

GARDEN CITY UNIVERSITY

SEMESTER- VI B.Sc. Biotechnology, Biochemistry, Genetics

COURSE TITLE: BIOPROCESS TECHNOLOGY

COURSE CODE : 02ABSMG17553

CREDITS : 04

Unit 1: Concept of Fermentation and Bioprocess technology

- 1.1 The fundamental concept of Fermentation and bioprocess technology
- 1.2 Types of bioprocesses
- 1.3 Design and formulation of Media for industrial bioprocess
- 1.4 Criteria for medium design, carbon/nitrogen sources, nutrients
- 1.5 Sterilization of media

Unit 2: Bioreactors-design, types and operation

- 2.1 Bioreactors, bioreactor design, criteria, operation and types of bioreactors.
- 2.2 Agitation and aeration in the bioreactor, impeller and sparger design.
- 2.3 Concept of scale up, scale up challenges.
- 2.4 Influence of various bioprocess parameters viz. pH, temperature, medium components on product synthesis.
- 2.5 Bioprocess monitoring and control, automated control vs manual control of bioprocesses.

Unit 3: Downstream processing

- 3.1 Downstream processing: definition, cost involved in downstream processing
- 3.2 Typical steps involved in Downstream processing.
- 3.3 Criteria for downstream processing, Target application of product vs cost, separation of cells and broth.
- 3.4 Typical unit operation for downstream processing filtration, centrifugation, chromatography, solvent extraction, HPLC.
- 3.5 Methods for cell breakage for harvesting intercellular products.

Unit IV: Bioprocess based products and application

- 4.1 Commercial production of various bioprocess based products (Bioethanol, butanol, citric acid, acetic acid)

4.2 Antibiotics-penicillin, streptomycin, tetracycline. Single cell protein; amino acids: glutamic acid, lysine

4.3 Types and nature of wastes generated from bioprocesses .

COURSE: ENVIRONMENTAL BIOTECHNOLOGY

CODE: 02ABSNG17553

CREDITS: 04

Unit 1 : Fundamentals of Environmental Biotechnology.

1.1.Introduction

1.2 Natural resources

1.3 Structure and composition

1.4 Environmental pollution and monitoring

Unit 2 : Water & Waste Water Treatment Technologies

2.1Water Management

2.2 Waste water treatment

2.3 Processes of treating waste water

2.4 Bio waste treatment

Unit 3 Bioremediation

3.1 Concept and principles

3.2 Types of remediation

3.3 Production of oils and fuels

3.4 Eutrophication

Unit 4 : Environmental Education and Awareness

4.1Global environmental problems

4.2Environmental Protection Acts

4.3Environmental Policy Resolution, Legislation, Public Policy

4.4 Labelling

TITLE OF THE COURSE- NUTRITION AND DIETETICS

CODE:02ABSND17652

CREDIT – 3

Unit 1 :Introduction

- 1.1 Introduction to Nutrition
- 1.2 proximate analysis of foods for carbohydrate, proteins, fats, fiber material and water content.
- 1.3 Energy content of foods, Balanced diet
- 1.4 Determination of calorific value of foods Bomb calorimeter.

UNIT 2 - Biomolecules

- 2.1 Carbohydrates
- 2.2 Proteins
- 2.3 Lipids
- 2.4 Respiratory quotient of food stuffs and significance of RQ.

UNIT 3- Macro and Micro nutrients

- 3.1 Nitrogen balance
- 3.2 Minerals
- 3.3 Protein Energy malnutrition
- 3.4 RDA for different physical activities

UNIT 4 – Chemistry of Drugs

- 4.1 Basic concepts of Diet Therapy
- 4.2 Diet in Infections and Fevers
- 4.3 Diet in Food Allergy and food intolerance (hypersensitivity)
- 4.4 Skin disturbances

TITLE OF THE COURSE- PHYTOCHEMISTRY

CODE – 02ABSPC17652

CREDIT – 3

UNIT I - Introduction

- 1.1 Introduction
- 1.2 Primary and secondary metabolites and its classification and basic structure.
- 1.3 General techniques involved in biosynthetic studies.

UNIT 2 - Phytochemical Study

- 2.1 Distribution, Occurrence, Properties – Alkaloids
- 2.2 Distribution, Occurrence, Properties - Glycosides
- 2.3 Distribution, Occurrence, Properties – Flavonoids and Terpenoids
- 2.4 Distribution, Occurrence, Properties- Steroids and Carotenoids
- 2.5 Distribution, Occurrence, Properties- Tannins and Resins

UNIT III- Extraction

- 3.1 Definition, factors influencing the choice of extraction, principles of extraction methods, types of extraction.
- 3.2 Selection and Purification of Solvents For Extraction.
- 3.3 Methods of isolation.
- 3.4 Identification tests for various secondary metabolites special emphasis on HPLC, HPTLC and other advanced techniques.

UNIT IV – Chemistry of Drugs

- 4.1 Source, Uses and Chemistry of the following drugs
- 4.2 Source, Uses and Chemistry of Cardiac glycosides , Anthracene glycosides.
- 4.3 Source, Uses and Chemistry of Resins – Cannabis and Podophyllum and Tannins
- 4.4 Natural products leads to new drugs.
- 4.5 Selection and optimization of lead compounds for further development with suitable examples from CNS, Anticancer, Antibiotics and cardiovascular drugs.

COURSE: APPLICATIVE GENETICS & EPIGENETICS

CODE: 02ABSGE17653

CREDITS: 04

Unit 1: Plant Breeding:

- 1.1 Natural breeding systems in plants and their application in plant breeding
- 1.2 Conventional breeding methods for self, cross-pollinated and vegetatively propagated crop plants
- 1.3 Heterosis breeding, Polyploidy and haploids in plant breeding
- 1.4 Molecular plant breeding: Introduction - molecular markers as new efficient tools in breeding

Unit 2: Animal breeding:

- 2.1 Introduction to animal breeds, inbreeding, grading, cross breeding. Fish breeding (Selection, Induced Polyploidy, Gynogenesis and Androgenesis, Inbreeding)
- 2.2 Production of breeds: crossing of inbred lines for commercial production. Breeding strategies for improvement of livestock for milk, meat, wool production
- 2.3 Breeding strategies for improvement of Poultry
- 2.4 Transgenics and animal cloning: Creating transgenic animals and plants. Animal cloning, Biosafety and Bioethics

Unit-3: Human genetic diseases and remedies

- 3.1 Types, pedigree analysis, Inheritance patterns, Diagnosis Non-invasive and invasive methods
- 3.2 Genetics in Medicine & Industry: Production of recombinant Insulin, Interferon and Human Growth hormone (HGH). Vaccines- Hepatitis B vaccine. Preparation of DNA probes, Monoclonal antibodies and Diagnostic kits (Typhoid, Syphilis)
- 3.3 DNA markers: Methodology of DNA fingerprinting. Molecular markers-RFLP & RAPD, Micro satellite, SNPs, STR
- 3.4 Applications with examples in forensic science, medico legal aspects, wild life crying. Stem cell therapy, Genetic counseling and ethical consideration

Introduction to Epigenetics

- 4.1 Basic discoveries on genetic materials, Centromeres and Telomeres, Distribution of repeat and transposable elements (TE), Chromatin structure
- 4.2 Introduction to histones and histone variants, chromatin packing, transcription factors and gene expression; Non-coding RNAs.
- 4.3 Methodologies for methylome profiling
- 4.4 Epigenetics and disease: Rett syndrome, ICF syndrome, Cancer; Introduction to Epigenome based therapeutics