

GOVT. BILASA GIRLS' POST-GRADUATE COLLEGE

[AUTONOMOUS]



BILASPUR (C.G.)

[Affiliated to Atal Bihari Vajpayee Vishwavidyalaya Bilaspur]

SYLLABUS

B.Sc. [Biotechnology]

Semester III to IV

Session - 2022-23

Govt. Bilasa Girls PG College, Bilaspur (C.G.)

BIOTECHNOLOGY B. Sc. Third Semester Session 2022-23

Session: 2022-23

Paper (Pass Course) (Genetics, Molecular Biology & Biostatistics)

Max. Marks – 60 Passing marks - 21 Time of Exam. – 2.5 Hrs.

Unit – 1: Basic concept of Genetics:

Historical background. Mendel's law of inheritance, gene interactions, linkage & crossing over, sex determination, recombination and gene mapping. Extra chromosomal Inheritance.

Unit – 2: Chromosome:

Chromosome structure and behaviour through cell cycle. Chromosome organization; Lamprush and polygene chromosome. Chromatin organization (solenoid model). Nucleic Acid: Experimental evidence for nucleic acid as genetic material, structure and types of DNA & RNA.

Unit – 3: Replication & expression of Gene:

Concept of Gene: Features, enzymes involved and mechanism of Prokaryotic DNA replication, central dogma: Transcription (feature, mechanism and inhibition). Translations: initiation elongation, termination and inhibition.

Unit – 4: Regulation of Gene Expression:

Operon concept, negative and positive regulation, instability of bacterial mRNA, inducer and co repressor, catabolic repression. Regulation by attenuation (trp operon). Molecular basis of Mutation, DNA damage and DNA repair.

Unit – 5: Biostatistics:

Objective, Statistical term, data types and collection, frequency distribution, central tendency (Mean, Median and Mode), Standard deviation and standard error. Probability calculations, ANOVA and test of significance (χ^2 test) method of sampling.

Suggested Books:

1. Lehninger Principles of Biochemistry; 5th Edition; Michael M. Cox, David L Nelson; W H Freeman and Company.
2. Principles of Genetics; 8th Edition; Eldon Gardner, Michael Simmons and Peter Snustad, John Wiley & Sons, Inc
3. Molecular Biology of the Cell; 3rd Edition; Bruce Alberts, Dennis Bray, Julian Lewis, Martin Raff, Keith Roberts, James Watson; Garland Publishing.
4. Statistical Methods; S. P. Gupta; Sultan Chand & Sons.
5. Bio statistics; Sunder Rao

Signature of Members, Board of Studies:

Third Semester Practical

1. Isolation of DNA from human blood and karyotyping.
2. Isolation of genomic DNA from bacteria and purification by column chromatography.
3. Isolation of genomic DNA from plant.
4. Isolation and separation of plasmid DNA.
5. Representation of statistical data by: a) Histograms b) O give curve c) Pie diagram.
6. Determination of statistical averages of arithmetic mean, median and mode by computers and by manually.
7. Determination of measures of dispersion: a) chi square test b) Standard deviation.
8. Test of significance application of following a) chi- square test b) t- Test

BIOTECHNOLOGY
B. Sc. Fourth Semester
Paper (Pass Course)

(Plant/Animal Biotechnology, DNA Technology and Ethical Issues)

Max. Marks – 60 Passing marks - 21 Time of Exam. – 2.5 Hrs.

Unit – 1: Plant Tissue Culture:

Basic techniques of plant tissue culture, in-vitro pollination & fertilization, embryo culture & its applications, embryogenesis & organogenesis. Micro propagation, haploids & its application. Somaclonal variations & its applications. Endosperm culture & Production of triploids.

Unit – 2: Animal tissue culture:

Tissue culture media: Physiochemical properties, Balance Salt Solution, complete media, Serum, Serum Free Medium - Advantages and Disadvantages. Equipment's, Culture Vessel and Sterilization. Primary Cell Culture. Cell lines: Finite and continuous cell line.

Unit-3: Molecular Tools For Gene Cloning Nucleases:

Exonucleases and Endonucleases, Restriction Enzymes (Type I, Type II, Type III, Type IV & Type V), RNases Methylases: CpG Methylase, Dam Methylase, Dcm Methylase Polymerases: DNA Pol I, Klenow Fragments, Reverse Transcriptase, Taq & Pfu Polymerases Ligases: T4 DNA Ligase, *E.coli* DNA Ligase, T4 RNA Ligase Topoisomerases: Type I(A, B) & Type II(A,B) End Modifying Enzymes: Terminal Transferase, T4 Polynucleotide Kinase, Alkaline Phosphatases

Unit-4: Vectors and Gene Cloning

Introduction to cloning vectors - Desirable properties of vectors – Prokaryotic & Eukaryotic Expression Systems (Constitutive & Inducible) Plasmid Vectors - Phage Vectors - Cosmids - Phagemids - BACs - Yeast Vectors – YACs. Physical and chemical method of introduction of recombinant vector into host. Genomic libraries, cDNA Cloning. Screening of recombinants (blue-white screening and hybridization)

Unit – 5: Transgenic animal and Bioethical issues:

Cloning in mammalian cells, integration of DNA into mammalian genome. Transgenic animals (Fish, Mice and Sheep). Bioethical and Regulatory issues; Medical ethics, facts and technology involves in bioethical issues. Intellectual property rights introduction, trade secret, patents, and copyright and plant variety protection

Suggested Books:

1. Gene Cloning - An introduction, T.A. Brown. Van Reinhold,
2. Recombinant DNA - Watson JD, Gilman M, Witkowski J and Zoller M, 1992. Second Ed. Scientific American Books.
3. Principles and Practice of Animal Tissue Culture; SudhaGangal Universities Pres
4. Culture of Animal Cells; 4th Edition; Ian Freshney A John Wiley & Sons; Inc., Publication

Signature of Members, Board of Studies:

Fourth Semester Practical

Session: 2022-23

1. Isolation of plasmid by alkaline lysis method.
2. Preparation of bacterial competent cells.
3. Transformation & screening of transformants in bacteria.
4. Isolation of genomic DNA from onion.
5. Southern / western blotting Technique
6. Replica plating technique.
7. Restriction digestion of isolated plasmid DNA.
8. Identification of Lac⁺ bacteria by blue white screening using IPTG
9. To design a primer for Polymerase chain Reaction using BLAST and FastA.
10. Demonstration of PCR and DNA sequencing.
11. Estimation of DNA from plant cells
12. Sterilization of Plant material.
13. Plant tissue culture by plant parts.
14. To prepare medium for Plant tissue culture
15. Callus induction and Organogenesis

Scheme of Practical Examination:

- ❖ Schedule of Examination – In Third & Fourth semester only
- ❖ Total Marks - 50
- ❖ Marks distribution –
 - Lab. Task - 30 marks [15 from each course- CCBT-03 & CCBT-04] Question of 20 marks - [two questions (10+5)] from course
 - Question of 20 marks - [two questions (10+5)] from course
 - Spotting-5 spots -10 marks [at least two spots from each course [CCBT-03 & CCBT-04]
 - Viva-voce - 05 marks
 - Sessional - 05 marks

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