GARDEN CITY UNIVERSITY
V SEMESTER
B.Sc. Biotechnology, Biochemistry, Genetics
Title of the course: PLANT BIOTECHNOLOGY

CODE- 02ABSPB17551 **CREDITS: 04**

Unit 1.0: Introduction to Plant Biotechnology and Techniques:

1.1 Laboratory Organization: Washing &Storage facilities, Cleaning Glassware's, Media preparation room, Transfer area Culture room, Observation or Data collection Area.
1.2 In-vitro Methods in Plant Tissue Culture, Aseptic Techniques, Nutrient Media ,Types and uses of Nutrient Media
1.3 Micro propagation of elite species, Stages involved in Micro propagation
1.4 Growth Regulators: Auxins, Cytokinins, Gibberellins and their uses.

Unit 2.0: Types of in vitro culture
2.1 Haploid Production: Anther and microspore culture, media, factors controlling androgenesis, applications in plant breeding.
2.2 Triploid production-endosperm culture, media, factors affecting organogenesis, applications in plant breeding.
2.3 Types of embryo, media, role of suspensor, precocious germination, embryo rescue, applications in plant breeding.
2.4 In-vitro fertilization, Culture of ovary,ovule and its applications.

Unit 3.0: Applications to plant breeding
3.1 Organogenesis and Somatic Embryogenesis-Techniques and its application.
3.2 Protoplast Isolation, Culture, Fusion-Chemical and electro fusion, Somatic Hybridization and Cybridization.
3.3 Somaclonal and Gametoclonal Variation and their significance

Unit 4.0: Application to Agriculture, Horticulture, Forestry and Industry
4.1 Production of Disease free plants-Methods of Virus Elimination-Meristem tip culture, Thermotherapy and chemical treatment
4.2 In-vitro production of secondary metabolites-Techniques and significance
4.3 Edible vaccines from plants-Banana and watermelon
4.4 Germplasm conservation and Synthetic seed technology

GARDEN CITY UNIVERSITY
V SEMESTER
B.Sc. Biotechnology, Biochemistry, Genetics
Title of the course: ANIMAL BIOTECHNOLOGY

CODE- 02ABSPB17551 **CREDITS: 04**

Unit 1: Introduction

1.1 Historical Perspectives, early experiments & Scope of Animal tissue culture, requirements for Animal cell culture. Design & layout of ATC laboratory.

1.2 Serum Composition: Basic Techniques of mammalian cell culture; Sub culturing. Primary culture, Evolution of cell line, Monolayer, suspension culture and Cryopreservation

1.3 Culture and maintenance: primary and established cell lines. Organ culture, Embryo culture. Characterization of cultured cells, viability, cytotoxicity, growth parameters.

Unit – 2 : Introduction to Stem cells :

2.1 Introduction to embryonic and adult stem cells, properties, Identification, stem cells culture techniques and their applications in modern clinical sciences.

2.2 Introduction to Transgenic Animals: Methods involved in the production of transgenic animals, importance and applications of transgenic animals.

2.3 Animal cloning: Introduction to animal cloning, methods of cloning and their importance with reference to domestic animals.

Unit – 3.0 Applications of Animal Biotechnology

3.1 Embryo Technology & Animal Breeding. Invitro fertilization, Embryo transfer, Fertility control & regulation, test tube babies. Transgenic animals-Sheep, Mice

3.2 Introduction to Tissue engineering: Organ culture, Role of stem cells in Animal cloning, applications of stem cells in tissue engineering.

3.3 Ethical values in animal Biotechnology: International ethical , legal and social issues connected with animal and human cloning

4.0 Biosafety:

4.1 Introduction to Biosaftey: Biosafety management: Key to the environmentally responsible use of biotechnology. Ethical implications of biotechnology

4.2 Biosafety products**:** Introduction to Biosafety products, Social and ethical implications of biological weapons. (K,L,A, Ap).

4.3 Biosafety regulations: National and international guidelines with regard to rDNA technology, levels of containments.

4.4 Good Laboratory practices (GLP) :Good manufacturing practice and Good lab practices (GMP and GLP). Use of genetically modified organisms and their release to environment. (K,L,A, Ap)

GARDEN CITY UNIVERSITY
V SEMESTER
B.Sc. Biotechnology, Biochemistry, Genetics
Title of the course: BIOCHEMICAL TECHNIQUES

CODE- 02ABSBC17552 **CREDITS: 04**

UNIT I:

1.1 Cell fractionation techniques: Cell lysis, homogenization

1.2 Protein purification, salting in, salting out, dialysis and ultra filtration, criteria for purity.

1.3 Centrifugation - Principle of centrifugation, Swedberg equation, Differential centrifugation

1.4 Principle and applications of Density gradient centrifugation and analytical centrifugation

UNIT II:

2.1 Chromatography, Principle and applications of paper chromatography – ascending, descending, circular, Thin layer chromatography

2.2 Principle and applications of Ion exchange chromatography, Affinity chromatography

2.3 Principle and applications of Gas chromatography (GC), High performance liquid chromatography (HPLC)

2.4 Principle and applications of gel filtration, Fast protein liquid chromatography (FPLC)

UNIT III:

3.1 Electrophoresis - Principles and applications of gel electrophoresis – PAGE, SDS PAGE, and agarose gel electrophoresis

3.2 Isoelectric focusing and 2D Gel electrophoresis. Pulsed field electrophoresis, capillary electrophoresis

3.3 Radio isotopes, concept of half-life, autoradiography, pulse chase technique

3.4 Detection and quantitation - GM counter and scintillation counter

UNIT IV

4.1 Spectroscopic techniques: Beer-Lambert's Law, Principles and applications of colorimeter

4.2 Principle and applications of UV – Vis spectrophotometry, Fluorimeter, Nuclear Magnetic Resonance (NMR)

4.3 Principle and applications of Mass spectroscopy and ionization modes

4.4 Principle and applications of X-ray crystallography – principle and application

GARDEN CITY UNIVERSITY
V SEMESTER
B.Sc. Biotechnology, Biochemistry, Genetics
Title of the course: ENZYMOLOGY

CODE- 02ABSEN17652 **CREDITS: 03**

Unit 1 INTRODUCTION

1.1 Enzymes: Definition, classification of enzymes, biological importance.

1.2 Holoenzyme, apoenzyme, prosthetic group, Active site and its characteristics.

1.3 Enzyme specificity, specific activity Units of enzyme activity, IU and Katal.

UNIT II – ENZYME KINETICS:

2.1 Enzyme kinetics of single substrate reactions – MM equation. Significance of Km and V max. Substrate enzyme interaction – lock and key model, induced fit model

2.2 Factors affecting enzyme activity.

2.3 Cofactors - metal cofactors, coenzymes definition and role of NAD, TPP and PLP

UNIT III- ENZYME INHIBITION

3.1Enzyme inhibition - Reversible inhibition (competitive, uncompetitive, non-competitive, mixed and substrate).

3.2 Mechanism based inhibitors - antibiotics as inhibitors.

UNIT IV – ENZYME REGULATION AND ITS APPLICATION

4.1 Regulation of enzymes

4.2 Isoenzymes; LDH, multifunctional enzymes (DNA polymerase) and multi enzyme complex (PDC).

4.3 Enzymes used in clinical biochemistry as reagents, diagnostics and therapy. Role of

immobilized enzymes in industry

GARDEN CITY UNIVERSITY
V SEMESTER
B.Sc. Biotechnology, Biochemistry, Genetics
Title of the course: MICROBIAL GENETICS

CODE- 02ABSMG17553 **CREDITS: 03**

Unit 1

1.1 Bacterial chromosomes in the nucleoid: the genophore supercoiling and the importance of DNA supercoiling.

1.2 Organization of Eukaryotic Genome: Chromatin structure based on successive level of DNA packing, repetitive and non Repetitive DNA sequence.

1.3 Histones: DNA binding proteins: Structure of histones, Types or classes of Histones, Functions of histone modifications.

Unit – 2

2.1 Prokaryotic DNA replication: Mechanism of DNA Replication, stages of replication, DNA polymerases, Models of DNA replication M13 bacteriophage replication.

2.2 Genes and Mutation: Definition of a gene, Types of gene mutations**:** Spontaneous and induced mutations and their role in evolution; Causes of mutations: Mutagens, Transposons and site directed mutagenesis

Unit – 3

3.1 Mechanism of genetic recombination in Prokaryotes: Transduction: Specialized and general, transformation and conjugation.

3.2 Homologous chromosomes, alleles. Synapsis, breakages and re-union, role of recombinases, Chromosomal crossover, gene conversion.

Unit – 4

4.1 Gene transfer mechanisms in bacteria and its types:

Bacterial transformation; Host cell restriction; Transduction; conjugation, Complementation; and transfection, Mechanisms and applications.

4.2 Analysis of virus, Bacteria and yeast genomes.

4.3 Plasmids and Bacteriophages: Definition, properties and characteristics, classification and types, vectors, episomes, role/use of plamids

4.4 Lysogeny and lytic cycle in bacteriophages, Life cycle and their uses in microbial genetics.

GARDEN CITY UNIVERSITY
V SEMESTER
B.Sc. Biotechnology, Biochemistry, Genetics
Title of the course: BEHAVIORAL NEUROGENETICS

CODE- 02ABSNG17553 **CREDITS: 03**

Unit 1: Introduction to Behaviour

1.1 Behaviour of invertebrates: Insects. Behaviour of vertebrates: Birds

1.2 Receptors, Effectors and Conductors: Nature, Characteristics and Functions of Receptors, Effectors, and Conductors.

1.3 Types and Functions of Receptors, Exteroreceptors, Interoceptors and Proprioceptors,

1.4 Structure and Functions of neural genes, Genetic Abnormalities

Unit 2: Foundations of Behaviour

2.1 Biological Basis of Behaviour (Heredity): Human Evolution, Behaviour Genetics, Phenotype, Genotype, Studies on the Effect of Hormones on Behaviour, Genetics and Behaviour.

2.2 Sociocultural Basis of Behaviour (Environment): Environment and Behaviour, Natural Internal Environment (physical or maternal environment) and Behaviour, Man-made Environment (subjective environment).

2.3 Effect Heredity & Environment in behaviour

2.4 Evolutionary Basis of Behaviour

Unit 3: Nervous System

3.1 The Brain: Basic Features of Nervous System, Central Nervous System, Peripheral Nervous System, Role of Nervous Systems in Controlling Behaviour. Neuron: Structure and Function, Communication within a Neuron, Neural Communication, Synaptic Transmission, Neurotransmitters, Pharmacology of synapses. Spinal Cord: Reflex behaviour, Reflex Model, Anatomy and Physiology of Reflex, Reflex Complexity, Reflex Plan of Higher Centres. Drosophila model for human genetic disorders (e.g. Parkinson's, Huntington's, Alzheimer's diseases etc.)

3.2 Nature-nurture and behaviour

Study of the genetics animal behaviour: Selection studies; Inbred strain studies. Identifying genes for behaviour: Induced mutations; Quantitative trait loci; Synteny homology.

3.3 Study of the genetics of human behaviour: Twin and adoption study designs, interpreting heritability; Linkage and association studies.

3.4 Environmental influence- shared and non-shared environment.

Unit-4: Neuro Genetics

4.1 Study designs: genetic and environmental manipulations; Circadian rhythms; Learning and memory.

4.2 Cognitive disabilities: Mental retardation; Learning disorders, Communication disorders, Dementia.

4.3 Psychopathology: Schizophrenia; Mood disorders; Anxiety disorders; Disorders of childhood.

4.4 Personality and personality disorders- antisocial personality, criminal behaviour

Unit 1: Cellular Basis of Behaviour

1.1 Structure and Functions of a Typical Human Cell, Cell Division - Mitosis and Meiosis, Structure and Functions of Different Tissues - Epithelial, Connective, Muscular, Cardiac and Nerve tissues. 1.2 Receptors, Effectors and Conductors: Nature, Characteristics and Functions of Receptors, Effectors, and Conductors.
1.3 Types and Functions of Receptors-, Exteroreceptors, Interoceptors and Proprioceptors,
1.4 Genes: Structure and Functions, Chemical and Physical Structure of Nucleic Acids, Genetic Abnormalities

Unit 2: Foundations of Behaviour
2.1 Biological Basis of Behaviour (Heredity): Human Evolution, Behaviour Genetics, Phenotype, Genotype, Studies on the Effect of Hormones on Behaviour, Genetics and Behaviour.

2.2 Sociocultural Basis of Behaviour (Environment): Environment and Behaviour, Natural Internal Environment (physical or maternal environment) and Behaviour, Man-made Environment (subjective environment).

2.3 How these two affect behaviour? Heredity Vs Environment

2.4 Evolutionary Basis of Behaviour

Unit 3: Nervous System

3.1 The Brain: Basic Features of Nervous System, Central Nervous System, Peripheral Nervous System, Role of Nervous Systems in Controlling Behaviour. Neuron: Structure and Function, Communication within a Neuron, Neural Communication, Synaptic Transmission, Neurotransmitters, Pharmacology of synapses. Spinal Cord: Reflex behaviour, Reflex Model, Anatomy and Physiology of Reflex, Reflex Complexity, Reflex Plan of Higher Centres. Drosophila model for human genetic disorders (e.g. Parkinson's, Huntington's, Alzheimer's diseases etc.)

Nature-nurture and behaviour

3.2 Genetic experiments to investigate animal behaviour: Selection studies; Inbred strain studies. Identifying genes for behaviour: Induced mutations; Quantitative trait loci; Synteny homology.

3.3 Investigating the genetics of human behaviour: Twin and adoption study designs, interpreting heritability; Linkage and association studies

3.4 Environmental influence- shared and non-shared environment.

Unit-4: Neuro Genetics

4.1 Study designs: genetic and environmental manipulations; Circadian rhythms; Learning and memory.

4.2 Cognitive disabilities: Mental retardation; Learning disorders, Communication disorders, Dementia

4.3 Psychopathology: Schizophrenia; Mood disorders; Anxiety disorders; Disorders of childhood.

4.4 Personality and personality disorders- antisocial personality, criminal behaviour