

**Guru Kashi University**  
**University College of Agriculture (Code:05)**  
**M.Sci. Plant Pathology**

**Mycology (509101)**

**Credits:2**

**L T P**  
**2 0 0**

Introduction, basic concepts and terminology. Mycology in relation to agriculture and mankind. History of mycology. Concepts of nomenclature and classification. Fungal biodiversity. Reproduction in fungi. Comparative morphology, ultrastructure and characters of different groups of fungi up to generic level of Divisions Myxomycota and Eumycota emphasizing sub- divisions Mastigomycotina Zygomycotina, Ascomycotina, Basidiomycotina and Deuteromycotina. Types of Lichens and importance, fungal genetics and variability in fungi.

**Detection and Diagnosis of Plant Diseases (509102)**

**Credits:2**

**L T P**  
**2 0 0**

Isolation of pathogens using selective media, pure culture techniques. Methods to prove Koch's postulates with biotroph and necrotroph pathogens. Preservation of plant pathogens and disease specimens, use of haemocytometer, micrometer, centrifuge, pH meter, camera lucida. Microscopic techniques and staining methods, chromatography, phase contrast and electron microscopy, spectrophotometer, ultracentrifuge and electrophoretic apparatus. Serological and molecular techniques for detection of plant pathogens. Evaluation of fungicides and bactericides. Data collection and preparation of reports.

**Principles of Plant Pathology (509103)**

**Credits:3**

**L T P**  
**3 0 0**

Importance, terminology 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. Host parasite interaction, recognition concept and infection. Symptomatology, disease development. Role of enzymes, toxins, growth regulators. Defense strategies, oxidative burst, phenolics, phytoalexins, PR proteins and elicitors. Altered plant metabolism as affected by plant pathogens. Genetics of resistance, 'R' genes, mechanism of genetic variation in pathogens, molecular basis for resistance, marker-assisted selection and genetic engineering for disease resistance. Disease management strategies.

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**Plant Bacteriology (509104)**

**Credits:2****L T P****2 0 0**

Theory History and introduction to phytopathogenic procarya, viz., bacteria, MLOs, spiroplasmas and other fastidious procarya. Importance of phytopathogenic bacteria. Evolution, classification and nomenclature of phytopathogenic procarya and list of important diseases caused by them. Growth, nutrition requirements, reproduction, preservation of bacterial cultures and variability among phytopathogenic procarya. General biology of bacteriophages, L form bacteria, plasmids and bdellovibrios. Procaryotic inhibitors and their mode of action against phytopathogenic bacteria. Survival and dissemination of phytopathogenic bacteria.

**Plant Virology (509105)**

**Credits:2****L T P****2 0 0**

History of plant viruses, their composition and structure. Symptomatology of important plant viral diseases, transmission, chemical and physical properties. Host virus interaction and virus vector relationship. Virus nomenclature and classification, genome organization, replication and movement. Isolation, purification, electron microscopy, protein and nucleic acid based diagnostics. Mycoviruses, phytoplasma arbo and baculoviruses, satellite viruses, satellite RNAs, phages, viroids, and prions. Origin and evolution, mechanism of resistance and genetic engineering of plant viruses. Study of representative viral/mycoplasmal diseases, emphasizing their distribution, symptomatology, etiology, epidemiology and principles of plant viral disease control.

**Integrated Disease Management (509106)**

**Credits:2****L T P****2 0 0**

Introduction, definition, concept and tools of disease management. Components of integrated disease management, their limitations and implications. Development of IDM and its adaptation in important crops, rice, wheat, cotton, sugarcane, chickpea, rapeseed mustard, pearl millet, Kharif pulses, vegetable and fruit crops.

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**Molecular Approaches in Plant Protection (509107)**

**Credits:2**

**L T P**

**2 0 0**

Recent concepts of molecular biology and techniques used in plant protection. Genes of interest in plant protection. Identification, characterization and isolation of novel genes involved in pest resistance. Molecular basis of host plant-insect and pathogen interactions. PR-proteins and G- proteins. Molecular characterization of biodiversity-insects and pathogens. Molecular biology of baculoviruses. Molecular mechanisms of genetically engineered plants for pest resistance and pesticide resistance. Improvement of biocontrol agents and useful insects using molecular techniques. Bio-safety related issues.

**Quarantine in Plant Protection (509108)**

**Credits:2**

**L T P**

**2 0 0**

Definition of pest and pesticides and transgenics as per Govt. notification. Relative importance and quarantine for domestic and international. Quarantine restrictions in the movement of agricultural produce including seeds and planting material. Case histories of exotic pests and diseases and their status. Plant protection organization in India. Acts related to registration of pesticides and transgenics. History of quarantine 156 legislations. PQ Order 2003. Environmental Acts and APEDA. Industrial registration. Import and Export of bio-control agents. Special requirements for biopesticide registration. Identification of pest and disease free areas. Contamination of food with toxigens of micro-organisms and their elimination. Symptomatic diagnosis and other techniques to detect pest/pathogen infestations. VHT and other safer techniques of disinfestations and salvaging of infected material. WTO regulations. Non-tariff barriers. Pest risk analysis and good laboratory practices for pesticide laboratories. Pesticide industry. Sanitary and phytosanitary measures.

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**Post Harvest Diseases (509109)**

**Credits:2**

**L T P**  
**2 0 0**

Concept of post harvest diseases, definitions, importance with reference to environment and health. Postharvest diseases of fruits and vegetables. Factors governing post-harvest problems. Role of physical environment, agro-ecosystem leading to quiescent infection. Concept of microbial associations, rhizosphere/ rhizoplane colonization, competitive saprophytic ability, antibiosis, induced resistance. Operational mechanisms and cultural practices in perpetuation of pathogens. Operational mechanisms, handling and its relevance in control. Management of aflatoxigenic and mycotoxigenic fungi. Antagonists, their relationship and role as biocontrol agents. Chemicals in controlling post-harvest diseases. Merits and demerits of phyto-extracts in controlling post-harvest diseases. Integrated approach in controlling diseases and improving the shelf life of produce. Codex Alimentarius for agro-product and commodity.

**Fungal Diseases of Plants (509110)**

**Credits:2**

**L T P**  
**2 0 0**

Nomenclature, classification and general characterization of fungi. Description of important phytopathogenic genera. Study of representative fungal diseases with emphasis on their distribution, symptomatology, etiology, epidemiology and control. Post harvest diseases in transit and storage and their management.

**Insect Vectors of Plant Pathogens (509111)**

**Credits:2**

**L T P**  
**2 0 0**

History of developments in the area of insects as vectors of plant pathogens. Important insect vectors and their characteristics. Mouth parts and feeding processes of important insect vectors. Efficiency of transmission. Transmission of plant viruses and fungal pathogens. Relation between viruses and their vectors. Transmission of plant viruses by insect vectors and mites. Transmission of mycoplasma and bacteria by leaf hoppers and plant hoppers. Epidemiology and management of insect transmitted diseases through vector management. Paratransgenesis.

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**Bio-Control of Insect Pests (508005)**

**Credits:2**

**L T P**  
**2 0 0**

Principles and scope of biological control. Techniques in biological control. Biology and host seeking behaviour of predatory and parasitic groups of insects. Role of insect pathogens and their mode of action. Biological control of weeds using insects. Techniques for mass production of quality biocontrol agents. Various formulations and economics of bioagents. Field application and evaluation. Analysis of successful biological control projects. Trends and future possibilities of biological control. Importation of natural enemies and quarantine regulations. Biotechnology in biological control. Semiochemicals in biological control

**Agricultural Statistics (504021)**

**Credits:3**

**L T P**  
**3 0 0**

Frequency distribution, standard error and deviation, correlation and regression analyses, coefficient of variation; Hypothesis testing. Concept of p-value. Tests of significance-t, F and chi-square (X<sup>2</sup>); Data transformation and missing plot techniques; Design of experiments and their basic principles, completely randomized, randomized block, split plot, strip-plot, factorial and simple confounding designs; Efficiency of designs; Methods of statistical analysis for cropping systems including intercropping; Pooled analysis.

**Mycology Lab (509112)**

**Credits:1**

**L T P**  
**0 0 2**

Detailed comparative study of different groups of fungi; collection, identification and preservation of specimens. Isolation and identification of plant pathogenic fungi. Comparative study of different groups of fungi up to generic level of Divisions Myxomycota and Eumycota emphasizing sub-divisions Mastigomycotina, Zygomycotina, Ascomycotina, Basidiomycotina and Deuteromycotina. Collection, identification and preservation of specimens. Isolation and identification of plant pathogenic fungi.

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**Detection and Diagnosis of Plant Diseases Lab (509113)**

**Credits:1**

**L T P**  
**0 0 2**

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 centrifuge, pH meter, micrometer, haemocytometer, camera lucida. 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 manuscripts

**Plant Bacteriology Lab (509114)**

**Credits:1**

**L T P**  
**0 0 2**

Isolation, purification, identification and host inoculation of phytopathogenic bacteria, staining methods, biochemical and serological characterization, isolation of plasmid and use of antibacterial chemicals/antibiotics.

**Plant Virology Lab (509115)**

**Credits:1**

**L T P**  
**0 0 2**

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

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**Integrated Disease Management Lab (509116)**

**Credits:1**

**L T P**  
**0 0 2**

Application of biological, cultural, chemical and biocontrol agents, their compatibility and integration in IDM. Demonstration of IDM in certain crops as project work.

**Molecular Approaches in Plant Protection Lab (509117)**

**Credits:1**

**L T P**  
**0 0 2**

Molecular characterization of pest populations. Detection of biotypes/races. Establishment of phylogenetic relationships/dendrograms. Detection of Cry-gene and estimation of cry-toxin; characterization of capsid proteins of insect viruses. Detection of disease induced biochemical changes at molecular level.

**Post Harvest Diseases Lab (509118)**

**Credits:1**

**L T P**  
**0 0 2**

Isolation, characterization and maintenance of important post-harvest pathogens. Role of different storage conditions for disease development. Application of antagonists against pathogens under in vitro and in vivo conditions. Comparative efficacy of different chemicals, fungicides, phyto-extracts and bioagents.

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**Fungal Diseases of Plants Lab (509119)**

**Credits:1**

**L T P**  
**0 0 2**

Characteristics of important phytopathogenic genera and of fungi and their identification. Macro and microscopic diagnosis of representative diseases of various crops

**Insect Vectors of Plant Pathogens Lab (509120)**

**Credits:1**

**L T P**  
**0 0 2**

Identification of common vectors of plant pathogens- culturing and handling of vectors. Demonstration of virus transmission through vectors. Vector virus relationship studies.

**Bio-control of Insect Pests Lab (508017)**

**Credits:1**

**L T P**  
**0 0 2**

Identification of common natural enemies of crop pests and weed killers. Techniques for rearing of natural enemies. Visits (only where logistically feasible) to bio- control laboratories to learn rearing and mass production of natural enemies of crop pests and weeds and their laboratory hosts. Field collection of parasitoids and predators. Hands- on training in culturing and identification of common insect pathogens. Quality control and registration standards for biocontrol agents.



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**Agricultural Statistics Lab (504022)**

**Credits:1**

**L T P**  
**0 0 2**

Correlation analysis. Regression analysis (exponential, power function, quadratic, multi-variate, selection of variables, validation of models, ANOVA and testing of hypothesis). Tests of significance (Z-test, t-test, F-test and Chi-square test). Analysis of variance. Completely randomized design. Randomized block and latin square designs. Missing plot and analysis of covariance.  $2^3$ ,  $2^4$  and  $3^3$  simple and confounded experiments. Split plot designs. Factorial in split plot designs.

**Fundamental of Computer Applications Lab (504024)**

**1(NC)**

Ms-word: creating a document, saving and editing, use of options from tool bars, format, insert and tools(spelling and grammar), alignment of text, creating a table, merging cells, column and row width. Ms-excel: entering expressions through the formula tool bar and use of inbuilt functions, sum, average, max, min. Creating graphs and saving with and without data in Ms-excel. Ms-access: creating database, structuring with different types of fields. Ms-power point: preparation of slides on power point. Internet Browsing: browsing a web page and creating of E-Mail ID. Agri. net (ARIS).

**Library and Information Services Lab (504025)**

**1(NC)**

Introduction to Library and its services; five laws of library science; type of documents; classification and cataloguing; organization of documents; sources of information primary, secondary and tertiary; current awareness and SDI services; tracing information from reference sources; library survey; preparation of bibliography; use of Online Public Access Catalogue; use of CD-ROM databases and other computerized library services, CeRA, J-Gate; use of Internet including search engines and its resources; e-resources.

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**Technical Writing and Communication Skills Lab (504026)**

**1(NC)**

Various forms of scientific writings: theses, technical papers, review, manuals etc., various parts of thesis and research communications: title page, authorship contents page, preface, introduction, review of literature, material and methods, experimental results and discussion; writing of abstracts, summaries, precis, citations etc. commonly used abbreviations in the theses and research communications; illustrations, photographs and drawings with suitable captions; paginations, numbering of tables and illustrations; writing of numbers and dates in scientific write-ups; editing and proof reading; writing a review article. Access methods.

**Masters Research (509123)**

**24(NC)**