PROPOSED CURRICULUM IN ZOOLOGY FOR B.Sc., (UG)

VI SEMESTER

PAPER VII – GENETICS AND BIOTECHNOLOGY

- 40hours

Unit I: 13 hrs.

GENETICS

1.1. Heredity and Environment: Concept of genotype, phenotype, phenocopy, Norm of reactions (Experiments on *Potentilla glandulosa*, Fur colour in Himalayan Rabbit, studies of Human twins). - 02 hrs

1.2. Introduction to Mendelism - Mendelian principles - 02 hrs.

1.3. Deviation from Mendelism: - 05 hrs

a. Multiple allelism (Ex: Inheritance of ABO and MN blood groups), Rh factor and its inheritance (Gene complex and Multiple allele theories), Erythroblastosis foetalis and Applications of Blood groups.
b. Interaction of genes: Concept and Example - Inheritance of comb shape in poultry.
c. Multiple factor inheritance: Concept and Example - Inheritance of skin colour in man.
d. Sex linkage: Concept and types. X – linked inheritance: Eye colour in Drosophila, Colour blindness and Haemophilia (inheritance and construction of pedigree charts); and Y – linked inheritance : Hypertrichosis in man.

1.4. Chromosomal basis of sex determination: Types with examples. Genic balance theory, Gynandromorphs and Free Martins. - 02 hrs

1.5. Concept of gene: Classical concept, Fine structure of gene: Cistron, Recon and Muton, Operon concept: Inducible Operon (E.g. Lac Operon) and Repressible Operon (Tryptophan Operon). - 02 hrs

Unit-II 13 hrs.

2.1. Cytoplasmic inheritance: Kappa particles in Paramecium, Coiling of shells in Snail. - 01 hr

2.2. Chromosomal aberrations: Types – Structural (Duplication, Deletion, Inversion and Translocation) and Numerical (Aneuploidy) – Cri du Chat syndrome, Down's syndrome, Edwards's syndrome, Turner's syndrome and Klinefelter's syndrome. - 03 hrs

2.3. Gene mutations: Spontaneous and induced mutations, ClB method of detection of mutations, Physical, Chemical and Biological mutagens, Molecular basis of mutation. - 05 hrs

2.4. Eugenics: Definition, Positive and negative aspects, Genetic counselling, Euthenics and Euphenics. - 02 hrs

2.5. Biochemical Genetics: Inborn errors in metabolism – Phenylketonuria, Alcaptonuria, Albinism, Sickle cell anaemia, Thalassemia, Galactosemia and Cystic fibrosis – 02hrs.

Unit III: BIOTECHNOLOGY -14 hrs

3.1. Genetic Engineering / Recombinant DNA (rDNA)Technology: - 03 hrs

a. Introduction.
b. Components of rDNA technology:
   i. Molecular tools: Restriction enzymes, DNA ligases, Alkaline phosphatase.
   ii. Host cells: Prokaryotic hosts and Eukaryotic hosts.
   iii. Vectors: Plasmids, Bacteriophages, Cosmids, Artificial chromosome vectors, Shuttle vectors. Choice of a vector.
   iv. Bioreactors.
c. Methods of gene transfer in animals: Transfection – microinjection, electroporation, of DNA, lipofection and direct transfer of DNA.

3.2. Applications of Biotechnology:

a. **Transgenesis**: - 02 hrs

i. Introduction – Meaning and significance.
ii. Transgenesis in mice, Gene targeting in mice, Knock out and Knock in technology.

b. **Animal improvement:** - 02 hrs

i. Super ovulation and Embryo transfer: Steps, Difference between surgical and non-surgical transfers, Benefits and limitations of embryo transfer.
ii. Artificial insemination
iii. Sperm sexing.

c. **Gene therapy**: - 02 hrs
   i. Introduction.
   ii. Approach for gene therapy: Somatic cell gene therapy, Embryo cell gene therapy and Germ cell gene therapy.
   iii. In vivo and ex-vivo gene therapy.
   iv. Gene therapy strategies for Cancer: Tumor necrosis factor gene therapy, Suicide gene therapy, Gene replacement therapy and Antigene and antisense gene therapy.

d. **Stem cells**: Introduction, features, types, sources and applications -01 hr
e. **Bioinformatics**: Meaning, Scope and applications. -01 hr.

f. **Hybridoma technology**: Monoclonal antibodies and their applications. -01 hr.

g. **DNA fingerprinting or Profiling**: RFLP, VNTR, Microsatellites (Simple tandem repeats and Single nucleotide polymorphisms (SNPs) techniques. Application of DNA fingerprinting. - 02 hrs

VI SEMESTER B.Sc., ZOOLOGY PRACTICAL - 07
Genetics and Biotechnology

1. Drosophila Genetics:
   a. Sexual dimorphism and Mutant forms – Vestigial wing, White eye, Bar eye, Sepia eye, Yellow body and Ebony.
   b. Mounting of Polytene chromosomes (Salivary gland chromosomes)
   c. Mounting of Sex comb and Genital plate.
2. Human Genetics:
   d. Blood typing
   e. Preparation of Buccal smear for sex chromatin
   f. Preparation of Blood smear for identification of Cell types and to comment on the types of leucocytes.
   g. Differential counting of blood cells using haemocytometer.
   h. Micrometry of cell types.
3. Biotechnology:
   i. Staining and identification of Bacteria (Gram staining)
   j. Biochemical analysis to determine the interaction of bacteria with different substrates.
   k. Isolation of plasmid DNA
4. Isolation of DNA from animal tissue (Sheep, Goat, Cow or Hen)
5. Qualitative detection of acetic acid in Yeast culture (Student is required to prepare the culture)
6. Study of polyploidy in Onion root tip using Colchicine
7. Translocation in Rheo.

SCHEME OF PRACTICAL EXAMINATION UNDER CBSS 2014-15 ONWARDS
B.Sc. VI SEMESTER ZOOLOGY

GENETICS AND BIOTECHNOLOGY – PRACTICAL - VII

Duration: 3 hrs. Max.Marks : 35

01	<u>Drosophila Genetics:</u> a) Mounting : Polytene Chromosome (Salivary Gland Chromosome) or Sex comb or Genetial Plate Or Two Genetic problems b) Identify and comment with a neat labeled diagram. Drosophila male, female and mutants (any two)	07 marks 05 marks
02	Human Genetics : from d to f	06 marks
03	Biotechnology: a) From i, j and k (any one) b) From 4, 5, 6 and 7 (any one)	 06 marks 06 marks
04	Class Records	05 marks
	Total	35 marls