproductively isolated species and models of speciation- Allopatric, Sympatric and Parapatric models
5.7 Recent knowledge about hominid evolution: a brief outline

Module ZH202: Preliminary knowledge for quantification in biology (15)

1. Logarithm, Matrices, Permutation and Combination, Probabilities (just preliminary concepts and very simple problems to be worked out)

2. Graphical representation of data- bar chart, histograms, scatter plots, pie charts; Discrete and Continuous variables-examples, Normal distribution (only primary characteristics and examples, detailed mathematical characterizations not required); Mean, Mode and Median, Standard deviation, Variance and Standard error; Simple Correlations; concept of Hypothesis Testing, Tests for goodness of fit- Chi-square, Student t-test for comparing means of two small samples from normal populations.

Paper-03: Practicals **(Full Marks 50)**

Module ZH301: Morpho-anatomical studies (23)

Study of distinctive characters in the external morphologies of (5) -
Crab, Prawn, *Achatina* , *Pila*, *Lamellidens*, Honeybee, Spider, Leech, Sea Star, Dogfish, Flatfish, Rohu, *Mystus*, Toad, Frog, House lizard, Garden lizard, Checkered keelback snake, Russel's viper, Pigeon, Bat

Study of exoskeletons (3): fish scales (ctenoid, placoid and cycloid), feathers (different types found in a pigeon

Study of skeleton and identification of skulls (5):
Skeleton of a guinea-pig,
Skulls of- toad, garden lizard, venomous and non-venomous snakes, bird, dog.

Dissecting the body to reveal anatomical peculiarities (10): in cockroach: digestive system, nervous system, male and female reproductive systems; in *Tilapia*/*Oreochromis* (urino-genital system, brain and vagus distribution, pituitary gland)

Module ZH302: Identifying important and common animals (12)

Mention the systematic position, specimen name and specimen characters only for the following animals:
Paramoecium, Sponge (*Scypha* and common freshwater sponge), Jelly fish, *Obelia* colony, *Taenia solium*, Liver fluke, *Ascaris*, *Nereis*, *Limnea*, *Bellamya*, Octopus, Cuttle fish, *Daphnia*, *Scylla*, *Ocypode*, *Penaeus*, Scorpion, Cerambycid beetle, Water scorpion, Preying mantis, Aphid, Earwig,

Bumble bee, Potter wasp, *Polystes* wasp (common yellow wasp), Sea-star, Sea cucumber, Sea-urchin, Sea-lily, *Balanoglossus*, *Ascidia*, Amphioxus, *Petromyzon*, Myxine, Sting Ray, Flying fish, *Monopterus cuchia*, Caecilian, Tree frog, Salamander, Axolotl larva, Skink, *Varanus, Ptyas, Naja*, Russel's viper, Bandicoot, *Mus musculus*, Flying fox, Pippistrel bat

Module 303: Outdoor animal watching (5):

Field trips to any locations suitable for watching animals in their natural habitats and natural mood as much intensively as possible (for example, watching surface swimming insects in a stream or pond, the inter-tidal fauna in estuary or coast, bird watching, butterfly watching, etc.) and noting down own observations in a field diary.

Lab note book: 5 (should include actual lab sketches)

Viva voce: 5

***Readings Suggested* :**

Text Books

Pechenik, J.A., Biology of Invertebrates, TMH, 2002

Kardong, K. V., Vertebrates, 3rd ed., TMH ed.2002

Taylor, Green and Stout, Biological Sciences Cambridge LPE

Manning, A. and M. S. Dawkins, M.S., An Introduction to Animal Behaviour, Cambridge Univ. Press, Indian Ed.

Ridley, Mark, Evolution, Blackwell, 2nd Ed., 1999

Reference books :

Rupert, E.E**.,** R.S. **Fox and** R.D. **Barnes**, Invertebrate Zoology: A functional Evolutioanry Approach, Thomson, 7th Ed, 2004

Pough et al., Vertebrate Life, Pearson LPE, 6th ed., 2003

~~**Hildebrand,**~~ **M.,** Analyses of Vertebrate Structure**,** John Wiley & sons, 1995

Meglitsch, Paul A. & Frederick R. Schram, Invertebrate Zoology, OUP, 3rd edition,1991.

Gadagkar, R. Survival Strategies, Universities Press

Chapman, J.L. and **M.J. Reiss,** Ecology: principles and applications**,** Cambridge LPE

Futuyma, D., Evolutionary Biology, Sinauer Associates

And relevant web materials

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PART-II-200 Marks

Paper-04: Genetics, Cell and Molecular Biology, Biochemistry and Biophysics (100)

Module 401: Genetics (20)
Module 402: Cell and Molecular Biology (40)
Module 403: Biochemistry and biophysics (40)

Paper 05: Theory (50)

Module 501: Taxonomy and Systematics (10)
Module 502: Ecology, Biodiversity and Conservation (40)

Paper 06: Practicals (50)

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PART-III-400 Marks

Paper-VII: Theory (100)

Module 701: Animal Physiology (40)
Module 702: Endocrinology and Reproductive biology (30)
Module 703: Immunology (20)
Module 704: Parasitology (10)

Paper VIII: Theory (100)

Module 801: Developmental Biology (25)
Module 802: Histology (15)
Module 803: Environmental Pollutions and Toxicology (15)
Module 804: Microbiology (15)
Module 805: Medical Zoology (10)
Module 806: Economic Zoology (20)

Paper 09: Practicals (100)

Paper 10: Practicals (100)

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SYLLABUS
For The
B.Sc in Zoology (Hons)

The following syllabus* (Part II) *has been finalised by the UG-BOS in Zoology of W.B.S.U for being implemented from the year 2011

PART II - 300 Marks

Paper-IV (Theory) : Genetics, Cell and Molecular Biology, Biochemistry and Biophysics (100)

Group A (50) : Genetics, Cell Biology and Molecular Biology

Module 401: Genetics (20)

1. Significance of Mendel's experiments and laws, Concepts and examples of -Test Cross and Back Cross, Incomplete Dominance/Codominance, Multiple Alleles, Epistasis, Polygenic inheritance
2. Chromosomal aberrations, gene mutations and human diseases (Down's, Klienfelter's, Turner's, Cri du Chat, Sickle cell, Haemophilia, Thallassimia, Albinism – only genetical aspects here, details of physiological consequences not required), Sex chromosomes and sex-linked inheritance
3. Linkage and Recombination – Types and outcome, linkage disequilibrium, 3-point cross

Module 402: Cell Biology and Molecular Biology (30)

1. Units of biological measurements and microscopy
2. Plasma membrane : lipid bilayer, membrane proteins and membrane transport - brief outline only
3. Other organelles : introduction to structure and functions of mitochondria, GERL
4. Cell Cycle : preliminary concept
5. Replication : only outline of the mechanisms
6. Transcription : only outline of the mechanisms
7. Translation : only outline of the mechanisms
8. Gene expression-lac operon, trp operon (only introductory outline of the processes)
9. Types of mutations
10. Transposable genetic elements (preliminary introductions)
11. Genetic engineering- preliminary concepts and common examples
12. Introductory principles of common methods used in cellular and molecular biology: PCR, RFLP, DNA fingerprinting, Gene sequencing

Group B : Biochemistry and Biophysics (50)

Module 403: Biochemistry (30)

1. Chemical evolution of biomolecules (outline only)
2. Biological significance of water
3. Structural identities of biomolecules : Carbohydrates, Amino Acids, Peptides, Lipids (preliminary outlines of lipids), nucleic acids
4. Enzymes (major classes of enzymes –mode of actions and examples) and enzyme kinetics
5. Metabolic pathways: Glycolysis, HMP shunt, Kreb's cycle, electron transfer system (outline), Gluconeogenesis, Glycolysis, beta oxidation,

Module 404 : Biophysics (20)

1. Three-dimensional structure of proteins (preliminary concepts only) : peptide bonds, alpha helix, beta conformation, common examples of globular proteins
2. Structure of nucleic acids (preliminary concepts only) : DNA and RNAs
3. Chromosome structure including Nucleosomes (preliminary concepts only)
4. Introductory principles of common methods used in biochemistry and biophysics : Chromatography, Ultracentrifuge, Electrophoresis, X-ray crystallography, Immunoeletrophoresis & Western blotting

Paper V (Theory): Taxonomy, Ecology, Biodiversity & Microbiology, Parasitology, Immunology (100)

Group A (50): Taxonomy and Systematics, Ecology and Biodiversity

Module 501: Taxonomy and Systematics (10)

1. Modern definitions of taxonomy and systematics, philosophy and working of modern taxonomy, Linaean hierarchy,
2. Concept of a species in taxonomic practice
3. ICZN and its important rules,
4. Cladistics: simple introductory concept and examples.

Module 502: Ecology (25)

1. Ecology of populations: survivorship curves, life history tables, age-sex

pyramids, population growth models (exponential and logistic models only)
2. Ecology of communities : defining a community, measuring species diversity, species interactions (competition and coexistence, predation, herbivory, mutualism), succession and concept of climaxes, Theory of Island Biogeography (introductory concepts only)
3. Ecosystems ecology: trophic structure, energy flow, nutrient cycling

Module 503 : Biodiversity and Wildlife Conservation (15)

1. Biodiversity: concept of biodiversity, Importance of biodiversity, biodiversity hotspots, India- a megadiversity country, CBD, Indian Biodiversity Act.
2. Wildlife Conservation: Major forest types and their locations in India, Major wildlife of India - their Indian distribution, present status, conservation efforts (PAs- major sanctuaries and national parks, Indian Wildlife Act, IUCN categories, Project tiger as a case study)

Group B (50): Microbiology, Parasitology, Immunology

Module 504: Microbiology (15)

1. The study of microbial structure
2. Microbial Nutrition
3. Microbial growth
4. Control of Microorganisms by Physical and Chemical agents
5. Pathogenicity of Microorganisms
6. Human diseases caused by Virus (polio, avine influenza) Bacteria (cholera, tuberculosis), Fungi (ringworm)

Module 505: Parasitology (15)

1. Concept of parasitism
2. Origin and evolution of parasitism, host parasitic interactions,
3. Parasitic adaptation: physiological, bio-chemical, Zoonosis, Myasis
4. Identifying characters, life cycles, mode of infections of important parasites – *Entamoeba*, *Giardia, Fasciola, Taenia, Ascaris*

Module 506: Immunology (20)

1. What is Immunology: a short preview of the development of the subject
2. Innate (Nonspecific) and Acquired (Specific) immunity.
3. Central dogma of Immune system: (a) Cells of Immune system (b) Organs of Immune system- Primary & Secondary lymphoid organs.

4. Concept of Antigen & Antigen Presentation: Antigenic determinant (for ABO and Rh group only)
5. The Major Histocompatibility Complex : Antigen processing & presentation
6. Concept of T Cell-Antigen recognition and activation [Intracellular signal transuding enzymes excluded] : Structure and function of TCR complex, APC-T Cell interaction,
7. Concept of B Cell Activation and Antibody production [Intracellular signal transuding enzymes excluded]: Structure & Function of Immunoglobins [class switching among Immunoglobin gene excluded].Antigenic determinants of Immunoglobins (Isotype, Allotype & Idiotype).
8. Cytokines (source & function of IL-1, IL-2, IL-4, IL-5, IL-6, IL-8, IL-10, IL-12, Interferons, Tumor Necrosis Factors, Tumor Growth Factors, GM-CSF, M-CSF).
9. The Complement System (Basic concepts & Types only)
10. Techniques in Immunology: ELISA, RIA, Immunodiffusion Techniques,

Paper VI: Practicals (100)

Group A : 50

1. Pedigree analyses (8) : simple pedigrees of Mendelian and common sex-linked traits
2. Statistical tests of data and decision making (8) : Chi square test for goodness of fit and student t test for comparing means of two small samples from normal populations (paired/unpaired)
3. Database preparation, analyses and graphical presentation by EXCEL in Microsoft/Open Office (7)
4. Ecological study (12) – Sampling techniques in field ecology- Quadrat, Transects, Pitfall, Measuring species diversity of given sample of a community
5. Documentation of local fauna (5): documentation of different species of wild birds, mammals, butterflies, mollusks, fishes, amphibians, reptiles, any other common group of animals (any one group to be chosen by the college for a year and not to be repeated in succeeding year) found naturally in the localities around the college.
6. Viva voce (5)
7. Lab Note book (5)

Group B : 50

1. Uses of microscope, stages and occular micrometer and camera lucida for cellular study (5)
2. Chromosome preparations : Onion root tip (mitotic stages), Grasshopper testes (meiotic stages) and Drosophila larvae (Polytene chromosome and imaginal disc) (15)
3. Biochemical tests (20)- Qualitative tests for unknown carbohydrates and proteins, colorimetric assay of protein (Lowry's method) and glucose (

Nelson and Somogyi method), Preparation of Buffers – PBS, TRIS-Cl,
4. Viva voce (5)
5. Lab Note book (5)

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Text books and references will be prescribed along with the detailed curriculum, soon to be available in this website

Module 401: **Genetics**
Text Book :
Principle of Genetics by Robert H. Tamarin
TMH, 2002
Or
Principles of Genetics by Gardner et al.
8th Ed. Wiley Paper back
References :
Genetics : Analysis of Genes and Genomes by Hartl and Jones; 6th ed., Jones and Bartlett publishers, 2005
Genetics by Strickberger

Module 402: **Cell and Molecular Biology**
Text Book :
Chapters on Cellular structures and Molecular Biology in Integrated Principles of Zoology by Hickman, Roberts and Larson; McGrew Hill
or
Principle of Genetics by Robert H. Tamarin
TMH, 2002
Or
Principles of Genetics by Gardener et al.
8th Ed., Wiley Paperback
References :
Molecular Biology of the Cell by Alberts et al.
Molecular Biology of the gene by Watson et al.
Lehninger Principles of Biochemistry by Nelson and Cox

Module 403: **Biochemistry**
Text Book :
Chapters on Biomolecules and biochemical processes in Integrated Principles of Zoology by Hickman, Roberts and Larson; McGrew Hill
or
Lehninger Principles of Biochemistry by Nelson and Cox
Or
Biochemistry by Stryer
References :
Harper's Illustrated Biochemistry, 28th ed.

Module 404: **Biophysics**
Text Book :
Lehninger Principles of Biochemistry by Nelson and Cox
Or
Biochemistry by Stryer
References :
Standard Internet Sources

Module 501: **Taxonomy and Systematics**
Text Book :
Taxonomy and Systematics by Mayr and Ashlock
References :
Standard internet sources

Module 502: **Ecology**
Text Book :
Ecology : Theory and applications by Peter Stiling, PHI-EEE, 4th edition
References :
Ecology: principles and applications by Chapman and Reiss, Cambridge Low Priced ed.,
Ecology by Charles Krebs

Module 503: **Biodiversity and Wildlife Conservation**
Text Book/ source :
Webpages for Biodiversity, Indian Forests and Wildlife at en.wikipedia.org/wiki
Biodiversity Profile of India in Madhav Gadgil's Home page at ces.iisc.ernet.in/hpg/cesmg/indiabio.html
Biodiversity and Species category Homepages at www.iucn.org

Module 504: **Microbiology**
Text Book :
Microbiology by Prescott, Harley & Klein, 5th Edition; 2002
Or
Microbiology by Pelczar et al. Mc Grew Hill, 5th Ed.
References :
Standard internet sources

Module 505: **Parasitology**
Text Book :
Outlines & Highlights For Human Parasitology By Roberts and Janovy, Academic Internet Publishers, 6th Ed.
Or
Parasitology by Bogitsh, Carter and Alteman, Academic Press, Indian Edition, 2006

References :
Outlines & Highlights For Human Parasitology By Bogitsh, Academic Internet Publishers

Module 506: **Immunology**
Text Book :
NMS-Immunology by R. Hyde, Williams and Wilkins
Or
Basic Immunology : Functions and disorders by Abbas and Litchman, W. B. Sanders & Co.
References :
Kuby's Immunology by Goldsby, Kindt and Osborn, W.H. Freeman

Background reading: Students are advised to read thoroughly the following text book before reading topics in the text books specified above to develop their fundamental understanding of the subjects.

Integrated Principles of Zoology by Hickman et al., McGrewHill 11th ed. or later editions. (Free downloadable soft copies of the book is also available through internet)

Students are also to be encouraged to use free internet sources including free downloadable softcopies of books on relevant subjects

For achieving good results, students are advised to study prescribed text books and other reading materials thoroughly and thoughtfully instead of mugging readymade notes.

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Question patterns :

Questions of 1, 3 and 5 marks totalling the assigned marks for the module from each module in all paper.

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Please note that the marks and paper distribution for three years / parts of B.Sc. in Zoology (Hons) would be following. The syllabus and marks distribution for Part I remain as it is now ongoing (implemented for the first year of 2010-2011). *Any previously prescribed pattern of syllabus and marks distribution for the Part II and Part III for B.Sc. in Zoology (Hons) is to be ignored.*

PART-II : 300 Marks

Paper-04 (Theory): 100 marks

Group A: Genetic & Cell and Molecular Biology
Module 401: Genetics (20)
Module 402: Cell and Molecular Biology (30)

Group B: Biochemistry and Biophysics
Module 403: Biochemistry (30)
Module 404: Biophysics (20)

Paper 05 (Theory) : 100 marks

Group A : Taxonomy and Systematics, Ecology, Biodiversity and Wildlife Conservation (50)
Module 501: Taxonomy and Systematics (10)
Module 502: Ecology (25)
Module 503: Biodiversity and Wildlife Conservation (15)

Group B : Microbiology, Parasitogy and Immunology (50)
Module 504: Microbiology (15)
Module 505: Parasitology (15)
Module 506: Immunology (20)

Paper 06 (Practicals): 100 marks

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PART-III : 300 Marks

Paper-07 (Theory) : 100 marks

Module 701: Animal Physiology (40)

Module 702: Histology and Histopathology (20)
Module 702: Endocrinology and Reproductive Biology (40)

Paper-08 (Theory) : 100 marks

Module 801: Developmental Biology (35)
Module 803: Environmental Biology and Toxicology (20)
Module 804: Medical Zoology (10)
Module 805: Economic and Applied Zoology (35)

Paper 09: Practicals (100)

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West Bengal State University

(Barasat, N-24 Parganas, India, Pin Code 700126)

PART-III-300 Marks

***DRAFT SYLLABUS* (June 2012)**

Paper-VII: Theory (100)

Module 701: **Animal Physiology (40)**

1. Transport across cell surface membrane, Donnan membrane equilibrium
2. Functions of mammalian blood: Oxygen transport and CO_2 transport
3. Neurophysiology: Generation of action potential and propagation of nerve impulse in myelinated and non-myelinated nerve fibers. Synaptic and neuro-mascular junctions : structure and functions
4. Respiration: gill respirations in fishes, respiration in air-breathing fishes, respiration in avian lungs
5. General architecture of skeletal (striated) muscle and smooth muscle; Ultrastructure of skeletal muscle sarcomere, molecular structure of actin and myosin, Muscle contraction: sliding filament theory
6. Swim bladder and its functions in teleost fishes
7. Water and osmotic regulations : problems in marine cyclostomes, elasmobranchs and teleosts, freshwater teleosts, in hot desert environments(camel) and examples of significant adaptations solving it by different animal groups
8. Urine formation in human kidney
9. Bioluminescence: occurrence, mechanism of production

Text Book:
Animal Physiology by Kurt Neilsen-Schmidt, Cambridge Univ. Press, New Delhi, 2002 Indian Ed.
References:
Textbook of Medical Physiology by A.C. Guyton & J.E. Hall

Module 702: **Endocrinology and Reproductive biology (40)**

1. Classification of vertebrate hormones based on chemical nature and mechanism of action (names and examples only).
2. Hormone delivery systems: Endocrine, neuroendocrine, paracrine, neurocrine, autocrine (Definitions and examples only)
3. Feed back control of hormone secretion: negative and positive.
4. Hormone biosynthesis (including sites of synthesis, outlines only): Thyroid hormones (T_3, T4), testosterone, estrogen, progesterone, adreno-cortical hormones, Insulin, Adrenal catecholamines.

5. Physiologic functions of hormones: Insulin, glucagon, T3 and T4.
6. Hormonal control of spermatogenesis
7. Hormonal control of mammalian ovarian cycle, differences between estrous and menstrual cycle.
8. Mechanism of hormone actions (outlines only): cytoplasmic receptor, nuclear receptor, membrane receptor, HRE, HSP, cAMP, cGMP, IP3—DAG, tyrosine kinase, calcium-calmodulin
9. Endocrine disorders (*symptoms and causes only*): Diabetes insipidus; IDDM & NIDDM, Hypothyroidism and hyperthyroidism, Conn's and Cushing's syndrome.

Text Book :
Endocrinology by Turner and Baxter
References:
Textbook of Medical Physiology by A.C. Guyton & J.E. Hall

Module 703: **Histology (20)**

1. Basic tissue types: epithelial, connective, cardiac and nervous tissue(typical structure of neuron and types of neuron, glial cells etc)
2. Membrane specializations of epithelia. (Intercellular surface [cell junctions], luminal surfaces and basal surfaces.).
3. Exocrine glands: Types and discharge of secretory products (merocrine, apocrine, holocrine).
4. Principles of tissue fixation, staining,
5. Histology of: stomach, pancreas, testis, ovary, thyroid, lymph node. (Outline of structures).
6. Histological structure of mammalian nephron and functions of each regions.

Text Books :
Basic Histology: Text & Atlas by Luiz Carlos Junqueira et al. Macgrew-Hill (also visit-http://www.freeebook4u.net/2011/03/basic-histology-text-atlas-11th-edition.html)
References:
1. Histology: A Text and Atlas by Ross & Reith. Lippincott williams
2. Histology & Cell Biology by Kurt E. Johnson; Harwal Publishing Company
3. A Text book of Histology: practical guide by J.P. Gunashekharan, 2nd Ed. Elsivier India

Paper VIII: Theory (100)

Module 801: **Developmental Biology (30)**

1. Outlines of historical concepts and experiments in the emergence of developmental biology- Induction, Fate map, Spemann and Mangold's organizer transplant experiments, von Baer's laws.
2. Germ layers and its contributions to the development of different tissues in vertebrates.

3. Origin of germ cells, Structural features of sperms and eggs in sea urchins and in mammals, Gametogenesis in mammals,
4. Fertilization: external fertilization in sea urchins, internal fertilization in mammals (in depth molecular details not required)
5. Cleavage : Types of cleavage found in animals and animal groups that exhibit a type, outlines of cleavage process in *C. elegans*, Zebra fish and *Xenopus* and chick
6. Gastrulation: generalized patterns, brief outlines of the process in *C. elegans*, Zebra fish, *Xenopus* and chick
7. Organogenesis : development of brain in chicken
8. Conceptual outlines (very brief) of – Cell potency and Stem Cells, Sex determination in *Drosophila* and Man, Environmental sex determination in reptiles. HOX genes in development

Text Books :
Principles of Development : by Lewis Wolpert, Jim Smith, Tom Jessell, Peter Lawrence (3rd Ed. OUP, India)
References :
Developmental Biology by Scott Gilbert

Module 802: **Environmental Pollutions and Toxicology (20)**

1. Environmental pollutions (nature and sources of pollutants, impacts on ecosystems and humans, remedies): water, soil, air and sound pollutions
2. Environmental laws: major ones applicable in West Bengal
3. Toxicology: including its significance as a branch of Science
4. Dose-response relationships
5. In vivo and In vitro toxicity tests
6. Introduction to the concepts of detoxication mechanisms

Text Books:
1. Rana, S. V.: Environmental Pollution - Health and Toxicology
2. Curtis D Klaassen: Casarett and Doull's Toxicology

Module 805: **Medical Zoology (15)**

1. Mosquito-borne diseases: Malaria and Filaria- causative agents, their life cycle, modes of infections in man, major modes of treatments, major vector species in India, their ecology and life cycles, control measures
2. Mosquito-borne diseases: Dengue and DHF, Chikungunya- causative virus, symptoms and treatments
3. Visceral Leishmaniasis (Kala-azar)- causative species and vectors in West Bengal
4. Common ticks and mites in human surroundings and diseases caused by them

Text Book:
Hati, A. K., Medical Entomology, Allied Publishers

Module 006: **Economic Zoology (35)**

1. Fishes and fishery: diversity of indigenous freshwater, estuarine, marine fishes and shell fishes in West Bengal. Invasive and exotic species of fishes in West Bengal. Techniques of modern pisciculture and prawn culture. Problems related to wild prawn seed collections in Sunderbans, fish productivities in India and West Bengal, ecology and degradation of freshwater fish habitats and decrease in wild fish stocks (very brief idea)

2. Sericulture: silks and silk worms, sericulture practices- methods, scopes and problems

3. Apiculture: Honey bees and their behaviours in relation to bee-keeping, popular methods of bee keeping, scopes and problems

4. Lac culture: Lac and lac insects, host plants and lac cultivation, scopes and problems

5. Poultry birds: different breeds, their advantages and disadvantages, importance of indigenous breeds

6. Cattle, goats and lambs: different breeds, their advantages and disadvantages, importance of indigenous breeds

Text Books:
Economic Zoology- Shukla and Upadhyaya. Rastogi Pub., 2nd Ed, 2005
References :

- Fish and Fisheries of India by Jhingran. Hindustan Publishing
- Encyclopedia of Economic Zoology. 2 vols. By Khan, A. A. (Editor), 2007. Anmol Publications. 2007
- Freshwater Aquaculture by Santhanam *et al.*
- Aquaculture by T. V. R. Pilley
- Animal Husbandry by G. C. Banerjee
- Sericulture & Silk Industry by D. C. Sarkar
- Lac Culture by N. Ghorai
- Bee keeping in India by ICAR
- Livestock & Poultry Production by Singh and Moore

Paper IX: Practical (100)

GROUP A : Full Marks 50

1. Physiology: Blood slide preparations (from goat/rat) to identify and study the characteristic features of different types of WBC, total count of WBC. Determination of haemoglobin content of goat/rat blood by Sahli's haemoglobinometer. Human B.P. and pulse measurements etc. (15)

2. Microtomy: Paraffin section cutting and mounting, H&E staining of histological tissues and identifying the stained slide (name, identifying characters only). [fixation and paraffin embedding procedure should be demonstrated in the class] (15)

3. Determination of soil and water pH (With pH meter); Quantification of free CO_2 and dissolved O_2 (Winkler's Method) in water sample (10)

4. Viva voce (5)

5. Lab Note Book (must include actual lab notes and sketches) (5)

Group B : Full Marks 50

1. Developmental Biology: Identification of chick's embryonic stages (at 24, 48 & 96 hrs. of incubation. Identification of fry stages of a carp fish (any cultivated carp species) (10)

2. Morpho-metric studies: mouth parts and fins of fishes (any major Carp, *Mystus*, Tilapia), different aspects of shells of *Acatina*, *Pila*, *Bellamya*, Ants (Total length, Head length, Trunk and Petiole length, Gaster length of any big sized easily available ant like *Camponotus*, *Oecophila*, *Tetraponera*) (15)

3. Medical entomology: Identifications of *Culex*, *Aedes* and *Anopheles* mosquitoes from whole mount dry specimens. Identification of *Plasmodium*, *Entamoeba*, *Giardia*, *Fasciola*, *Ascaris*, *Wuchereria* (15)

4. Viva voce (5)

5. Lab Note Book (must include actual lab notes and sketches) (5)