M.Sc. (Life Sciences) I Semester

Course Title: Physics-Remedial (LSC 101)

Mechanics: Measurement, Forces, Torque, Dynamics, Energy, Momentum, Properties of Matter, Fluids, Liquid. Solids, Gases; Wave Phenomena; sound, light and Radiation, Optics
Electricity Magnetism and Electrodynamics including Instrumentation (Basic Principles, Meters, amplifiers and transducers)
Modern Physics: Quantum mechanics, Radioactivity, Information Handling and Processing.

Course Title: Mathematics-Remedial (LSC 102)

Real number system, Quadratic equations, summation of series in A.P. and G.P., Elements of co-ordinate geometry - straight line, circle, parabola ellipse, hyperbola, sects, relations and functions limit, continuity, differentiation
Trigonometric functions, Differentials, Roll's Theorem, mean value theorem, Tailor's theorem, maxima/minima definite and indefinite integrals
Simple differential equation and examples from mathematical modeling problem, review of 1-1 function, logarithmic and exponential functions and applications, introduction to matrices.

Course Title: Biology-I-Remedial (LSC 103)

Principles of Taxonomy, Animal classification and study of model system, Plant Classification and study of Model systems, Evolution and origin of life, Ecology and Adaptation, Prokaryotes, Eukaryotes, Structural plan of plants, Structural plan of animals.

Course Title: Biology-II-Remedial (LSC 104)

Structure and function of different systems in Animals, Structure and function of different systems in Plants, Reproduction in Animals and plants, Development Process in Animals and Plants

Course Title: Chemistry (LSC 105)

ORGANIC CHEMISTRY:
Reaction Mechanisms: Substitution, Rearrangement, Addition, Elimination and free Radicals.
Hammett Equation: Derivation, Constituent Constant (k), Reaction constant and uses.
INORGANIC CHEMISTRY:
Electronegativity, Redox reactions and ligand field theory.
PHYSICAL CHEMISTRY:
Kinetics: First and second order reactions, Transition state theory, Energy of activation.
Thermodynamics: First and second law, Enthalpy and Entropy, Free Energy and Equilibrium, Donnan membrane equilibrium.
Spectroscopy: General Principles.

Course Title: Microbiology (LSC 107)

The place of microorganisms in nature and their relevance. The cells and its structure. The grouping of prokaryotes, The viruses: distribution and structure. The fungi (Mycota) and Algae. Growth of microorganism. Basis mechanisms of metabolisms and energy conversions. Fermentations. Electron transport under aerobic and anaerobic conditions. Complete and Incomplete oxidation. Inorganic

hydrogen donors: aerobic, chemolithotrophic, Phototrophic bacteria and photosynthesis. Fixation of molecular nitrogen, basis of microbial genetics, exchange, recombination and transfer of genetic information. Microorganisms and the environment.

Course Title: Biochemistry-I (LSC 106)

MOLECULAR COMPONENTS OF CELLS

Chemistry is the logic of biological phenomenon. Biomolecules: the molecules of life. A bimolecular hierarchy, Simple molecules are units of complex structures, metabolites and macromolecules, organelles, membranes, unit of life - cell. Biological macromolecules and their building blokes, Organization and structure of cells: prokaryote and eukaryotic.

Amino acids: Building blocks of' proteins, acid base chemistry of amino acids, reactions of amino acids, optical activity and stereochemistry, spectroscopic properties.

Proteins: Primary Structure, determination of amino acid sequence, protein sequence strategy, chemical method of analysis, identification of N and C terminal residues. Secondary, Tertiary and Quaternary structures. Forces inducing protein structure and stability like hydrogen bonds, hydrophobic interactions, electrostatics interactions, Vander walls interactions. Purification methods, ammonium sulfate, solublization, ion exchange and electrophoresis, size estimation through SDS, gel electrophoresis and gel filtration, Prosthetic groups, Proteins as Enzymes and electric power.

Mechanisms: of "Enzyme action: Behariam regulation, enzyme nomenclature, coenzymes, Enzymes kinetics, enzyme inhibition, cooperatively. Modifications-phophorylation,
RNA and antibody molecules as Enzymes, Ribozymes and Abzymes.

Carbohydrates and cell surfaces: Carbohydrate nomenclature and structure, monosaccharides, Glycosidic bonds and glycosides, disaccharides, oligosaccharides, structural and storage polysaccharides, glycoproteins, proteoglycans, bacterial cells wall peptidoglycans

Lipids and Membrane: fatty acids, phosphoglyceride backbone structure, conformation and properties, sphingolipids, glycolipids, cholesterol and related steroids, properties of lipid aggregates, membrane structures, structure of membrane proteins and lipoproteins.

Course Title: Cell Biology (LSC 108)

1. The evolution of the Cell;
   - From molecules of the First Cell;
   - From Prokaryotes to Eukaryotes;
   - From Single Cell to multicellular Organisms
2. How cells are studies/Approaches for studying cells
   - Light and electron microscopes
   - Imaging techniques
   - Isolation of cells and cell/tissue culture
   - Fractionation of cells and analysis of their molecules.
   - Tracing and imaging molecules inside cells.
3. The Cell Nucleus
   - Chromosomal DNA and its packaging.
   - The global structure of chromosomes.
   - The organization and evolution of the Nuclear Genome.
4. Internal Organization of the Cell
   - Membrane structure.
   - Lipid bilayer and membrane protein.
   - The endoplasmic reticulum
   - The golgi apparatus

- The lysosomes
- The peroxisomes, Mitochondria and chloroplasts

5. Intracellular traffic
   - Vesicular traffic in the secretary pathways.
   - Traffic in the endocytic pathway
   - Exocytosis
6. The cytoskeleton
   - The nature of the cytoskeleton
   - Intermediate filaments
   - Microtubules
   - Actins filaments
   - Cilia and centrioles.

Course Title: Genetics (LSC 109)

Nature of genetic material, DNA replication, Cell divisions: mitosis and meiosis
Mendalian laws and inheritance and Gene interactions, Sex-determination and sex-linked inheritance, Chromosomes: Structure and organization, Centromeres and telomeres, Chromosomal aberrations: nature and mechanism, linkage analysis and gene mapping in eukaryotes, Allelism: simple and multiple alleles, Complementation analysis and fine structure of gene, Concept of gene, mutations, bacterial genetics: Restriction–modification system, Transformation, Conjugation and Transduction, Extra-chromosomal inheritance, Population genetics.

M.Sc. (Life Sciences) II Semester

Course Title: Cell Biology II (LSC 201)

1. Cell Signaling
   - General principles
   - G-linked cell surface receptors
   - C^{++} signaling system
   - Enzyme-linked cell surface receptors
   - Target cell adaptation/desensitization
2. The Cell Division Cycle
   - General strategy of the cell cycle
   - Molecular basis of cell cycle control, causes and consequences of failure of control
   - M-phase
   - Mitosis
   - Cytokinesis and karyokinesis
3. Energy Conversions: Mitochondrial and chloroplast
   - Mitochondria and chloroplast - fine structure and chemistry
   - Glycolysis, TCA cycle, Respiratory electron chain and ATP synthesis
   - Photosynthesis-Pigments, Photosystems, Light reaction, Dark reaction
   - The evolution of electron transport chain
   - The genomes of mitochondria and chloroplast
   - Localization signals and protein import
4. Cell Junction, Cell Adhesion and Extra-Cellular Matrix
   - Cell Junctions
   - Cell-Cell Adhesions and cell adhesion molecules

- The Extra-Cellular Matrix
- Extra-cellular matrix receptors of animals

5. Excitable cells/tissues: Neuron-structure, types, properties, functions Transmembrane potential, action potential, conduction of impulse, channels-active and passive, voltage and chemical sensitive axoplasmic flow, communication between excited tissues/neurons-cellular and molecular basis of synaptic transmission, neurotransmitters, neurotoxins

Course Title: Biochemistry-II (LSC 202)

Metabolism and its regulation:
Metabolism-an overview, metabolic diversity, catabolism and anabolism, Intermediary metabolism is tightly regulated, integrated processes, experimental methods to reveal metabolic pathways, vitamins as coenzymes

Molecular basis of hormone action, classes of hormones and second messengers

Glycolysis, overview, regulatory enzymes, allosteric and covalent modification, first and second phase of glycolysis, TCA cycle-reactions of the cycle including pyruvate dehydrogenase, Anaplerotic reactions, Regulation of TCA cycle, Glyoxylate cycle, Electron transport and oxidative phosphorylation, coupling factors, mechanism of ATP synthesis, mitochondrial shuttle, transporters in the mitochondria, Gluconeogenesis, Glycogen metabolism and the pentose phosphate pathway

Fatty acid catabolism, oxidation of fatty acids, ketone bodies, lipid biosynthesis, fatty acid synthesis, phospholipids, other complex lipids, cholesterol biosynthesis, sterol biosynthesis and regulation

Amino acid metabolism, degradative pathway, amino acid biosynthesis, synthesis and degradation of nucleotides-purine and pyrimidine degradation and biosynthesis, salvage pathway

Course Title: Molecular Biology (LSC 203)

1. Introduction to molecular biology
2. Structure of DNA and RNA and their physical, chemical and biological properties
3. Types of RNA and their functions
4. DNA replication in prokaryotes and eukaryotes-enzymes involved and mechanisms
5. RNA as template for DNA and RNA synthesis
6. Catalytic RNA
7. Molecular basis of mutations
8. Repair of DNA damages
9. Gene structure and sequence organization
10. Transcription in prokaryotes and eukaryotes: enzymes involved and mechanisms
11. RNA processing and co- and post-transcriptional modifications of RNA
12. Ribosomes, Genetic code and translation in prokaryotes and eukaryotes
13. Regulation of gene expression in prokaryotes: activation, repression, attenuation, and generalized controls
14. Regulation of gene expression in eukaryotes
15. Transposable elements
16. Recombination of DNA
17. Methods used in recombinant DNA research

Course Title: Immunology (LSC 204)

Introduction, Types and functions of leucocytes, natural immunity, polymorphonuclear leucocytes, Neutrophils, Molecular mechanism in activation and diapedesis, Mechanisms of opsonization and phagocytosis, intracellular microbicidal action, Eosinophils, role in antihelminthic immunity ad asthma, Baspophils/mast cells. Immediate hypersensitivity, inflammatory response

Immunoglobulin's Structure and function, Isotypes, allotypes, idiotypes, Ig domains, Primary and secondary immune response. Immunoglobulin genes, Generation of diversity and affinity maturation. Ig receptors, B-cells. B-Cell maturation, T-dependent and -independent antigens. Isotype switching. Idiotypic network, Hybridoma and monoclonal antibodies

Complements-classical and alternate pathways of complement activation. Regulation of complement activation pathways

Major Histocompatibilty complex (MHC) antigens. Allograft rejection. Inbred and cogenic mice MHC locus in mice and humans. Types of MHC antigen and their structures and genes. HLA typing and disease association

T-cell activation MHC restriction and their molecular basis. T-cell receptor complex and genes, Signal transduction in T-cells, T-cell differentiation on class I and Class II MHC molecules, Super antigens, Cytokines and cytokine receptors
Natural killer cells, Mechanisms of NK and T cell cytotoxicity
Hypersensitivity reactions/autoimmunity.

Course Title: Biophysics and Structural Biology (LSC 205)

Introduction, interactions in biological systems, structure of biomolecules: structure and conformation of proteins and nucleic acids, tertiary and quaternary structure of proteins, primary and secondary structure of RNA and DNA, methods of conformational analysis and prediction of conformations, Equilibrium studies: Scatchard and Hill plots for ligand-macrmolecule interactions, thermodynamics and kinetics of conformational transitions of proteins, protein folding

Techniques of studying macromolecular structure: Sedimentation velocity and equilibrium, determination of molecular weights, Electron microscopy, UV-Visible Spectroscopy, Fluorescence spectroscopy, Circular Dichroism Spectroscopy, X-ray diffraction, Nuclear Magnetic Resonance, Computer modeling of biological macromolecules

Course Title: Animal Physiology (LSC 206)

Excitable and non-excitable tissues
Muscles- types, structure and contraction, neuro-muscular junctions,
Cardio-vascular systems: Heart - structure, myogenic heart, specialized tissues, ECG - basis, principles of recording, significance, cardiac cycles, cardiac output, blood pressure, regulation of heart
Respiratory system- anatomical considerations, transport of gases, exchange of gases, waste elimination, regulation of respiration
Blood and Circulation - Blood corpuscles - formed elements, plasma, functions, blood volume regulation, blood groups

Excretory system: Kidney - Nephron, urine formation, urine concentration, waste elimination, maturation, role of kidney in the regulation of water balance, blood volume, blood pressure, electrolyte balance, acid-base maintenance
Thermoregulation: Comfort zone, body temperature regulation physical, chemical, neural regulation, acclimatization
Digestive system: digestion, absorption, anabolism, catabolism
Endocrinology and reproduction - endocrine glands, hormone action, reproductive process:

Course Title: Plant/Microbial Physiology (LSC 207)

Water relations in plants: Properties of water and solution, determination of vapour pressure, osmotic and chemical potential plant - soil atmosphere continuum, Reponses of plants to water deficit
Photosynthesis: Light absorption and emission, primary processes of photosynthesis, O_2 cycles, chloroplast membrane architecture, structure-function relationship of thyllakoid membrane proteins, CO_2 fixation, photorespiration, C_3, C_4 and CAM photosynthesis
Respiration: Architecture of plant mitochondrial membrane, electron transfer complexes and components of plant mitochondria cyanide-resistant pathway
Phytochrome and phtomorphogensis: The structure and optical properties of phtychrome, cryptochrome and their role in photomophogenesis
Plant Hormones: Auxin, gibberellin, cytokinins, ethylene - structure biosynthesis and their role in plant growth in development, role of abscissic acid and salicylic acid in physiological processes
Nitrogen metabolism
Phototropism, gravitropism, dormancy, long day and short day plants and senescence.
Nutritional requirements of microorganisms: Modes of nutrition, uptake of nutrients by cells, culture media
How do *Escherichia coli* synthesize ATP during Aerobic Growth on Glucose?
Biosynthesis of ATP by *Escherichia coli* cells during anaerobic growth from Glucose
Aerobic Growth of *Escherichia coli* on Substrates other than Glucose
Metabolism: Role of ATP in metabolism, Oxidation-Reduction reaction and Electron carriers, Enzymes structure and classification, mechanism of reaction, Effects of environment on enzymes activity, enzyme inhibition. An overview of the generation of energy
Metabolic Diversity of Aerobic Heterotrophs
Catabolic Activities of Aerobic Heterotrophs
Regulation of Bacterial Metabolisms

M.Sc.(Life Sciences) III Semester

Course Title: Developmental Biology (LSC 301)

Cell differentiation and development - an introduction, cell differentiation and morphogenesis in *Dyctyostelium*, fertilization, early developmental stages of invertebrate and vertebrate embryos, morphogenetic cell movements, cell-cell interactions during development (cell recognition and selective cell adhesions), inductive tissue interactions, organogenesis – limb/eye/brain (any one), nuclear-cytoplasmic interaction in cell differentiation.

Novel developmental process in plants, pattern formation and growth control, the concept of polarity, the role of stable messengers in growth and development, frontiers in fertilization, seed formation, dormancy and germination, development of vegetative shoot, environmental regulation of phase change from vegetative to reproductive, homoeotic genes in flower development, use of *in vitro* cultures in understanding growth and development.

Course Title: Bioinformatics (LSC 302)

Computer System Concepts: concepts Type of Computers - Main, mini and Micros System Configuration - Primary and secondary storage devices , peripherals - Hardware and software – system software – Application software – DOS, Unix, VMS and WINDOWS – Word-processing, programming Concepts – ANSI.

Information Sources, System and services: Primary, secondary and tertiary source Information Systems in India information services and products - Information Dissemination - information retrieval Concepts – Boolean, relational, arithmetic's operations. Database concepts: Definition – Structure Type of Databases – bibliographic and Nonbibliographic AGRIS, Biotech Abstracts, Medline, Biosis etc. – embl, Genbank, PIR, Swiss Prot, PDB etc, Database management System, Online database.

Network Concepts: Definition Network types - LAN. MAN ANI) WAN – Applications and services - Email. Remote logging, file transfer, News Groups - ERNET, SIRNET

NCNET AND BTNET - Communication softwares - On line access - Internet tools: FTP TELNET, WWW ARCHIE

Course Title: Molecular Genetics and Genetic Engineering (LSC 304)

1. Introduction to molecular Genetics and its importance in Biology
2. Changing Concept of Gene
3. Transcription control regions of Eukaryotic and Prokaryotic genes
4. Molecular Biology of Plasmids and lambda, M_{l3} and P1 phages
5. Transposable elements
6. Cloning vectors
7. DNA synthesis and DNA library
8. Construction of genomic library
9. Identification and analysis of recombinant clones (including fictional and positional cloning)
10. Methodology of DNA sequencing
11. Polymerase Chain reaction (PCR)
12. Site-directed mutagenesis
13. Transgenic

Course Title: Cancer biology (LSC 306)

1. Cancer as a cellular disease
2. Incidences of cancer
3. Benign and malignant tumors, tumour behaviour
4. Cancer cells – structural, cytogenetical, biochemical and behavioural alterations; Origin of neoplastic cell, tumor growth pattern, tumor cell kinetics and dynamics, apoptosis and neurosis, Cancergensis model – initiation-promotion-progression, Genetics basis of carcinogenesis, tumor angiogenesis and its molecular mechanisms; Cancer invasion and metastasis and their molecular mechanisms. Heredity and cancer, radiation carcinogenesis; Chemical carcinogenesis and chemoprevention. Viral carcinogenesis;

oncogenes and tumor suppressor genes and molecular mechanism of neoplastic transformation, Immunological aspects of cancer, cancer control mechanisms.

Course Title: Ecology and Bio-diversity (LSC 307)

1. General Ecology and Ecological considerations.
2. Bio-diversity, spatial and temporal dimension;
3. Bio- diversity and Population Biology;
4. Theoretical aspects of Genetic Issues at population level
5. Fragmentation of Habitat: Consequences for Ecology and Biodiversity;
6. Eco-functions of Biodiversity at Community/Eco-system/Landscape Level;
7. Inventorying & monitoring of Biodiversity.
8. Conservation of Biodiversity, Problems in Protected Areas
9. Problems of Rehabilitation of Degraded Ecosystems
10. Problems and Principles of In situ and Lx Situ Biodiversity conservation.
11. Biodiversity anti agriculture/Fisheries Development.
12. Biodiversity and Industrial Development
13. Biodiversity conservational Practices and Ethnic Cultures
14. Biodiversity and Global natural and cultural changes.

Course Title: Advanced Microbial, Physiology (LSC 310)

Importance of identification and classification or microorganisms – using modern techniques; Physiology of symbiosis and regulation; Degradation of biocellulytic polymers, Biodegradation of aromatics compounds, Regulation of nitrogen fixation Physiology and regulation of nitrification, denitrification and ammonification Hydrogen metabolism, Energy conservation microbes.

Course Title: Human Genetics (LSC 311)

1. Genes in Pedigrees
2. Complication to the basic pedigree pattern
3. Organization of human genome and genes
4. Overlapping genes and genes within genes
5. Multigene families
6. Mapping: Physical and Genetic, Strategies in identifying human disease genes
7. Pathogenic mutations
8. Animal models for human diseases
9. Genetic testing and therapeutic approaches

Course Title: Neurophysiology (LSC 313)

Neurogenesis, Neuron. Glia structure function, role of growth factor. Transmembrane potential, action potential properties on neurons, nerve impulse conduction, myelination, neurotransmitter synthesis, axoplasmic transport. Synapse – types, synapse properties, neurotransmitter receptor types, generator and action potential, molecular, cellular basis of synaptic transmission, neuro-muscular junction. Receptor types - mechano- thermo-kinesthic, pressure, chemophoto receptors, spinal cord anatomy and organization, ascending and descending tracts, Brain – Cerebrum, cerebellum, brain stem, anatomy, connections, sensory, motor association areas, cytoarchitecture reticular formation, blood brain barrier, CSF, Reflex - type properties myotake reflex, muscle tone

maintenance, posture regulation, decerebraterigidity. Sensation – modalities, coding of information, touch paid Method to study – lesion stimulation – inactivation (gross specific) cellular study (single unit level, molecular level) biochemical, functional anatomical, histological, microdialysis, microiontophoresis.

Course Title: Virology (LSC 310)

The origin and discovery of viruses: nomenclature and classification of viruses General structure of bacterial, animal and plant viruses. Replication and multiplication of coli phages; (a) double standard DNA phages e.g. T (odd and even) series (b) single stranded DNA phages e.g. φx l74 Cc) Lambda and lysogeny, integration and replication (d) RNA phages cg QB,MS2 R17 etc. Structure and replication of lipid containing phages e.g. PM2 host animal cell and virus interaction Multiplication of animal viruses (a) DNA Viruses. e.g. SV40, polyoma. Adeno & Herpes,. (b) RNA viruses cg. Polio, VSV Influenza, reo, etc. Transformation of cell and RNA tumor viruses Cancer and Viruses Pneumotropic and Derinotropie viral diseases visierotropic and neurotropic viral diseases. Plant vii uses e.g. TMV and its pathogenic development to host (host -viruses interaction) Assembly of virus.

Course Title: Biostatistics (LSC 303)

Aim, scope, definition and elementary idea of Statistics in Biology, Compilation, classification, tabulation and diagrammatic presentation of statistical data, concepts of statistical population and sample, elementary account of Random samples, Frequency distributions.
Measures of Central Location and dispersion; Simple measures of skewness and Kurtosis. Probability - Definition, Simple theorems on probability, Definition, Simple theorems on probability, Discrete and continuous varieties; Standard distributions – Binomial, Poison, Normal, Basic ideas of sampling distribution, statistical estimation and tests of significance, some commonly used tests of significance Normal test, student's 't' test, correlation and regression. Least squares method of fitting linear and quadratic regressions.

Course Title: Mathematics (LSC 310)

Partial derivatives and Taylors theorem for more than one variable maxima/minima of two variables and application, simple biological models and differential equations of first order (discussion includes among others models on radioactive decay population growth chemical kinetics spread of infectious disease. cell growth diffusion process etc. Matrices and Eigen value system of first order differential equation, Leslie.

Course Title: Photobiology (LSC 308)

Absorption and fluorescence spectroscopy, photosynthesis, X-ray crystal structures of bacterial photosystem. Higher plants photosystem I and II and light harvesting chlorophyll protein complexes. Use of chlorophyll fluorescence to monitor the function of photosynthetic apparatus, transport processes across thylakoid and envelope membranes. Plant pigments biosynthesis and their role in photodynamic reactions photodynamic herbicides, insecticides and photodynamic therapy of cancer Halo bacterium and its light emission properties UV-B irradiation and its effect on biological systems Phototropism, photoreceptors signal transudation and photomorphogenesis

Course Title: Radiation Biology (LSC 305)

Introduction: Interaction of radiation with Matter, Radiation chemistry of water, chemical mechanism of radiation induced DNA and membrane damages, Survival curve and its significance. Sensitivity of tissues, Acute effects of whole body irradiation, Radiation effect on development. Radiation induced apoptosis. Lethal, potentially lethal (PLD)) and sub-lethal d (SLD) damage, High LET radiation effect, relative biological effectiveness (RBE) and oxygen effect. Role of radiation in initiation, propagation and progression of carcinogenesis. Radiation mutagenesis and clastogenesis. Chemical and biological factors modulating the genetic effects of radiation. Radiation therapy of Cancer - Significance and limitations. Chemical modification of radio response, mechanism and usefulness, radiation induced lesions in DNA and their repair. Radiation effects in space. Effects of low doses of radiation, Food irradiation, lionizing radiation risk vs. benefit.

M.Sc.(Life Sciences) IV Semester

Course Title: Hormone Action & Metabolic Disorder (LSC 401)

1. Characteristics of hormone system, Classification
2. Molecular basis of hormone action, hormone receptors, cAMP, protein kinase other intracellular messenger like Ca^{++} and phosphoinositides
3. GTP binding proteins, phospholipase, inositol triphosphate and diacyl glycerol
4. Assay of hormones
5. Mechanism of action of insulin receptors and tyrosine kinase growth factors
6. Diabetes regulation of insulin/glucagon and its significance
7. Hormonal regulation of carbohydrate, fat and protein metabolism
8. The hypothalamus and pituitary, over and undersecretion of pituitary hormones
9. Hormones and cancer
10. Thyroid hormone – Mechanisms of action and pathophysiology
11. Hormones regulating calcium metabolism, calcium as a second messenger, calmodulin
12. Classification and mechanism of action of catecholamines, neurohormones and substance P: Biomedical importance
13. Hormones of the gonads, testosterone and estrogens mechanism of action and pathophysiology
14. Gastrointestinal and neural hormone like secretion, substance P, neurotensin, their mechanism of action

Course Title: Plant Cell Culture (LSC 402)

Reflections on aseptic culture
Embryogenesis, organogenesis and plant regeneration
Clonal multiplication: meristem, shoot-tip maintenance and manipulation of development in embryogenic suspension cultures
In vitro pollination and fertilization, Embryo culture, Endosperm culture, Triploid production, Haploid production- androgenic, gynogenic, uses of haploids
Protoplast isolation and culture, Somatic hybridization: fatty protoplasts, fusogens, mechanisms of protoplast fusion.
Selection of somatic hybrids, cytoplasmic hybridization (cybridization), genetic and breeding applications Manipulation with cells and protoplast in culture: Somaclonal variation, induction and selection of mutants, disease- and herbicide-resistant mutants, stress-tolerant mutants
Genetic transformation of plants, direct DNA uptake, liposome-mediated DNA delivery, Ti-plasmids, particle gun-mediated transformation,

Production of Secondary plant products, Cryopreservation

Course Title: Microbial Biotechnology (LSC 407)

Microbial Biotechnology: Scope, Techniques, Examples
Microbes: Moving factories for Macromolecules
Production of Proteins in Yeast, Single cell proteins
Recombinant and Synthetic Vaccines
Microbial Insecticides
Microbial enzymes
Microbial Polysaccharides and Polyesters
Microorganisms in Plant Biotechnology
From biomass to Fuels - Ethanol
Metabolites form Microorganisms - Antibiotics; their Organic Synthesis and degradation.

Course Title: Molecular Parasitology (LSC 408)

Classification of Parasites: Diversity of parasites causing human and plant diseases; Biology of protozoan parasites, Entamoeba histolytica and other amitochondriates; Kinetoplastids includes Leishmania and Trypanosomes; Apicomplexans e.g Plasmodium, Toxoplasma gondii, Entric protozoan parasites; Genome organization, structure of genes and gene expression (including its regulation) of selected parasites; Host-parasite interactions; Immunology of the protozoan parasites; Molecular Biology and Immunology; Diagnostics; Biology of selected helminthes and nematode parasites

SEMINAR

DISSERTATION (Research Project)