

GYANVEER UNIVERSITY, SAGAR (M.P.)

Academic Year: 2023-2024

M.Sc. (Ag) Plant Pathology



Syllabus & Scheme

Semester – I & II

School of Agricultural Science





GYANVEER UNIVERSITY, SAGAR (M.P.)
Scheme of Examination M.Sc (Agriculture-Plant Pathology) I Semester
School of Agricultural Science (Academic Session 2023-24)
Subject wise distribution of marks and corresponding credits

S. No.	Subject Type	Course	Subject Code	Paper Name	Maximum Marks Allotted										Total Marks	Contact Periods Per week			Credits Allotments	Total Credits
					Theory Slot				Practical Slot							L	T	P		
					End Term Exam	Internal Assessment Class test (Descriptive & Objective)/Assignment/Seminar			Internal Assessment			External Assessment								
						Final Exam	Internal Assessment I	Internal Assessment II	Internal Assessment III	Class test/Interaction	Attendance	Practical/Presentation/Lab Record	Viva Voce	Lab Work						
1	Major Course	M.Sc (Agriculture-Plant Pathology)	GUPP-501T	Principles of Plant Pathology	70	15	15	15	-	-	-	-	-	100	3	0	0	3(3+0)	3	
2	Major Course		GUPP-502T	Mycology(Theory)	70	15	15	15	-	-	-	-	-	100	2	0	0	3(2+1)	2	
4	Major Course		GUPP-502P	Mycology(Practical)	-	-	-	-	10	10	10	10	10	50	0	0	1		1	
5	Major Course		GUPP-503T	Plant Virology(Theory)	70	15	15	15	-	-	-	-	-	100	2	0	0	3(2+1)	2	
6	Major Course		GUPP-503P	Plant Virology(Practical)	-	-	-	-	10	10	10	10	10	50	0	0	1		1	
8	Major Course		GUPP-504P	Detection and Diagnosis of Plant Diseases	-	-	-	-	10	10	10	10	10	50	0	0	2	4(2+2)	2	
9	Minor Course		GUGPB-501T	Principles of Genetics(Theory)	70	15	15	15	-	-	-	-	-	100	2	0	0		2	
10	Minor Course		GUGPB-501P	Principles of Genetics(Practical)	-	-	-	-	10	10	10	10	10	50	0	0	1	1(0+1)	1	
11	Minor Course		GUGPB-504T	Cell Biology and Molecular Genetics(Theory)	70	15	15	15	-	-	-	-	-	100	2	0	0	3(2+1)	2	
12	Minor Course		GUGPB-504P	Cell Biology and Molecular Genetics(Practical)	-	-	-	-	10	10	10	10	10	50	0	0	1		1	
13	Supporting Course		GUSTAT-501T	Statistical Methods for Applied Sciences (Theory)	70	15	15	15	-	-	-	-	-	100	3	0	0	4(3+1)	3	
14	Supporting Course		GUSTAT-501P	Statistical Methods for Applied Sciences (Practical)	-	-	-	-	10	10	10	10	10	50	0	0	1		1	
15	Non Credit Course		GUPGS-501	Basic Concept in Laboratory Techniques	NO CREDIT															
16	Non Credit Course		GUPGS-502	Agricultural Research, Research Ethics and Rural Development Programmes	NO CREDIT															

Total of Credits is = 21

*Note** Allotment of Marks for Internal Assessment for theory portion is Best of Two / either of two and addition of them.

*R: Remedial course;

** NC - Non Gratial Course



M.Sc. (Ag.) PLANT PATHOLOGY

Course Contents

FIRST SEMESTER

**Course Title : GUPP-501T PRINCIPLES OF PLANT PATHOLOGY
(Theory)**

3(3+0)

OBJECTIVE

To introduce the subject of Plant Pathology, its concepts and principles.

THEORY

UNIT I

Importance, definitions and concepts of plant diseases, history and growth of plant pathology, biotic and abiotic causes of plant diseases. Growth, reproduction, survival and dispersal of important plant pathogens, role of environment and host nutrition on disease development.

UNIT II

Host parasite interaction, recognition concept and infection, symptomatology, disease development - role of enzymes, toxins, growth regulators; defense strategies- oxidative burst: Phenolics, Phytoalexins, PR proteins, Elicitors. Altered plant metabolism as affected by plant pathogens.

UNIT III

Genetics of resistance; 'R' genes; mechanism of genetic variation in pathogens; molecular basis for resistance; marker-assisted selection; genetic engineering for disease resistance. Disease management strategies.

SUGGESTED READINGS

- *Agrios GN. 2005. Plant Pathology. 5th Ed. Academic Press, New York.*
- *Mehrotra RS & Aggarwal A. 2003. Plant Pathology. 2nd Ed. Oxford & IBH, New Delhi.*
- *Singh RS. 2002. Introduction to Principles of Plant Pathology. Oxford & IBH, New Delhi.*
- *Singh DP & Singh A. 2007. Disease and Insect Resistance in Plants. Oxford & IBH, New Delhi.*
- *Upadhyay RK & Mukherjee KG. 1997. Toxins in Plant Disease Development and Evolving Biotechnology. Oxford & IBH, New Delhi. 69*
- *Sharma PD, 2006. Plant Pathology. Narosa publishing house pvt. Ltd. 22 Daryaganj Delhi*
- *Chaube HS, Pundhir VS, 2014. Crop diseases and their management. PHI learning pvt. Ltd. Delhi – 110092*

Course Title : GUPP-502T MYCOLOGY (Theory)

3(2+1)

OBJECTIVE

To study the nomenclature, classification and characters of fungi.

THEORY

UNIT I

Introduction, definition of different terms, basic concepts. Importance of mycology in agriculture, relation of fungi to human affairs, history of mycology. Concepts of nomenclature and classification, fungal biodiversity, reproduction in fungi.

UNIT II

The comparative morphology, ultrastructure, characters of different groups of fungi up to generic level (a) Myxomycota and (b) Eumycota- i) Mastigomycotina ii) Zygomycotina. iii) Ascomycotina, iv) Basidiomycotina, v) Deuteromycotina. Lichens types and importance, fungal genetics and variability in fungi.

Course Title : GUPP-502P MYCOLOGY (Practical)

PRACTICAL

Detailed comparative study of different groups of fungi; collection, identification and preservation of specimens. Isolation and Identification of plant pathogenic fungi.

SUGGESTED READINGS

- *Ainsworth GC, Sparrow FK & Susman HS. 1973. The Fungi – An Advanced Treatise. Vol. IV (A & B). Academic Press, New York.*
- *Alexopoulos CJ, Mims CW & Blackwell M.2000. Introductory Mycology. 5th Ed. John Wiley & Sons, New York.*
- *Mehrotra RS & Arneja KR. 1990. An Introductory Mycology. Wiley Eastern, New Delhi.*
- *Sarbhoy AK. 2000. Text book of Mycology. ICAR, New Delhi.*
- *Singh RS. 1982. Plant Pathogens – The Fungi. Oxford & IBH, New Delhi.*
- *Webster J. 1980. Introduction to Fungi. 2nd Ed. Cambridge Univ. Press, Cambridge, New York.*
- *Dubey H.C. 2005. Introduction of fungi. 3rd edition, vikash publishing house, New Delhi*

Course Title : GUPP-503T PLANT VIROLOGY (Theory)

3(2+1)

OBJECTIVE

To acquaint with the structure, virus-vector relationship, biology and management of plant viruses.

THEORY

UNIT I

History of plant viruses, composition and structure of viruses. Symptomatology of important plant viral diseases, transmission, chemical and physical properties, host virus interaction, virus vector relationship.

UNIT II

Virus nomenclature and classification, genome organization, replication and movement of viruses. Isolation and purification, electron microscopy, protein and nucleic acid based diagnostics.

UNIT III

Mycoviruses, phytoplasma arbo and baculoviruses, satellite viruses, satellite RNAs, phages, viroids, prions. Principles of the working of electron-microscope and ultra-microtome. Origin and evolution, mechanism of resistance, genetic engineering, ecology, and management of plant viruses.

Course Title : GUPP-503P PLANT VIROLOGY (Practical)

PRACTICAL

Study of symptoms caused by viruses, transmission, assay of viruses, Physical properties, purification, method of raising antisera, serological tests, electron microscopy and ultratotomy, PCR.

SUGGESTED READINGS

- *Bos L. 1964. Symptoms of Virus Diseases in Plants. Oxford & IBH., New Delhi.*
- *Brunt AA, Krabtree K, Dallwitz MJ, Gibbs AJ & Watson L. 1995. Virus of Plants Descriptions and Lists from VIDE Database. CABI, Wallington.*
- *Gibbs A & Harrison B. 1976. Plant Virology - The Principles. Edward Arnold, London.*
- *Hull R. 2002. Mathew's Plant Virology. 4th Ed. Academic Press, NewYork.*



**Course Title : GUAPP-504P DETECTION AND DIAGNOSIS OF
PLANT DISEASES (Practical) 2(0+2)**

OBJECTIVE

To impart training on various methods/techniques/instruments used in the study of plant diseases/pathogens.

PRACTICAL

UNIT I

Methods to prove Koch's postulates with biotroph and necrotroph pathogens, pure culture techniques, use of selective media to isolate pathogens. Preservation of plant pathogens and disease specimens, use of haemocytometer, micrometer, centrifuge, pH meter, camera lucida.

UNIT II

Microscopic techniques and staining methods, phase contrast system, chromatography, use of electron microscope, spectrophotometer, ultracentrifuge and electrophoretic apparatus, disease diagnostics, serological and molecular techniques for detection of plant pathogens. Evaluation of fungicides, bactericides etc.; field experiments, data collection and preparation of references.

SUGGESTED READINGS

- Baudoin ABAM, Hooper GR, Mathre DE & Carroll RB. 1990. *Laboratory Exercises in Plant Pathology An Instructional Kit*. Scientific Publ., Jodhpur.
- Dhingra OD & Sinclair JB. 1986. *Basic Plant Pathology Methods*. CRC Press, London, Tokyo.
- Fox RTV. 1993. *Principles of Diagnostic Techniques in Plant Pathology*. CABI Wallington.
- Pathak VN. 1984. *Laboratory Manual of Plant Pathology*. Oxford & IBH, New Delhi.
- Forster D & Taylor SC. 1998. *Plant Virology Protocols From Virus Isolation to Transgenic Resistance*. Methods in Molecular Biology. Humana Press, Totowa, New Jersey.
- Matthews REF. 1993. *Diagnosis of Plant Virus Diseases*. CRC Press, Florida.
- Trigiano RN, Windham MT & Windham AS. 2004. *Plant Pathology- Concepts and Laboratory Exercises*. CRC Press, Florida.



Course Title : GUGPB-501T PRINCIPLES OF GENETICS (Theory)

3(2+1)

OBJECTIVE

This course is aimed at understanding the basic concepts of genetics, helping students to develop their analytical, quantitative and problem solving skills from classical to molecular genetics.

THEORY

UNIT I

Beginning of genetics; Cell structure and cell division; Early concepts of inheritance. Mendel's laws; Discussion on Mendel's paper, Chromosomal theory of inheritance. Multiple alleles, Gene interactions. Sex determination, differentiation and sex-linkage. Sex-influenced and sex-limited traits; Linkage-detection, estimation; Recombination and genetic mapping in eukaryotes, Somatic cell genetics, Extra chromosomal inheritance.

UNIT II

Population - Mendelian population – Random mating population - Frequencies of genes and genotypes-Causes of change: Hardy-Weinberg equilibrium. Structural and numerical changes in chromosomes; Nature, structure and replication of the genetic material; Organization of DNA in chromosomes, Genetic code; Protein biosynthesis.

UNIT III

Genetic fine structure analysis, Allelic complementation, Split genes, Transposable genetic elements, Overlapping genes, Pseudogenes, Oncogenes, Gene families and clusters. Regulation of gene activity in prokaryotes; Molecular mechanisms of mutation, repair and suppression; Bacterial plasmids, insertion (IS) and transposable (Tn) elements; Molecular chaperones and gene expression. Gene regulation in eukaryotes, RNA editing.

UNIT IV

Gene isolation, synthesis and cloning, genomic and cDNA libraries, PCRbased cloning, positional cloning; Nucleic acid hybridization and immunochemical detection; DNA sequencing; DNA restriction and modification, Anti-sense RNA and ribozymes; Micro RNAs (miRNAs), Genomics and proteomics; Functional and pharmacogenomics; Metagenomics.

Methods of studying polymorphism at biochemical and DNA level; Transgenic bacteria and bioethics; Gene silencing; genetics of mitochondria and chloroplasts. Concepts of Eugenics, Epigenetics, Genetic disorders and Behavioural genetics.



Course Title : GUGPB-501P PRINCIPLES OF GENETICS (Practical)

PRACTICAL

Laboratory exercises in probability and chi-square; Demonstration of genetic principles using laboratory organisms; Chromosome mapping using three point test cross; Tetrad analysis; Induction and detection of mutations through genetic tests; DNA extraction and PCR amplification- Electrophoresis- basic principles and running of amplified DNA- Extraction of proteins and isozymes- use of *Agrobacterium* mediated method and Biolistic gun; practical demonstrations- Detection of transgenes in the exposed plant material; visit to transgenic glasshouse and learning the practical considerations.

SUGGESTED READINGS

- Gardner EJ & Snustad DP. 1991. *Principles of Genetics*. John Wiley & Sons.
- Klug WS & Cummings MR. 2003. *Concepts of Genetics*. Peterson Edu.
- Lewin B. 2008. *Genes IX*. Jones & Bartlett Publ.
- Russell PJ. 1998. *Genetics*. The Benzamin/Cummings Publ. Co.
- Snustad DP & Simmons MJ. 2006. *Genetics*. 4th Ed. John Wiley & Sons.
- Strickberger MW. 2005. *Genetics (III Ed)*. Prentice Hall, New Delhi, India
- Tamarin RH. 1999. *Principles of Genetics*. Wm. C. Brown Publs.
- Uppal S, Yadav R, Subhadra & Saharan RP. 2005. *Practical Manual on Basic and Applied Genetics*. Dept. of Genetics, CCS HAU Hisar.



Course Title: GUGPB-504T CELL BIOLOGY AND MOLECULAR GENETICS (Theory) 3(2+1)

OBJECTIVE

To impart knowledge in theory and practice about cell structure, organelles and their functions, molecules like proteins and nucleic acids.

THEORY

UNIT I

Ultrastructure of the cell; Differences between eukaryotic and prokaryotic cells. macromolecules: Structure and function of cell wall, nuclear membrane and plasma membrane; Cellular Organelles – nucleus, plastid/chloro/ chromoplast, mitochondria endoplasmic reticulum, Golgi complex, lysosomes, peroxisomes.

UNIT II

Bioenergetics; Ultrastructure and function of mitochondria and biological membranes: Chloroplast and other photosynthetic organelles; Interphase nucleus- Structure and chemical composition; Cell division and physiology of cell division.

UNIT III

Historical background of molecular genetics; Genetic material in organisms; Structure and properties of nucleic acid, DNA transcription and its regulation – Transcription factors and their role; Genetic code, regulation of protein synthesis in prokaryotes and eukaryotes – ribosomes, t-RNAs and translational factors.

UNIT IV

Transposable elements; Mechanisms of recombination in prokaryote; DNA organization in eukaryotic chromosomes – DNA content variation, types of DNA sequences – Unique and repetitive sequences; organelle genomes; Gene amplification and its significance; Proteomics and protein-protein interaction; Signal transduction; Genes in development; Cancer and cell aging.



Course Title: GUGPB-504P CELL BIOLOGY AND MOLECULAR GENETICS (Practical)

PRACTICAL

Morphological and Gram staining of natural bacteria; Cultivation of bacteria in synthetic medium; Determination of growth rate and doubling time of bacterial cells in culture; Demonstration of bacteriophage by plaque assay method; Determination of soluble protein content in a bacterial culture. Isolation, purification and raising clonal population of a bacterium; Biological assay of bacteriophage and determination of phage population in lysate; Study of lytic cycle of bacteriophage by one step growth experiment; determination of latent period and burst size of phages per cell; Quantitative estimation of DNA, RNA and protein in an organism; Numericals: problems and assignments.

SUGGESTED READINGS

- Bruce A. 2004. *Essential Cell Biology*. Garland.
- Karp G. 2004. *Cell and Molecular Biology: Concepts and Experiments*. John Wiley.
- Klug WS & Cummings MR 2003. *Concepts of Genetics*. Scot, Foreman & Co.
- Lewin B. 2008. *IX Genes*. John Wiley & Sons
- Lodish H, Berk A & Zipursky SL. 2004. *Molecular Cell Biology*. 5th Ed. WH Freeman.
- Nelson DL & Cox MM. 2005. *Lehninger's Principles of Biochemistry*. WH Freeman & Co.
- Russell P.J. 1996. *Essential Genetics*. Blackwell Scientific Publ.
- Schleif R. 1986. *Genetics and Molecular Biology*. Addison-Wesley Publ. Co.



**Course Title: GUSTAT-501T STATISTICAL METHODS FOR
APPLIED SCIENCES (Theory)**

4(3+1)

OBJECTIVE

It would also help them in understanding the concepts involved in data presentation, analysis and interpretation. The students would get an exposure to presentation of data, probability distributions, parameter estimation, tests of significance, regression and multivariate analytical techniques.

THEORY

UNIT I

Classification, tabulation and graphical, representation of data. Box-plot. Descriptive statistics. Exploratory data analysis;

UNIT II

Measures of central tendency- Mean, Median, Mode, Geometric mean, Harmonic mean. Measures of Dispersion- Range, Quartile deviation, Mean deviation, Standard deviation.

UNIT III

Theory of probability. Random variable and mathematical expectation. Discrete and continuous probability distributions. Correlation and regression

UNIT IV

Binomial, Poisson, Negative Binomial, Normal distribution, Beta and Gamma distributions and their applications. Concept of sampling distribution: chi-square, t and F distributions. Tests of significance based on Normal, chi-square, t and F distributions.



**Course Title: GUSTAT-501P STATISTICAL METHODS FOR
APPLIED SCIENCES (Practical)**

PRACTICAL

- ❖ Exploratory data analysis, Box-Cox plots; Fitting of distributions~Binomial, Poisson, Negative Binomial.
- ❖ Normal; Large sample tests, testing of hypothesis based on exact sampling distributions- χ^2 , t and F.
- ❖ Confidence interval estimation and point estimation of parameters of binomial, Poisson and Normal distribution.
- ❖ Correlation and regression analysis, fitting of orthogonal polynomial regression: applications of dimensionality reduction and discriminant function analysis.
- ❖ Nonparametric tests.

SUGGESTED READINGS

- Anderson TW. 1958. *An Introduction to Multivariate Statistical Analysis*. John Wiley.
- Goon AM, Gupta MK & Dasgupta B. 1977. *An Outline of Statistical Theory*. Vol. I
- Goon AM, Gupta MK & Dasgupta B. 1983. *Fundamentals of Statistics*. Vol. I.
- Hoel PG. 1971. *Introduction to Mathematical Statistics*. John Wiley.



Course Title: GUPGS-501 BASIC CONCEPT IN LABORATORY TECHNIQUES

N.C.

OBJECTIVE

To acquaint the students about the basics of commonly used techniques in laboratory.

PRACTICAL

- ❖ Safety measures while in Lab; Handling of chemical substances; Use of burettes, pipettes, measuring cylinders, flasks, separatory funnel, condensers, micropipettes and vaccumets; Washing, drying and sterilization of glassware; Drying of solvents/chemicals. Weighing and preparation of solutions of different strengths and their dilution;
- ❖ Handling techniques of solutions; Preparation of different agrochemical doses in field and pot applications; Preparation of solutions of acids; Neutralization of acid and bases; Preparation of buffers of different strengths and pH values.
- ❖ Use and handling of microscope, laminar flow, vacuum pumps, viscometer, thermometer, magnetic stirrer, micro-ovens, incubators, sand bath, water bath, oil bath; Electric wiring and earthing.
- ❖ Preparation of media and methods of sterilization; Seed viability testing, testing of pollen viability.
- ❖ Tissue culture of crop plants; Description of flowering plants in botanical terms in relation to taxonomy.

SUGGESTED READINGS

- Furr AK. 2000. *CRC Hand Book of Laboratory Safety*. CRC Press.
- Gabb MH & Latchem WE. 1968. *A Handbook of Laboratory Solutions*. Chemical Publ. Co.8. FMPE 503: *Testing and Evaluation of Tractors and Farm Equipment*.
- Aneja, K.R. fourth edition *Experiments in Microbiology, Plant pathology and Biotechnology*.



**Course Title: GUPGS-502 AGRICULTURAL RESEARCH,
RESEARCH ETHICS AND RURAL DEVELOPMENT
PROGRAMMES**

N.C.

OBJECTIVE

To enlighten the students about the organization and functioning of agricultural research systems at national and international levels, research ethics, and rural development programmes and policies of Government.

THEORY

UNIT I

History of agriculture in brief; Global agricultural research system: need, scope, opportunities; Role in promoting food security, reducing poverty and protecting the environment; National Agricultural Research Systems (NARS) and Regional Agricultural Research Institutions; Consultative Group on International Agricultural Research (CGIAR):

UNIT II

International Agricultural Research Centers (IARC), partnership with NARS, role as a partner in the global agricultural research system, strengthening capacities at national and regional levels; International fellowships for scientific mobility. Research ethics: research integrity, research safety in laboratories, welfare of animals used in research, computer ethics, standards and problems in research ethics.

UNIT III

Concept and connotations of rural development, rural development policies and strategies. Rural development programmes: Community Development Programme. Intensive Agricultural District Programme, Special group Area Specific Programme. Integrated Rural Development Programme (IROP) Panchayati Raj Institutions, Co-operatives. Voluntary Agencies/Non-Governmental Organizations. Critical evaluation of rural development policies and programmes. Constraints in implementation of rural policies and programmes.

SUGGESTED READINGS

- *Bhalla G. S. & Singh G. 2001. Indian Agriculture - Four Decades of Development. Sage Publ.*
- *Punia M. S. Manual on International Research and Research Ethics. CCS, Haryana Agricultural University, Hisar.*
- *Rao B. S. V. 2007. Rural Development Strategies and Role of Institutions Issues, Innovations and Initiatives. Mittal Pub.*
- *Singh K. 1998. Rural Development - Principles, Policies and Management. Sage Pub.*

