

**JYOTI NIVAS COLLEGE AUTONOMOUS
SYLLABUS FOR 2018 BATCH AND THEREAFTER**

Programme: B.Sc.

Semester: II

GENETICS PAPER II

BIOMETRY AND TRANSMISSION GENETICS

Course Code: 18HGT2

No. of Hours: 60

COURSE OBJECTIVES:

- To give a strong foundation on statistical analysis which will help in research
- To study the fine structure of chromosome
- To learn the characteristics of sex linked inheritance
- **LEARNING OUTCOMES:**
- To understand the fundamentals of biometry and its effective application in genetic analysis
- To understand that genes are discrete units that interact to affect phenotype
- To know that sex determination has a genetic basis

A. BIOMETRY

UNIT I: ELEMENTS OF BIOMETRY **15 HRS**

Probability – Definition, addition and multiplication rules

Normal curve – Importance, properties, standard normal curve, computing normal probabilities

Hypothesis testing – Types of hypotheses; Two types of errors; standard errors of a statistic;

t test – Test for single mean, test for difference of means for independent and dependent samples

F test- equality of variances

Chi square test – testing of goodness of fit, testing for independence of attributes and its application in segregation ratios

B. TRANSMISSION GENETICS

UNIT II: ALLELISM **11 HRS**

Introduction: Definition and types of allelism; penetrance and expressivity; test for

allelism **2 HRS**

Multiple alleles: Color loci in corn; Eye color in Drosophila; ABO Blood groups and Rhesus factor in human. Genetic problems	6 HRS
Pseudoalleles: lozenge eye in Drosophila; eye colour in Drosophila	2 HRS
Lethal alleles in mice	1 HR
UNIT III: GENE INTERACTIONS	11 HRS
Non-epistasis: Inheritance of comb pattern in fowl	1 HR
Epistasis:	
Dominant epistasis – coat color in dog (12:3:1),	1 HR
Recessive epistasis – coat color in mice (9:3:4),	1 HR
Duplicate genes with cumulative effect – kernel color in wheat (9:6:1)	1 HR
Duplicate dominant genes – capsule shape in shepherd’s purse (15:1)	1 HR
Duplicate recessive genes – flower color in sweet pea (9:7)	1 HR
Dominant – recessive interaction – plumage in fowls (13:3)	1 HR
Pleiotropism	1 HR
Genetic problems	3 HRS
UNIT IV: SEX DETERMINATION	12 HRS
Chromosomal theory of sex determination:	1 HR
XX-XY, XX-XO and ZZ-ZW	
Bridges’ Genic Balance theory,	1 HR
Parthenogenesis as a sex determining mechanism-Arrhenotoky and Thelytoky with examples	1 HR
Sex determination in man; SRY gene and its role	1 HR
Y Chromosome in sex determination in Melandrium and Sphaerocarpus	2 HRS
Environment and sex determination: Sex determination in Bonellia; hormonal control of sex determination (free martin); gynandromorphs, intersexes, supersexes in Drosophila; sex differentiation and dosage compensation	4 HRS
Sex limited (cock feathering) and sex influenced traits (pattern baldness in man)	2 HRS
UNIT V:SEX LINKAGE	11 HRS
Non-disjunction of chromosomes: Bridges’ theories of non-disjunction - Primary and secondary non-disjunction in Drosophila	2 HRS
Sex linked inheritance:	3 HRS

X linked inheritance in Drosophila (eye color and lethal genes) and man (haemophilia and color blindness).

Y linked inheritance in Drosophila (bobbed bristles). **1 HR**

Sex linked genes in poultry and moths. **1 HR**

Sex related genes in maize. **1 HR**

Attached X chromosome in Drosophila. **1 HR**

Genetic problems **2 HRS**

I B.Sc. Genetics-II Semester - Practical II

DURATION: 3 HRS/UNIT

NO. OF UNITS: 15

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| 1. Temporary squash preparation of -Onion flower buds and Grasshopper testis for meiosis | 3 UNITS |
| 2. Study of | 3 UNITS |
| a. Incomplete dominance – <i>Mirabilis jalapa</i> | |
| b. Non-epistatic gene interaction/supplementary gene interaction- inheritance of comb pattern in fowls | |
| c. Recessive epistasis – coat color in mice | |
| d. Duplicate dominant epistasis – capsule shape in <i>Capsella</i> (Shepherd's purse) | |
| e. Duplicate recessive epistasis/Complementary gene interaction- <i>Lathyrus odoratus</i> (Sweet pea) | |
| 3. Study of ABO and Rh blood groups in man | 1 UNIT |
| 4. Computation of mean, mode, median, standard deviation and standard error | 2 UNITS |
| 5. Genetic Problems | 2 UNITS |
| 5 a. Multiple alleles | |
| 5 b. Gene interactions | |
| 6. Application of Chi-square test, t test and F test | 2 UNITS |
| Practical tests/repetition | 2 UNITS |
- Note:** 13 Practical + 2 units for practical tests/repetition

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1. Daniel Hartl and Jones E.W. (1998), GENETICS, PRINCIPLES AND ANALYSIS, 4th edition, Jones & Bartlett Publication, Massachusetts.
2. Elrod S.L. and Stansfield W.D. (Schaum's outlines) (2002), THEORY AND PROBLEMS OF GENETICS, 4th edition, Tata McGraw-Hill, New Delhi.
3. Gardener et al, (2005), PRINCIPLES OF GENETICS, 8th edition, John Wiley & Sons Inc., New York.
4. Klug W.S., Cummings M.R. (2000), CONCEPTS OF GENETICS, 6th edition, Prentice Hall, London.

5. Ross S., A FIRST COURSE IN PROBABILITY, (1994) 4th edition, McMillan, New York.
6. Satguru Prasad (1993), FUNDAMENTALS OF BIOSTATISTICS, Emkay Publications, New Delhi.
7. Sinnott E.W., Dunn L.C. and Dobzhansky T. (1958), PRINCIPLES OF GENETICS, 5th edition, McGraw-Hill Publications, New York.
8. Snustad, D.P., and Simmons M.J. (2006), PRINCIPLES OF GENETICS, 4th edition, Wiley Asia Student Edition.
9. Strickberger M.W. (2006), GENETICS, 3rd edition, Prentice Hall of India, New Delhi.
10. Tamarin R.H. (2002), PRINCIPLES OF GENETICS, 7th edition Tata McGraw-Hill, New Delhi.
11. **e-books:**<http://torrentz.eu/gen/genetics+books-q>, Snustad D.P. and Simmons M.J., (2012), PRINCIPLES OF GENETICS, 6th edition