

**BHAVAN'S VIVEKANANDA COLLEGE OF SCIENCE, HUMANITIES AND
COMMERCE, SAINIKPURI, SECUNDERABAD.**

Autonomous College

Affiliated to Osmania University, Hyderabad.

(Accredited with 'A' grade by NAAC)

Department of Genetics and Biotechnology

Program name: B.Sc BtGC & BtMbC (w.e.f. 2023- '24)

Biotechnology paper VB Theory

Course Name: Medical Biotechnology

Paper Code: BT533B

Year/Semester: III/V

Credits: 4

No of Classes: 60

No

of

Employability: Theoretical knowledge and practical skills gained on karyotyping helps students to procure jobs in hospitals and institutes as genetic counselors.

Course Objective: To analyze the concepts of Inheritance of Human diseases, its genetic basis and to interpret the techniques for its diagnosis and therapeutic approaches.

Unit wise course objective:

Cob1: To understand the inheritance of human diseases and karyotyping including chromosomal staining.

Cob2: To analyze the genetic basis of Human disorders.

Cob3: To examine the techniques for diagnosis of human diseases.

Cob4: To interpret the Therapeutic approaches for human diseases.

Unit 1: Inheritance of human diseases and karyotyping

15 Hours

1.1: Inheritance patterns- pedigree analysis of autosomal traits (3)

1.2: Inheritance patterns – pedigree analysis of allosomal traits (3)

1.3: Factors affecting pedigree pattern – penetrance, expressivity (2)

1.4: Genetic heterogeneity-allele and locus heterogeneity (2)

1.5: karyotyping of Human chromosomes (2)

1.6: Chromosomal staining – G.Q, R and C banding techniques. (3)


CHAIRPERSON
BOS in Genetics/Biotechnology
Bhavan's Vivekananda College
Sainikpuri


Prof. SMITA C. PAWAR
Chairperson
Scientist in Charge (OU-IAEC)
Department of Genetics
Osmania University
Hyderabad-500 007. Telangana

Unit 2: Genetic basis of Human disorders

15 Hours

- 2.1: Chromosomal disorders caused due to structural chromosomal abnormalities (deletions, duplications, translocations and inversions) (3)
- 2.2: Chromosomal disorders caused due to numerical chromosomal abnormalities (euploidy, aneuploidy, autosomal and allosomal) (3)
- 2.3: Monogenic disorders (autosomal and X- linked diseases) (2)
- 2.4: Mitochondrial diseases-LHON, MERRF (2)
- 2.5: Multifactorial disorders – diabetes and hypertension (2)
- 2.6: Cancer – types of cancer, genetic basis of cancer (Oncogenes, tumor suppressor genes) (2)
- 2.7: Introduction to communicable and non- communicable diseases (1)

Unit 3: Techniques for diagnosis of human diseases.

15 Hours

- 3.1: Prenatal; diagnosis -invasive techniques -amniocentesis, chorionic villi sampling (3)
- 3.2: Diagnosis using enzyme markers -Guthrie test (phenylketonuria) (2)
- 3.3: Diagnosis using monoclonal antibodies-ELISA (HIV) (2)
- 3.4: DNA /RNA based diagnosis-HBV (3)
- 3.5: PCR based genotyping techniques for diagnosis-RFLP (MTHFR C677T mutation) (3)
- 3.6: Chip bases diagnosis and applications- colon cancer (2)

Unit 4: Therapeutic approaches for human diseases

15 Hours

- 4.1: Recombinant proteins-human growth hormone, insulin (2)
- 4.2: Gene therapy -ex vivo and in vivo gene therapy (2)
- 4.3: Stem cells -potency definitions; embryonic and adult stem cells (2)
- 4.4: Applications of stem cell-based therapies and regenerative medicine (3)
- 4.5: Vaccines, different Types and their Applications -(herpes simplex virus, Cholera, Covid) (3)
- 4.6: Industrial production and Applications of monoclonal antibodies (3)

B. Colpana

CHAIRPERSON
BOS in Genetics/Biotechnology
Bhavan's Vivekananda College
Sainikpuri



Prof. SMITA C. RAWAR
Chairperson
Scientist In-Charge (OU-IAEC)
Department of Genetics
Osmania University
Hyderabad-500 007. Telangana

Paper VB- Practicals

Paper Code: BT533B P

Credits: 1

30 hrs(2 hrs/ week)

Skill Development: Students learn the method of karyotyping, identification of the mode of inheritance from pedigrees and DOT ELISA.

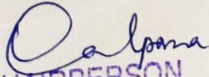
Objective: To demonstrate the role of karyotyping in identification of chromosomal disorders, to help students to identify the mode of inheritance by pedigree analysis, DOT ELISA and Chromosome banding.

1. Karyotyping of normal human chromosome set
2. Karyotyping of autosomal abnormality (Down's syndrome)
3. Karyotyping of allosomal abnormality (Klinefelter syndrome)
4. Chromosome banding -G Banding
5. Human pedigree analysis of autosomal disorder
6. Human pedigree analysis of allosomal disorder
7. Estimation of C-reactive protein
8. DOT ELISA
9. Field visit

Outcome: Students evaluate karyotyping procedures, Chromosome banding, different modes of inheritance of traits, and expertise in DOT ELISA

Spotters:

1. Identify the karyotype (Down's syndrome)
2. Identify the karyotype (Klinefelter syndrome)
3. Chromosomal banding techniques)
4. Identify the inheritance pattern of pedigree (autosomal disorder)


CHAIRPERSON
BOS in Genetics/Biotechnology
Bhavan's Vivekananda College
Sainikpuri



Prof. SMITA C. PAWAR
Chairperson
Scientist In-Charge (OU-IAEC)
Department of Genetics
Osmania University
Hyderabad-500 007. Telangana

Course outcomes:

By the end of this course, students will be able

BT533B CO1: To compare the pedigree analysis of autosomal and allosomal traits and the theory behind karyotyping and chromosomal staining of human chromosomes.

BT533B CO2: To distinguish chromosomal disorders, monogenic disorders, multi-functional disorders, mitochondrial disease and cancer.

BT533B CO3: To recognize the principles and applications involved in the techniques involved in the diagnosis of human diseases like Phenylketonuria, HIV, colon cancer.

BT533B CO4: To formulate therapeutic approaches for human diseases which involves recombinant proteins, gene therapy, stem cells, DNA based vaccines, monoclonal antibodies.

B. Dalpna

CHAIRPERSON
BOS in Genetics/Biotechnology
Ehavan's Vigneshwara College
Bhadrachalam



Dr. Smita C. Pawar

Prof. SMITA C. PAWAR
Chairperson
Scientist In-Charge (IAEC)
Department of Genetics
Osmania University
Hyderabad-500 007, Telangana

6. Prenatal diagnosis – invasive technique
7. Prenatal diagnosis- noninvasive techniques
8. Identify the type of gene therapy -ex vivo in vivo
9. Recombinant vaccine
10. ELISA technique
11. Identify the SNP genotype of different samples after performing PCR-RFLP
12. Count the viable cells on Neubauer chamber (hemocytometer)

Recommended Books:

1. Medical Biotechnology by Pratibha Nallari. V Venugopal Rao- Oxford Press
2. Introduction to Human Molecular Genetics by JJ Pasternak- John Wiley Publishers.
3. Human Molecular Genetics by Tom Strachen and AP Read Bios Scientific Publishers
4. Human Genetics Molecular Evolution by McConkey
5. Recombinant DNA Technology by AEH Emery
6. Principles and Practice of Medical Genetics - 1 II III Volumes by AEH Emery
7. Molecular Biotechnology by Glick and Pasternak

B. Calpana
CHAIRPERSON
BOS in Genetics/Biotechnology
Bhavan's Vivekananda College
Sainikpuri

 Prof. SMITA C. PAWAR
Chairperson
Scientist In-Charge (OU-IAEC)
Department of Genetics
Osmania University
Hyderabad-500 007, Telangana

**BHAVAN'S VIVEKANANDA COLLEGE OF SCIENCE, HUMANITIES AND
COMMERCE, SAINIKPURI, SECUNDERABAD.**

Autonomous College

Affiliated to Osmania University, Hyderabad.

(Accredited with 'A' grade by NAAC)

Department of Genetics and Biotechnology

Program name: B.Sc BtGC & BtMbC (w.e.f. 2023- '24)

Biotechnology Paper VIB Theory

Course Name: Environmental Biotechnology

Paper Code: BT633B
Year/Semester: III/VI

No of Classes: 60
No of Credits: 4

Employability: A profound knowledge gained from bioremediation helps students procure jobs in organizations dealing with bioremediation like sewage treatment.

Course objectives: To acquire knowledge on pollution and sources and understand the importance of Biomass, Biofuels, Biofertilizers, Biopesticides and Bioremediation.

Unit Wise course objectives:

Cob1: To discuss the different types of pollution and its sources.

Cob2: To appraise the different sources of Biomass and Biofuels.

Cob3: To distinguish the different concepts and types of Biofertilizers and biopesticides.

Cob4: To analyze the different methods of bioremediation of environmental pollution.

Unit 1: Environmental pollution

15 Hours

1.1: Introduction to environment and pollution. (2)

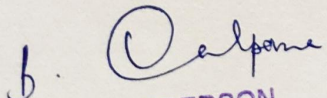
1.2: Types of pollution -air, water and soil pollution. (3)

1.3: Types of pollution-inorganic, organic and biotic. (3)

1.4: Sources of pollution -domestic waste, agricultural waste, industrial effluents and municipal waste. (3)

1.5 Greenhouse gases, global warming and climate change. (2)

1.6: Measurement methods of environmental pollution -BOD & COD. (2)


CHAIRPERSON
BOS in Genetics/Biotechnology
Bhavan's Vivekananda College
Sainikpuri




Prof. SMITA C. PAWAR
Chairperson
Scientist In-Charge (OU-IAEC)
Department of Genetics
Osmania University
Hyderabad-500 007, Telangana

15 Hours

Unit 2: Biomass and Biofuels

- 2.1: Renewable and non- renewable energy resources. (2)
- 2.2: Fossil fuels energy source and their impact on the environment. (3)
- 2.3: Biomass as source of energy (Bioenergy). (3)
- 2.4: Types of biomass -plant, animal and microbial biomass. (2)
- 2.5: Production of biofuels: bioethanol and biodiesel. (2)
- 2.6: Production of biohydrogen and biomethane. (2)

15 hours

Unit 3: Biofertilizers and Biopesticides

- 3.1: Chemical fertilizers and their impact on the environment (eutrophication). (3)
- 3.2: Concepts of biofertilizers. (2)
- 3.3: Types of biofertilizers – bacterial, fungal and algal fertilizers. (3)
- 3.4: Pesticides and their impact on the environment. (2)
- 3.5: Concepts of biopesticides, types of biopesticides. (3)
- 3.6: Uses of biofertilizers and biopesticides. (2)

15 hours

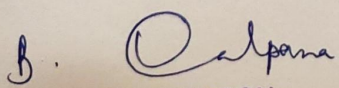
Unit 4: Bioremediation of Environmental Pollutants

- 4.1: Waste water treatment – sewage and industrial effluents (aerobic and anaerobic methods). (3)
- 4.2: Bioremediation -concepts and types (in-situ and ex-situ bioremediation). (3)
- 4.3: Bioremediation of toxic metal ions-biosorption and bioaccumulation. (3)
- 4.4: Composting of organic wastes. (2)
- 4.5: Microbial remediation of pesticides and xenobiotic compounds. (2)
- 4.6: Phytoremediation- concepts and applications. (2)

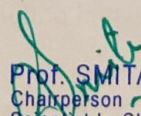
Course outcomes:

By the end of this course students will be able to

BT633B CO1: To interpret the different types of Pollution and its sources ,its effect on the globe along with the measurement methods.


CHAIRPERSON
BOS in Genetics/Biotechnology
Bhavan's Vivekananda College
Sainikpuri




PROF. SMITA C. PAWAR
Chairperson
Scientist In-Charge (OU-IAEC)
Department of Genetics
Osmania University
Hyderabad-500 007. Telangana

BT633B CO2: To evaluate the different types of biomass and biofuels used and its importance to the maintenance of the environment.

BT633B CO3: To explore the sources of energy that are eco-friendly like bio-fuels and biofertilizers and to motivate the students to pursue research in the same field for the betterment of the society.

BT633B CO4: To analyze the importance of bioremediation to the environment and to identify its methods.

B. Carlana

CHAIRPERSON
BOS in Genetics/Biotechnology
Bhavan's Vivekananda College
Sainikpuri



Prof. SMITA C. PAWAR
Chairperson
Scientist In-Charge (OU-IAEC)
Department of Genetics
Osmania University
Hyderabad-500 007. Telangana

Paper VI B- Practicals

30 hrs(2 hrs/ week)

Paper Code: BT633B P

Credits: 1

Skill development: Students will obtain skills to analyze polluted samples, produce biogas and biofertilizers.

Objective: To demonstrate the techniques involved to evaluate polluted water samples and to help students understand the microbial flora present in it.

1. Estimation of BOD in polluted water samples.
2. Estimation of COD in polluted water samples.
3. Estimation of total dissolved solid in wastewater samples.
4. Determination of quality of water sample (Coliform test).
5. Isolation of microorganisms from polluted soil/ industrial effluents.
6. Production of hydrogen or biogas.
7. Identification and characterization of bioremediation microorganisms.
8. Production of microbial biofertilizers.
9. Field Visit

Outcome: The students estimate BOD, COD of polluted water samples, isolate and characterize the microorganisms from different sources and analyze the techniques in the production of biofertilizers and biogas.

Spotters:

1. Air/water /soil pollution
2. Municipal waste
3. Industrial effluents
4. Algal blooms
5. Greenhouse effect
6. Plant biomass
7. Waste water treatment plant

B. Calpana
CHAIRPERSON
BOS in Genetics/Biotechnology
Bhavan's Vivekananda College
Santipur



Prof. SMTA C. PAWAR
Chairperson
Scientist In-Charge (OU-IAEC)
Department of Genetics
Osmania University
Hyderabad-500 007, Telangana

9. Biogas plant
10. Xenobiotic degrading bacteria
11. Phytoremediation
12. Microbial biofertilizers.

Recommended books:

1. TextBook of Biotechnology by H.K Das (Wiley publication)
2. Biotechnology by H. J. Rehm and G. Reed VIH Publications, Germany
3. Biogas Technology by T. Nijaguna
4. Biotechnology by K. Trehan
5. Industrial Microbiology by L.E. Casida
6. Food Microbiology by P.K. Gupta
7. Essentials of Biotechnology for Students by Satya N. Das
8. Bioethics – Readings and Cases by B.A Brody and h.t Engelhardt. Jr. (Pearson education)
9. Biotechnology. IPRS and biodiversity by M.B. Rao and Manjula Guru (Pearson education)

B. Carpana

CHAIRPERSON
BOS in Genetics/Biotechnology
Bhavan's Vivekananda College
Sainikpuri



Prof. SMITA C. PAWAR
Chairperson
Scientist In-Charge (OU-IAEC)
Department of Genetics
Osmania University
Hyderabad-500 007. Telangana