

## **ZOH501- GENETICS AND QUANTITATIVE BIOLOGY**

**Teaching hours**

**10hrs /Unit**

### **COURSE OUTCOME:**

1. The course is mainly focused on principles of classical genetics, environmental and genetic influences on expression of traits.
2. Both animal and human models are used to explain the phenomenon of inheritance of characters. Structural and functional components of genes are also studied.
3. Consequences of gene modifications and the possible mechanism of its repair, genetic control in the development of adult characters are also dealt.
4. Genetic disorders prevailing in human population, their chances of inheritance, and genetic methods of screening and preventive measures are included.
5. The students will be trained in various statistical tools commonly used which are included in understanding and interpreting the probable chances of genetic pattern of inheritance of human traits.
6. In the biological research fields, statistical analysis plays an essential role in concluding data and postulating different hypothesis. So Biostatistics is an essential subject for those who go for a research carrier.

### **UNIT-I**

Historical highlights - Development of the gene concept. Mendelian principles; Mendelian inheritance and probability. Modified genetic ratios – Co-dominance – incomplete dominance – Lethal alleles. Interaction between different genes – Complementary genes, Penetrance and expressivity, pleiotropy, epistasis. Extra chromosomal inheritance. Sex determination in drosophila and man. Sex linked inheritance in Drosophila and man. Multiple alleles – genetics of blood group inheritance.

### **UNIT-II**

Molecular structure of gene, genetic code, transposable elements, gene mutations and DNA repair mechanism. Regulation of gene expression in prokaryotes and eukaryotes- Operon concept, attenuation and anti-termination. Giant chromosomes. Linkage, recombination and gene mapping: Linkage groups and types of linkage. Construction of linkage maps in Drosophila. Genetic basis of development in Drosophila- genes involved in Drosophila development and their functional role.

### **UNIT-III**

Human karyotype- International System for Human cytogenetic Nomenclature (ISCN) Chromosome aberrations- structural and numerical variations. Chromosomal syndromes. Human genome project; Genetic counselling. Genetic Screening- Amniocentesis, Chorionic Villus sampling, Cardiocentesis, Dermatoglyphics.

#### UNIT-IV

Genetics of behaviour- twins in genetic studies. Genome imprinting. Pedigree analysis. Inheritance of autosomal and sex chromosomal traits. Multi- factorial and polygenic inheritance. Population genetics- Hardy Weinberg law. Factors changing allelic frequencies – mutation, selection, genetic drift, migration etc. Meiotic drive.

#### UNIT-V

Population and sample- sampling techniques. Organization of biological data –tabular and graphical methods. Analysis of data – measures of central tendency (Mean, Median, Mode), Standard deviation. Probability & Frequency distribution –normal, binomial and Poisson distributions. Correlation and regression. Chi-Square test. Test of significance. t –test. Analysis of Variance (ANOVA).

#### REFERENCES

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5. Gardner, E. J., Simmins M. J. and Snusstad D. P. (1991) Principles of Genetics, 8<sup>th</sup> edition, John Wiley and Sons Inc.
6. Hartl, D. L. (2001) Genetics: Analysis of genes and genomes, 4<sup>th</sup> edition, Jones & Bartlett publishers, Boston.
7. Hassard, T.H. (1991) Understanding Biostatistics, Mosby year Book St. Louis.
8. Hutt, F. B. and Rasmusen B. A. (1982) Animal genetics, 2<sup>nd</sup> edition, John Wiley & sons, New York.
9. Jha, A. P. (1997) Genes and evolution, McMillan Publishers, New Delhi.
10. Lawrence, P. A. (1992) The making of a fly: The genetics of animal design, Blackwell scientific publishers, London, Boston.
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12. Mange, E. J. and Mange A. P. (1994) Basic Human Genetics, Rastogi Publications, Meerut, India.
13. Norman, T. J. Bailey (1994) Statistical methods in biology, 3<sup>rd</sup> edition, Cambridge University Press.
14. Strickberger, M. W. (1995) Genetics, 3<sup>rd</sup> edition, Prentice Hall of India Pvt. Ltd.
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