



JIWAJI UNIVERSITY, GWALIOR
M.Sc. in Molecular and Human Genetics
(2015-2017)



DISTRIBUTION OF DIFFERENT PAPERS AND CREDITS IN VARIOUS SEMESTERS

Semester	Paper Code	Name of the Paper	Type of Paper	Credits
<i>Semester I</i>	MHG-101	A. Principles of Genetic Inheritance B. Statistical Tests in Genetic Analysis	Core	3
	MHG-102	Basic Human Genetics and Human Cytogenetics	Core	3
	MHG-103	Molecular Structure & Functions of the Cell	Core	3
	MHG-104	A. Molecular Organization of Chromatin and Cytogenetics B. Cancer Biology	Core	3
	MHG-105	Practical based on papers 101 & 102	Core	3
	MHG-106	Practical based on papers 103 & 104	Core	3
	MHG-107	Seminar	Core	1
	MHG-108	Assignment	Core	1
	MHG-109	Comprehensive Viva Voce	Virtual	4
	Total Credits			
<i>Semester II</i>	MHG-201	Molecular Genetics and Genomics	Core	3
	MHG-202	Human Molecular Genetics and Human Genomics	Core	3
	MHG-203	Immunogenetics	Core	3
	MHG-204	Biochemistry: Structure, Function and Regulation of Biomolecules	Core	3
	MHG-205	Practical based on papers 201 & 202	Core	3
	MHG-206	Practical based on papers 203 & 204	Core	3
	MHG-207	Seminar	Core	1
	MHG-208	Assignment	Core	1
	MHG-209	Comprehensive Viva Voce	Virtual	4
	Total Credits			
<i>Semester III</i>	MHG-301	Developmental and Reproductive Genetics	Core	3
	MHG-302	Clinical Genetics and Genetic Counseling	Core	3
	MHG-303	Population Genetics, Human Evolutionary and Behavior Genetics	Elective: Centric	3
	MHG-304	A. Recombinant DNA Technology B. Molecular Diagnostic Methods	Elective: Generic/Centric	3
	MHG-305	Practical based on papers 301 & 302	Core	3
	MHG-306	Practical based on papers 303 & 304	Elective: Generic/Centric	3
	MHG-307	Seminar	Core	1
	MHG-308	Assignment	Core	1
	MHG-309	Comprehensive Viva Voce	Virtual	4
	Total Credits			
<i>Semester IV</i>	MHG-401	Bio-informatics and Bio-techniques	Core	3
	MHG-402	Practical based on papers 401	Core	3
	MHG-403	Seminar	Core	1
	MHG-404	Assignment	Core	1
	MHG-405	Dissertation Work	Core	12
	MHG-406	Comprehensive Viva Voce	Virtual	4
	Total Credits			
Minimum Number of Credits to be earned for the award of degree (Valid:80 + Virtual: 16)				96



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The course for Master of Science (M. Sc.) in Molecular & Human Genetics shall comprise of four semesters of six months duration each. Each theory and practical paper will be of 3 credits. The first 3 semesters shall include 4 theory papers and 2 practical courses, while the 4th semester, will include 1 theory paper and 1 practical paper. The total marks for assessment in these papers are 100 marks, out of which 60 marks are for final examinations and 40 marks for internal assessments. All the theory papers are divided into 40 classes of 1 hr. After the completion of each topic in a particular paper, there will be a test and the maximum marks will be equivalent to the number of hours allotted to that topic. These marks will comprise the internal assessment marks (40) for each paper. The students will participate in weekly seminars (on any topic from the syllabus allotted to them by the faculty) and journal clubs (seminar on a research paper of interest), to meet the needs in their aim to become an interdisciplinary researcher. For this they will be awarded 1 credit each. Also a comprehensive viva voce examination will be held during the practical exams (4 credits).

In the last semester, the students shall formulate a short project proposal (dream project designed by the students themselves) in the subject related to the course under the supervision of the faculty involved and submit the proposal along with presentation for evaluation (2 credits). In addition, the students are required to undergo a 3 month dissertation work, to obtain professional exposure in well reputed Research Institutes/Universities or Industries and submit the final report along with a presentation for evaluation in the 4th semester (12 credits).

Detailed Syllabus for M. Sc. in Molecular & Human Genetics

Semester I

Paper MHG-101: A. Principles of Genetic Inheritance

B. Statistical tests in genetic analysis

(No. of classes of 60 mins each)

A. Principles of Genetic Inheritance

Unit I

1. Mendel's laws of inheritance 2
 - 1.1 Law of segregation
 - 1.2 Law of independent assortment
2. Chromosomal theory of inheritance 1
3. Extensions of Mendelism 5
 - 3.1 Allelic variation and gene function- Dominance relationships and Complications in the concept of dominance
 - 3.2 Multiple allelism, allelic series
 - 3.3 Testing gene mutations for allelism: complementation test
 - 3.4 Visible, sterile and lethal mutations
 - 3.5 Pleiotropy
4. Gene interactions and modifying genes 2

Unit II

5. Sex chromosomes and sex-linked inheritance 2
 - 5.1 Sex chromosomes and their meiotic behaviour
 - 5.2 Sex-linked inheritance in *Drosophila* and *human*
6. Linkage and crossing over 4
 - 6.1 Concept
 - 6.2 Cytological demonstration of crossing Over in *Drosophila*
 - 6.3 Genetic distance and physical distance
 - 6.4 Genetic and cytological crossing over
7. Linkage and crossing over: Preparation of Linkage map 3
 - 7.1 Genetic recombination & construction of genetic maps in *Drosophila* (3-point test Cross) & yeast (Tetrad analysis).
 - 7.2 Interference and coincidence
 - 7.3 Mitotic recombination
8. Inheritance of quantitative traits 4
 - 8.1 Continuous and discontinuous variation
 - 8.2 Genetic variance and heritability. (Narrow sense and broad sense); Quantitative trait loci (QTL)

Unit III

9. Polygenic inheritance, Environmental effects on gene expression 2
10. Extranuclear inheritance & maternal effects 3
 - 10.1 Organelle heredity (mitochondria & chloroplast); Petite mutations
 - 10.2 Infectious heredity (Cytoplasmic inheritance) in symbionts (*Paramecium*) & *Drosophila*
 - 10.3 Maternal inheritance: Ephestia pigmentation and snail coiling

B. Statistical tests in genetic analysis

Unit IV

11. Application of laws of probability (product rule, sum rule, binomial probability) 1
12. Measures of central tendency: Mean, Median, Mode 1
13. Measures of dispersion: Standard deviation, standard error, Variance, Coefficient of variation 2
14. Hypothesis testing and analysis of Genetic data 4
 - 14.1 Statistical & Scientific hypothesis
 - 14.2 The null and alternative hypothesis
 - 14.3 F-tests & Chi square test, Student's t test, Z test, Q test
15. General idea of Correlation and Regression Analysis 2
16. ANOVA: General idea of one way & two way analysis 2



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