P.G. DEPARTMENT OF AGRICULTURE

SYLLABUS FOR THE BATCH FROM THE YEAR

2022 TO YEAR 2024

Programme Code: MPPL- 2019

Programme Name: M.Sc. Ag. (Plant Pathology)

(Semester III- IV)

Examinations: 2023-24

Khalsa College, Amritsar

Programme Outcomes (POs):

1. Students will impart detailed knowledge of Plant Pathology and specific knowledge of its allied branches.

2. Students will learn about different Plant Pathogens, their classification and nomenclature.

3. Students will impart knowledge about basic concepts, principal and terminology of plant pathology.

4. Students will get detailed information regarding management of plant pathogens.

5. Students will have working knowledge of statistical methods and will be able to design basic statistical analyses and evaluate basic statistical information.

Programme Specific Outcomes (PSOs):

1. To impart knowledge to the students on basic concepts, terminology of plant pathology, quarantine restriction in movements of agricultural products

2. To impart knowledge on classification and identification of plant pathogens, history ,importance, rule and regulation of quarantine.

3. To impart knowledge to the students about application of biological, cultural, chemical and biocontrol agents and to study about compatibility and integration in IDM

4. To impart knowledge to the students on collection, identification and preservation of specimens of plant pathogenic fungi,bacteria nematodes etc

5. To impart knowledge to the students on history, importance and principles of plant pathology and understanding of insect pest management strategies and will also learn about new advancements in pest management in fields and in warehouses

6. To impart knowledge to the students about measuring diseases, spore dispersal and trapping of different plant diseases and to study about weather recording, survey, multiplication of inoculums of diseased samples and their reporting.

7. To impart knowledge to the students on principles, growth, reproduction, survival and dispersal of important plant pathogens their symptomatology

8. To impart knowledge to the students on different serological and molecular techniques for plant disease detection and seed certification

9. To impart knowledge to the students about acquaintance with formulation of different fungicides and plant protection appliances, formulation of fungicides, bactericides and nematicides used in different *in vitro* techniques

10. To impart knowledge to the students on basic concepts and terminology of plant viral pathogens, nematodes and their symptomatology and different methods for testing vegetative propagules.

11. To impart knowledge to the students about different staining methods, biochemical and serological characterization of bacteria , plant DNA extraction and their purification, Agarose gel electrophoresis, Homogenization of leaves and subcellular fractionation by centrifugation.

12. Students will have working knowledge of statistical methods and will be able to design basic statistical analyses , evaluate basic statistical information.

13. Provides information to the student about how to collect material related to their research,data analysis, how to write thesis, use scientific language in thesis, and how to publish the research paper in different journals.

M.Sc. Ag. (PLANT PATHOLOGY) 2022-24

SEMESTER-I

Course Code	Course title	Credit hours	Marks	Total Marks	Page Number
			Theory+Practical+I. Assesment		
PPL-511	Mycology	3(2+1)	50+25+25	100	8-9
PPL-512	Principles of Plant Pathology	3(2+1)	50+25+25	100	10-11
ENT-531 (Minor)	Biological control of Insect Pest	3(2+1)	50+25+25	100	12-13
STA-414	Statistical Methods for Research Workers	3(2+1)	50+25+25	100	14-15
*PGS-501	Technical writing & communication skills	1(1+0)	100(Th)	100	16-17
*PGS 502	Library & information services	1(0+1)	100(Pr)	100	18
PPL-600	Masters' Research	4(0+4)	---	S/US	19
	Total	**18 (12+6*)**			

*Non- Credit Course

Total Internal Assessment = 25 Marks(House Test- 10 Marks, Attendance- 10 Marks; Conduct & Academic, Extra Curricular activities- 5 Marks).

M.Sc. Ag. (PLANT PATHOLOGY) 2022-24

SEMESTER-II

Course Code	Course title	Credit hours	Marks	Total Marks	Page Number
			Theory+Practical+I.Assesment		
PPL-521	Plant Virology	3(2+1)	50+25+25	100	20-21
PPL-522	Plant Bacteriology	3(2+1)	50+25+25	100	22-23
ENT-522 (Minor)	Toxicology of Insecticides	3(2+1)	50+25+25	100	24-25
PPL-523 (Supporting)	Molecular Approaches for Plant Protection	3(2+1)	50+25+25	100	26-27
*PGS-503	Agricultural Research, Publication Ethics	1(1+0)	100(Th)	100	28-29
*PPL-600	Masters' Research	4(0+4)	---	S/US	30
Total		**17(12+5*)**			

`

*Non- Credit Course

Total Internal Assessment = 25 Marks (House Test- 10 Marks, Attendance- 10 Marks; Conduct & Academic, Extra Curricular activities- 5 Marks).

M.Sc. Ag. (PLANT PATHOLOGY) 2022-24

SEMESTER-III

Course Code	Course title	Credit hours	Marks	Total Marks	Page Number
			Theory+Practical+I.Assesment		
PPL-531	Epidemiology and Forecasting of Plant Diseases	3(2+1)	50+25+25	100	31-32
PPL-532	Quarantine in Plant Protection	3(2+1)	50+25+25	100	33-34
ENT-532 (Minor)	Integrated Pest Management	3(2+1)	50+25+25	100	35-36
PPL-591	Credit Seminar	1(1+0)	100	100	37
*PGS-504	Intellectual property and its management in Agriculture	1(1+0)	100(Th)	100	38-39
*PPL-600	*Master's Research	6(0+6)	--	S/US	40
Total		**17(10+7*)**			

*Non- Credit Course

Total Internal Assessment = 25 Marks (House Test- 10 Marks, Attendance- 10 Marks; Conduct & Academic, Extra Curricular activities- 5 Marks).

M.Sc. Ag. (PLANT PATHOLOGY) 2022-24

SEMESTER-IV

Course Code	Course title	Credit hours	Marks	Total Marks	Page Number
			Theory+Practical+I.Assesment		
PPL-541	Detection and Diagnosis of Plant Diseases	3(2+1)	50+25+25	100	41-42
PPL-542	Chemicals In Plant Disease Management	3(2+1)	50+25+25	100	43-44
*PGS-505	Disaster Management	1(1+0)	100(Th)	100	45-46
*PPL- 600	*Master's Research	6(0+6)	--	S/US	47
	Total	**13(6+7*)**			

*Non- Credit Course

Total Internal Assessment = 25 Marks (House Test- 10 Marks, Attendance- 10 Marks; Conduct & Academic, Extra Curricular activities- 5 marks

M.Sc. Ag. (PLANT PATHOLOGY) 2022-24

SEMESTER-I

PPL-511 **Mycology (Major)**

Time: 3 Hours **Maximum Marks: 100**

Theory: 50

Practical: 25

Internal assessment: 25

Credit hours: 3(2+1)

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. In all nine questions should be asked, of which first question of 10 marks (Comprising of 10 short answer type questions covering the whole syllabus) will be compulsory.
4. Of the remaining eight questions, two questions should be asked from each section, of which the candidates are required to attempt one question from each section. All questions carry equal marks (10).

Course Objectives

The course aims to:

1. To impart knowledge to the students on basic concepts and terminology of plant pathology.
2. To impart knowledge on classification and identification of plant pathogens based on their classification.

Theory:

Unit I

Introduction, definition of different terms, basic concepts. Importance of mycology in agriculture, relation of fungi to human affairs. History of mycology. Importance of culture collection and herbarium of fungi. Somatic characters and reproduction in fungi. Modern concept of nomenclature and classification, Classification of kingdom fungi: Stramenopila and Protists

Unit II

The general characteristics of protists and life cycle in the Phyla Plasmodiophoromycota, Dictyosteliomycota, Acrasiomycota and Myxomycota. Kingdom Stramenopila: characters and life cycles of respective genera under Hypochytriomycota, Oomycota and Labyrinthulomycota

Unit III

Kingdom fungi: General characters, ultrastructure and life cycle patterns in representative genera under Chytridiomycota, Zygomycota, Ascomycota; Archiascomycetes, Ascomycetous yeasts, Pyrenomycetes, Plectomycetes, Discomycetes, Loculoascomycetes, Erysiphales and anamorphs of ascomycetous fungi.

Unit IV

Basidiomycota; general characters, mode of reproduction, types of basidiocarps and economic importance of Hymenomycetes. Uridinales and Ustilaginales; variability, host specificity and life

cycle pattern in rusts and smuts. Mitosporic fungi; status of asexual fungi, their teliomorphic relationships, Molecular characterization of plant pathogenic fungi

Practical

- Detailed comparative study of different groups of fungi
- Collection of cultures and live specimens
- Saccardoan classification and classification based on conidiogenesis
- Vegetative structures and different types of fruiting bodies produced by slime molds, stramenopiles and true fungi
- Myxomycotina: Fructification, plasmodiocarp, sporangia, plasmodium and aethalia. Oomycota; Somatic and reproductory structures of Pythium, Phytophthora, downy mildews and Albugo, Zygomycetes: Sexual and asexual structures of Mucor, Rhizopus, General characters of VAM fungi. Ascomycetes; fruiting structures, Erysiphales, and Eurotiales
- General identification characters of Pyrenomycetes, Discomycetes, Loculoascomycetes and Laboulbenio-mycetes, Basidiomycetes; characters, ultrastructures and life cycle patterns in Ustilaginomycetes and Teliomycetes, Deuteromycetes
- Characters of Hyphomycetes and Coelomycetes and their teliomorphic and anamorphic states, Collection, preservation, culturing and identification of plant parasitic fungi
- Application of molecular approaches and techniques for identification of fungal pathogens

Suggested Reading

Ainsworth GC, Sparrow FK and Susman HS. 1973. The Fungi – An Advanced Treatise. Vol. IV (A & B). Academic Press, New York.

Alexopoulos CJ, Mims CW and Blackwell M.2000. Introductory Mycology. 5th Ed. John Wiley & Sons, New York.

Maheshwari R. 2016. Fungi: Experimental Methods in Biology 2nd edn. CRC Press, US.

Mehrotra RS and 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.

Course Outcomes:

The student will be able:

1. Thorough knowledge of plant pathogen nomenclature and classification.
2. Developing skill to identify different groups of fungi.
3. Knowledge on collection, identification and preservation of specimens of plant pathogenic fungi

M.Sc. Ag. (PLANT PATHOLOGY) 2022-24

SEMESTER-I

PPL-512 **Principles of Plant Pathology (Major)**

Time: 3 Hours **Maximum Marks: 100**
Theory: 50
Practical: 25
Internal assessment: 25
Credit hours: 3(2+1)

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. In all nine questions should be asked, of which first question of 10 marks (Comprising of 10 short answer type questions covering the whole syllabus) will be compulsory.
4. Of the remaining eight questions, two questions should be asked from each section, of which the candidates are required to attempt one question from each section. All questions carry equal marks (10).

Course Objectives

The course aims to:

1. To impart knowledge to the students on history and importance of plant pathology
2. To impart knowledge on various principles involved in the plant diseases

Theory

Unit I

Importance, definitions and concepts of plant diseases, history and growth of plant pathology, biotic and abiotic causes of plant diseases.

Unit II

Growth, reproduction, survival and dispersal of important plant pathogens, role of environment and host nutrition on disease development.

Unit III

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 IV

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

Practical

- Basic plant pathological techniques;
- Isolation, inoculation and purification of plant pathogens and proving Koch's postulates;

• Techniques to study variability in different plant pathogens;
• Purification of enzymes, toxins and their bioassay;
• Estimation of growth regulators, phenols, phytoalexins in resistant and susceptible plants.

Suggested Reading

Agrios GN. 2005. Plant Pathology. 5th Ed. Academic Press, New York.
Heitefuss R and Williams PH. 1976. Physiological Plant Pathology. Springer Verlag, Berlin, New York.
Mehrotra RS and Aggarwal A. 2003. Plant Pathology. 2nd Ed. Oxford & IBH, New Delhi.
Singh RP. 2012. Plant Pathology 2nd edn. Kalyani Publishers, New Delhi.
Singh RS. 2017. Introduction to Principles of Plant Pathology. 5th edn. MedTech, New Delhi.
Singh DP and Singh A. 2007. Disease and Insect Resistance in Plants. Oxford & IBH, New Delhi.
Upadhyay RK. and Mukherjee KG. 1997. Toxins in Plant Disease Development and Evolving Biotechnology. Oxford & IBH, New Delhi.

Course Outcomes:

The student will be able:

1. Thorough knowledge on principles, growth, reproduction, survival and dispersal of important plant pathogens and their symptomatology
2. Study of Biotic and abiotic causes of plant diseases and its management
3. Knowledge on different serological and molecular techniques for plant disease detection

SEMESTER-I

ENT- 531 **Biological Control of Insect Pests**

Time: 3 Hours **Maximum Marks: 100**

Theory: 50

Practical: 25

Internal assessment: 25

Credit hours: 3(2+1)

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. In all nine questions should be asked, of which first question of 10 marks (Comprising of 10 short answer type questions covering the whole syllabus) will be compulsory.
4. Of the remaining eight questions, two questions should be asked from each section, of which the candidates are required to attempt one question from each section. All questions carry equal marks (10).

Course Objectives

The course aims to:

1. To study the concept, history and scope, ecological basis of biological control, natural enemies: predators, parasitoids and insect pathogens (mode of action, application, epizootics), advantages and disadvantages, characteristics of bio-control agents
2. To learn about procedure of biological control: introduction; enhancement of bio control agents (introduction, conservation, mass culture, augmentation, release, monitoring and importation); rearing techniques of bio-control agents and their host insects; role of biological control in IPM

Theory

Section A

Principles and scope of biological control.

Techniques in biological control-Introduction, Inoculation and Augmentation.

Biology and host seeking behaviour of predatory and parasitic groups (Coleoptera, Hymenoptera, Neuroptera, Reduvid bugs) of insects.

Section B

Role of insect pathogens (Bt, NPV, Entomopathogenic fungi) 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.

Section C

Analysis of successful biological control projects. Trends and future possibilities of biological control.

Section D

Importation of natural enemies and quarantine regulations. Biotechnology in biological control. Semiochemicals in biological control

Practical:

1. Identification of common natural enemies of crop pests and weed killers.
2. Techniques for rearing of natural enemies.
3. Quality control and registration standards for biocontrol agents.
4. Field collection of parasitoids and predators.
5. Hands- on training in culturing and identification of common insect pathogens.
6. 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.

Suggested Reading

Burges HD and Hussey NW. (Eds). 1971. Microbial Control of Insects and Mites. Academic Press, London.
De Bach P. 1964. Biological Control of Insect Pests and Weeds. Chapman and Hall, New York.
Dhaliwal GS and Arora R. 2001. Integrated Pest Management: Concepts and Approaches. Kalyani
Publishers, New Delhi.
Gerson H and Smiley RL. 1990. Acarine Biocontrol Agents – An Illustrated Key and Manual. Chapman and Hall, New York.
Huffaker CB and Messenger PS. 1976. Theory and Practices of Biological Control. Academic Press, London.
Ignacimuthu SS and Jayaraj S. 2003. Biological Control of Insect Pests. Phoenix Publ., New Delhi.
Saxena AB. 2003. Biological Control of Insect Pests. Anmol Publ., New Delhi.
Van Driesche and Bellows TS. Jr. 1996. Biological Control. Chapman and Hall, New York.

Course Outcomes:

The student will be able:

1. Students will learn about various biocontrol agents used to prevent the attack of pests to promote eco-friendly control methods
2. They will learn the mass multiplication techniques of biocontrol agents through hands-on training and can earn good money from industrial production of biocontrol agents
3. To check the field efficacy of various formulations of biocontrol agents
4. To understand the trends and future possibilities of biological control and study the role of biotechnology and semio chemicals in biological control

M.Sc. Ag. (PLANT PATHOLOGY) 2022-24

SEMESTER-I

STA-414 Statistical Methods for Research Workers

Time: 3 Hours **Maximum marks: 100**
Theory: 50
Practical: 25
Internal assessment: 25
Credit hours: 3(2+1)

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. In all nine questions should be asked, of which first question of 10 marks (Comprising of 10 short answer type questions covering the whole syllabus) will be compulsory.
4. Out of remaining eight questions, two questions should be asked from each section, out of which the candidates are required to attempt one question from each section. All question will carry equal marks (10).

Course Objectives: The aim of this course is to understand the basics of statistical methods and their applications in agriculture. It helps the students in understanding, analyzing and interpreting the agricultural data. It also helps in making appropriate decisions in agricultural research findings

Theory

Section-A: Probability and fitting of standard frequency distribution, sampling techniques, sampling distributions, mean and standard error.

Section-B: Simple partial, multiple and intra class correlation and multiple regression.

Section-C: Tests of significance, students'-t, chi-square and large sample tests, confidence intervals.

Section-D: Analysis of variance for one way and two way classification with equal cell frequencies, transformation of data.

Practical:

Fitting of distributions, samples and sampling distributions, correlation and regression, tests of significance and analysis of variance.

Note: Students shall be trained to use computer to analysis the data, using available softwares. However, during university examination students will use scientific calculators to analyse the data.

Suggested Reading:

Goon A.M, Gupta M.K and Dasgupta B. 1977. An Outline of Statistical Theory. Vol. I. The World Press.
Goon A.M, Gupta M.K. and Dasgupta B. 1983. Fundamentals of Statistics. Vol. I. The World Press.
Hoel P.G. 1971. Introduction to Mathematical Statistics. John Wiley.
Hogg R.V and Craig T.T. 1978. Introduction to Mathematical Statistics. Macmillan.
Morrison D.F. 1976. Multivariate Statistical Methods. McGraw Hill.
Hogg RV, McKean JW, Craig AT. 2012. Introduction to Mathematical Statistics 7th Edition.
Siegel S, Johan N & Casellan Jr. 1956. Non-parametric Tests for Behavior Sciences. John Wiley.
Anderson TW. 2009. An Introduction to Multivariate Statistical Analysis, 3rd Ed. John Wiley
http://freestatistics.altervista.org/en/learning.php.
http://www.statsoft.com/textbook/stathome.html.

Course outcomes:

On completing the course, the students will be able to:

- Understand the basic components of definitions, descriptions, process explanations and other common forms of technical writing.
- Understand various stages of the writing process and apply them to technical and workplace writing tasks
- Integrate material collected from primary and secondary sources with their own ideas in search papers.

M.Sc. Ag. (PLANT PATHOLOGY) 2022-24

SEMESTER-I

***PGS 501 Technical Writing & Communication Skills**

Time: 3 Hours **Maximum marks: 100**
Theory: 100
Credit hours: 1(1+0)

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of five questions, out of which first question of 20 marks (Comprising of 10 short answer type questions of 2 mark each) covering the whole syllabus will be compulsory.
4. Out of remaining eight questions, two questions should be asked from each section, out of which the candidates are required to attempt one question from each section. All question will carry equal marks (20).

Course objectives: To equip the students/ scholars with skills to write dissertations, research papers, etc. To equip the students/ scholars with skills to communicate and articulate in English, (verbal as well as writing).

Theory:

Technical Writing- Various forms of technical writing-theses, technical papers, reviews, electronics communication etc: qualities of technical writing: parts of research communication-title page, content page, authorship, preface, introduction, review of literature, materials and methods, experimental results, documentation; photographs and drawings with suitable captions; pagination; citation; writing of abstracts; précis; synopsis; editing and proof reading. Communication Skills-defining communication; types of communication- verbal and non-verbal; assertive communication; assertive communication: using language for effective communication; techniques of dyadic communication- message pacing and message chunking, self disclosure mirroring, expressing conversation intent; paraphrasing; vocabulary building- word roots, prefixes, Greek and Latin roots.

Suggested Reading:

Barnes and Noble. Robert C. (Ed.). 2005. Spoken English: Flourish Your Language.

Chicago Manual of Style. 14th Ed. 1996. Prentice Hall of India.

Collins' Cobuild English Dictionary. 1995.

Harper Collins. Gordon HM and Walter JA. 1970. Technical Writing. 3rd Ed.

Holt, Rinehart and Winston. Hornby AS. 2000. Comp. Oxford Advanced Learner's Dictionary of Current English. 6th Ed. Oxford University Press.

James HS. 1994. Handbook for Technical Writing. NTC Business Books.

Joseph G. 2000. MLA Handbook for Writers of Research Papers. 5th Ed. Affiliated East-West Press.

Mohan K. 2005. Speaking English Effectively. MacMillan India.

Richard WS. 1969. Technical Writing.

Sethi J and Dhamija PV. 2004. Course in Phonetics and Spoken English. 2nd Ed.

Prentice Hall of India.
Wren PC and Martin H. 2006. High School English Grammar and Composition.
S. Chand & Co.

Course outcomes:

On completing the course, the students will be able to:

- Understand the basic components of definitions, descriptions, process explanations and other common forms of technical writing.
- Understand various stages of the writing process and apply them to technical and workplace writing tasks
- Integrate material collected from primary and secondary sources with their own ideas in research papers.

SEMESTER-I

***PGS 502 Library and Information Services**

Time: 3 Hours **Maximum marks: 100**
Practical: 100
Credit hours: 1(0+1)

Instructions for the Paper Setters:

1. The question paper will consist of nine skill-oriented questions.
2. The first 5 questions carry 8 marks each. There will be internal choice wherever possible. The answer should be in 50-80 words. (5×8=40 Marks)
3. There will be four essay type questions from the entire syllabus. There will be internal choice wherever possible. The answer should be in 250 words. (4×15= 60 Marks)

Practical:

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 references 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 and access methods.

Course outcomes:

• Understand the definitions, descriptions, process explanations and other common forms of technical
writing.
• Understand how to follow the stages of the writing process and apply them to technical and workplace writing tasks
• Synthesize and integrate material collected from primary and secondary sources with their own ideas
while writing research papers.

M.Sc. Ag. (PLANT PATHOLOGY) 2022-24

SEMESTER – I

***PPL – 600** **Masters' Research**

S/US

Credits **Hours:**

4(0+4)

M.Sc. Ag. (PLANT PATHOLOGY) 2022-24

SEMESTER-II

PPL-521 **Plant Virology (Major)**

Time: 3 Hours **Maximum Marks: 100**

Theory: 50

Practical: 25

Internal assessment: 25

Credit hours: 3(2+1)

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. In all nine questions should be asked, of which first question of 10 marks (Comprising of 10 short answer type questions covering the whole syllabus) will be compulsory.
4. Of the remaining eight questions, two questions should be asked from each section, of which the candidates are required to attempt one question from each section. All questions carry equal marks (10).

Course Objectives

The course aims to:

1. To impart knowledge to the students on basic concepts and terminology of plant viral pathogens and their symptomatology
2. To impart knowledge on classification and identification of plant viral pathogens, their epidemiology and management
3. Studies on other virus like organisms

Theory:

Unit I

History and economic significances of plant viruses. General and morphological characters, composition and structure of viruses. Myco-viruses, arbo and baculo viruses, satellite viruses, satellite RNAs, phages, viroids and prions. Origin and evolution of viruses and their nomenclature and classification

Unit II

Genome organization, replication in selected groups of plant viruses and their movement in host. Response of the host to virus infection: biochemical, physiological, and symptomatical changes. Transmission of viruses and virus-vector relationship. Isolation and purification of viruses

Unit III

Detection and identification of plant viruses by using protein and nucleic acid based diagnostic techniques. Natural (R-genes) and engineering resistance to plant viruses

Unit IV

Virus epidemiology and ecology (spread of plant viruses in fields, host range and survival). Management of diseases caused by plant viruses.

Practical:

• Study of symptoms caused by plant viruses (followed by field visit)
• Isolation and biological purification of plant virus cultures
• Bioassay of virus cultures on indicator plants and host differentials
• Transmission of plant viruses (Mechanical, graft and vector and study of disease development)
• Plant virus purification (clarification, concentration, centrifugation, high resolution separation and analysis of virions), Electron microscopy for studying viral particle morphology
• Antisera production, Detection and diagnosis of plant viruses with serological (ELISA), nucleic acid (Non-PCR–LAMP, Later flow micro array and PCR based techniques)
• Exposure to basic bio-informatic tools for viral genome analysis and their utilization in developing detection protocols and population studies (BLASTn tool, Primer designing software, Bioedit tool, Claustal X/W, MEGA Software)

Suggested Reading

Bos L. 1964. Symptoms of Virus Diseases in Plants. Oxford & IBH., New Delhi.
Brunt AA, Krabtree K, Dallwitz MJ, Gibbs AJ and Watson L. 1995. Virus of Plants: Descriptions
and Lists from VIDE Database. CABI, Wallington.
Gibbs A and Harrison B. 1976. Plant Virology – The Principles. Edward Arnold, London. Hull R. 2002. Mathew's Plant Virology. 4th Ed. Academic Press, New York.
Noordam D. 1973. Identification of Plant Viruses, Methods and Experiments. Oxford & IBH, New Delhi.
Wilson C. 2014. Applied Plant Virology. CABI Publishing England.

Course Outcomes:

The student will be able:

1. Thorough knowledge on symptoms, transmission, assay of viruses and their physical properties
2. To study about different serological tests, electron microscopy and molecular diagnostics techniques
3. Diagnosis of representative viral diseases and different principles of plant viral diseases

M.Sc. Ag. (PLANT PATHOLOGY) 2022-24

SEMESTER-II

PPL-522 **Plant Bacteriology (Major)**

Time: 3 Hours **Maximum Marks: 100**

Theory: 50

Practical: 25

Internal assessment: 25

Credit hours: 3(2+1)

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. In all nine questions should be asked, of which first question of 10 marks (Comprising of 10 short answer type questions covering the whole syllabus) will be compulsory.
4. Of the remaining eight questions, two questions should be asked from each section, of which the candidates are required to attempt one question from each section. All questions carry equal marks (10).

Course Objectives

The course aims to:

1. To impart knowledge to the students on basic concepts and terminology of plant pathogenic prokaryotes
2. To impart knowledge on classification and identification of plant pathogenic prokarotes, symptomatology and disease management

Theory:

Section A: History of bacteriology and introduction to phytopathogenic procarya. Importance of phytopathogenic bacteria. Evolution, classification and nomenclature of phytopathogenic procarya.

Section B: Survival and dissemination of phytopathogenic bacteria. Important diseases caused by procarya. Growth, nutrition requirements, reproduction, preservation of bacterial cultures.

Section C: Variability among phytopathogenic procarya. General biology of bacteriophages, L-form bacteria, plasmids and bdellovibrios.

Section D: Procaryotic inhibitors and their mode of action against phytopathogenic bacteria.

Practical:

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

Suggested Reading

Mondal, K. K. (2011) Plant Bacteriology. Kalyani Publishers

Tirpathi, D.P. (2008) Introductory Plant Bacteriology. Kalyani Publishers

Course Outcomes:

The student will be able:

1. Thorough knowledgeabout isolation, purification, identification and host inoculation of phytopathogenic prokaryotes

2. To know about different staining methods, biochemical and serological characterization of plant pathogenic prokarotes
3. To study about isolation of plasmid and use of antibacterial chemicals/antibiotics
4. Procaryotic inhibitors and their mode of action against phytopathogenic bacteria

SEMESTER-II

ENT- 522 **Toxicology of Insecticides (Minor)**

Time: 3 Hours **Max. Marks: 100**

Theory: 50

Practical: 25

Internal assessment: 25

Credit hr: 3(2+1)

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. In all nine questions should be asked, of which first question of 10 marks (Comprising of 10 short answer type questions covering the whole syllabus of each mark) will be compulsory.
4. Of the remaining eight questions, two questions should be asked from each section, of which the candidates are required to attempt one question from each section. All questions carry equal marks (10).

Course Objectives

The course aims to:

1. Outline the history of insecticides
2. Recognize the major classes of insecticide and understand their mode of action
3. List and describe processes involved in toxic dynamics of insecticides
4. Become aware of the limitations of insecticide use such as resistance and environmental contamination
5. Develop a basic understanding on performing insect bioassay

Theory:

UNIT I

Definition and scope of insecticide toxicology; history of chemical control; pesticide use and pesticide industry in India; lassification of insecticides and acaricides based on mode of entry, mode of action and chemical nature; categorization of insecticides on the basis of toxicity – criteria for bees, beneficial insects and other insects in general; structure and mode of action of organochlorines, organophosphates, carbamates, pyrethroids, tertiary amines, neonicotinoids, oxadiazines, phenyl pyrozoles, insect growth regulators, microbials, botanicals, new promising compounds/ new insecticide molecules; nanopesticides; drawbacks of insecticide abuse.

UNIT II

Principles of toxicology; evaluation of insecticide toxicity; joint action of insecticides-synergism, potentiation and antagonism; factors affecting toxicity of insecticides; insecticide compatibility, selectivity and phytotoxicity. bioassay definition, objectives, criteria, factors, problems and solutions.

UNIT III

Insecticide metabolism; insect-pest resistance to insecticides; mechanisms and types of resistance; insecticide resistance management and pest resurgence.

UNIT IV

Insecticide residues, their significance and environmental implications; procedures of insecticide residue analysis. Insecticide Act, registration procedures, label claim, and quality control of insecticides; safe use of insecticides; diagnosis and treatment of insecticide poisoning.

Practical:

- Insecticide formulations and mixtures;
- Laboratory and field evaluation of bio-efficacy of insecticides;
- Bioassay techniques;
- Probit analysis;
- Evaluation of insecticide toxicity;
- Toxicity to beneficial insects;
- Pesticide appliances;
- Working out doses and concentrations of pesticides;
- Procedures of residue analysis

Suggested Readings:

Chattopadhyay SB. 1985. Principles and Procedures of Plant Protection. Oxford and IBH, New Delhi.

Dodia DA, Petel IS and Petal GM. 2008. Botanical Pesticides for Pest Management. Scientific Publisher (India), Jodhpur.

Dovener RA, Mueninghoff JC and Volgar GC. 2002. Pesticides formulation and delivery systems:
meeting the challenges of the current crop protection industry. ASTM, USA

Gupta HCL.1999. Insecticides: Toxicology and Uses. Agrotech Publ., Udaipur.

Ishaaya I and Degheele (Eds.). 1998. Insecticides with Novel Modes of Action. Narosa Publ. House, New Delhi.

Ishaaya I and Degheele D. 1998. Insecticides with Novel Modes of Action: Mechanism and Application. Norosa Publishing House, New Delhi.

Krieger RI. 2001. Handbook of Pesticide Toxicology. Vol-II. Academic Press. Orlando Florida.

Mathews GA. 2002. Pesticide Application Methods. 4th Ed. Intercept. UK.

Matsumura F. 1985. Toxicology of Insecticides. Plenum Press, New York.

Otto D and Weber B. 1991. Insecticides: Mechanism of Action and Resistance. Intercept Ltd., UK.

Pedigo LP and Marlin ER. 2009. Entomology and Pest Management, 6th Edition, Pearson

Course Outcomes:

The student will be able:

1. Students will get to know about importance, scope and basic principle of insecticide toxicology and its relationships with other disciplines
2. To learn about the structure and mode of action of different groups of insecticides including botanicals and new promising compounds
3. Students will learn the mechanisms of resistance development in insects against insecticides and how we can manage the problem of insecticide resistance
4. To be able to evaluate toxicity of insecticides and to understand the factors affecting toxicity of insecticides. They will also learn about Insecticide Act 1968, safe handling of insecticides and treatment in case of insecticide poisoning
5. Students will get acquainted with different methods of estimation of insecticide residues.

M.Sc. Ag. (PLANT PATHOLOGY) 2022-24

SEMESTER-II

PPL-523 Molecular Approaches for Plant Protection (Supporting)

Time: 3 Hour **Maximum Marks: 100**

Theory: 50

Practical: 25

Internal assessment: 25

Credit hours: 3(2+1)

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. In all nine questions should be asked, of which first question of 10 marks (Comprising of 10 short answer type questions covering the whole syllabus) will be compulsory.
4. Of the remaining eight questions, two questions should be asked from each section, of which the candidates are required to attempt one question from each section. All questions carry equal marks (10).

Course Objectives

The course aims to:

1. To impart knowledge to the students on basic concepts of plant genome, molecular markers, gene flow in plants and marker assisted breeding
2. To impart knowledge on various molecular techniques

Theory:

Unit I

Plant genome: nuclear and cytoplasmic, Significance of organelle genome, Genome size and complexity. Modern gene concept: gene structure, structural and functional genes.

Unit II

Molecular markers: Morphological markers, hybridization based marker (RFLP), PCR based markers (RAQPD, AFLP, SNP, SCAR, SSR). Development of SCAR and SSR markers.

Unit III

Gene flow in plants (Mapping population, QTL mapping, Marker Assisted Selection (MAS), Gene pyramiding, Screening and Validation

Unit IV

Marker Assisted breeding in transgenic: Herbicide resistance, Pest and disease resistance and quality enhancement, DNA fingerprinting, Qualitative real time assay, DNA clip and micro error

Practical

Plant DNA extraction, Purification of DNA , Agarose gel electrophoresis, Homogenization of leaves, sub cellular fractionation by centrifugation, Polymerase chain reaction to amplify a plant gene, PCR by using SSR and SCAR markers and DNA fingerprinting

Suggested Readings:

Marshall, G. and Walters, D. (1994) Molecular Biology in Crop Protection, London (United Kingdom) Chapman & Hall

Narayanasamy, P. (2008) Molecular biology in Plant Pathogenesis and Disease Management, Springer Dordrecht

Course Outcomes:

The student will be able:

1. Thorough knowledgeabout Plant DNA extraction and their purification, Agarose gel electrophoresis, Homogenization of leaves and sub cellular fractionation by centrifugation
2. To study about isolation of plasmid and use of antibacterial chemicals/antibiotics
3. To study about different markers and DNA fingerprinting against Plant diseases

SEMESTER-II

***PGS-503 Agricultural Research & Publication Ethics**

Time: 3 Hours **Maximum marks: 100**

Theory: 100

Credit hours: 1 (1+0)

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of five questions, out of which first question of 20 marks (Comprising of 10 short answer type questions of 2 mark each) covering the whole syllabus will be compulsory.
4. Out of remaining eight questions, two questions should be asked from each section, out of which the candidates are required to attempt one question from each section. All question will carry equal marks (20).

Course objective: the main objective of the course is 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:

Section A: Introduction to philosophy: definition, nature and scope, concept, branches. Ethics: definition, moral philosophy, nature of moral judgments and reactions.

Section B: Publication ethics: definition, introduction and importance. Best practices/standards setting initiative and guidelines: COPE, WAME, etc. Conflicts of interest. Publication misconduct: definition, concept, problems that lead to unethical behaviour and vice versa, type.

Section C: Violation of publication ethics, authorship and contributor ship. Identification of publication misconduct, complaints and appeals. Predatory publishers and journals. Ethics with respect to science and research. Intellectual honesty and research integrity.

Section D: Scientific misconduct: Falsification, Fabrication, and Plagiarism (FFP); Redundant publication: duplicate and overlapping publication, salami slicing; selective reporting and misrepresentation of data.

Suggested Readings:

1. Bhalla GS and Singh G. 2001. Indian Agriculture - Four Decades of Development. Sage Publ.
2. Punia MS. Manual on International Research and Research Ethics. CCS Haryana Agricultural University, Hisar.
3. Rao BSV. 2007. Rural Development Strategies and Role of Institutions - Issues, Innovations and Initiatives. Mittal Publ.
4. Singh K. 1998. Rural Development - Principles, Policies and Management. Sage Publ.

Course Outcomes:

After successful competeion of this course students are expected:

- To be familiar with the national and international institutions involved in research and about various research ethics and the problems faced by researchers.
- To be aquainted with the various rural development programmes and the problems being faced in the implementation of the policies designed for rural development.

M.Sc. Ag. (PLANT PATHOLOGY) 2022-24

SEMESTER – II

***PPL – 600** **Masters' Research**

S/US

Credits **Hours:**

4(0+4)

SEMESTER-III

PPL 531 Epidemiology and Forecasting of Plant Diseases (Major)

Time: 3 Hours **Maximum Marks: 100**

Theory: 50

Practical: 25

Internal assessment: 25

Credit hours: 3(2+1)

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. In all nine questions should be asked, of which first question of 10 marks (Comprising of 10 short answer type questions covering the whole syllabus) will be compulsory.
4. Of the remaining eight questions, two questions should be asked from each section, of which the candidates are required to attempt one question from each section. All questions carry equal marks (10).

Course Objectives

The course aims to:

1. To impart knowledge to the students on basic concepts of disease epidemiology its history and importance in the disease development
2. To impart knowledge on survey and surveillance, vigilance and crop loss assessment models
3. To know about principles and pre-requisites of disease forecasting, procedures of modeling disease growth and disease prediction

Theory:

Section A: Epidemic concept and historical development, pathometry and crop growth stages, epidemic growth and analysis.

Section B: Common and natural logarithms, function fitting area under disease progress curve and correction factors, inoculum dynamics, population biology of pathogens, temporal spatial variability in plant pathogens.

Section C: Survey, surveillance and vigilance, crop loss assessment and models. Principles and pre-requisites of forecasting, systems and factors affecting various components of forecastings, some early forecasting

Section D: Procedures based on weather and inoculum potential, modelling disease growth and disease prediction.

Practical: Measuring diseases, spore dispersal and trapping, weather recording, survey, multiplication of inoculum, computerized data analysis, function fitting, model preparation and validation.

Suggested Reading

Campbell CL and Madden LV. 1990. Introduction to Plant Disease Epidemiology. John Wiley & Sons, New York

Cooke B, Jones DM and Gereth KB. 2018 The Epidemiology of Plant Diseases. Springer Publications.

Cowling EB and Horsefall JG. 1978. Plant Disease. Vol. II. Academic Press, New York.

Laurence VM, Gareth H and Frame Van den Bosch (Eds.). The Study of Plant Disease Epidemics.

APS, St. Paul, Minnesota.

Nagarajan S and Murlidharan K. 1995. Dynamics of Plant Diseases. Allied Publ., New Delhi.

Thresh JM. 2006. Plant Virus Epidemiology. Advances in Virus Research 67, Academic Press, New York.

Van der Plank JE. 1963. Plant Diseases Epidemics and Control. Academic Press, New York.

Zadoks JC and Schein RD. 1979. Epidemiology and Plant Disease Management. Oxford Univ. Press, London.

Course Outcomes:

The student will be able:

1. Thorough knowledgeabout measuring diseases, spore dispersal and trapping of different plant diseases and to study about weather recording, survey, multiplication of inoculums of diseased samples
2. To know about computerized data analysis, function fitting, model preparation and validation
3. To study about survey, surveillance, vigilance, crop loss assessment and models used in different plant diseases

SEMESTER-III

PPL 532 **Quarantine in Plant Protection (Major)**

Time: 3 Hours **Maximum Marks: 100**

Theory: 50

Practical: 25

Internal assessment: 25

Credit hours: 3(2+1)

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. In all nine questions should be asked, of which first question of 10 marks (Comprising of 10 short answer type questions covering the whole syllabus) will be compulsory.
4. Of the remaining eight questions, two questions should be asked from each section, of which the candidates are required to attempt one question from each section. All questions carry equal marks (10).

Course Objectives

The course aims to:

1. To impart knowledge to the students on basic concepts of pest and pesticide, Different Quarantine Law
2. To impart knowledge on WTO Regulations, VHT techniques, Symptomatic diagnosis and other techniques to detect pest/pathogen infestations

Theory:

Section A: 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.

Section B: Plant protection organization in India. Acts related to registration of pesticides and transgenics. History of quarantine legislations. PQ Order 2003. Environmental Acts and APEDA. Industrial registration. Import and Export of bio-control agents. Special requirements for biopesticide registration.

Section C: 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.

Section D: 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.

Practical: Identification of pest/disease free areas; contamination of food with toxigens, microorganisms and their elimination; Symptomatic diagnosis and other techniques to detect pest/pathogen infestations

Suggested Readings:

Rajeev K and Mukherjee RC. 1996. Role of Plant Quarantine in IPM. Aditya Books.
Rhower GG. 1991. Regulatory Plant Pest Management. In: Handbook of Pest Management in Agriculture. 2nd Ed. Vol. II. (Ed. David Pimental). CRC Press.

Course Outcomes:

The student will be able:

1. Thorough knowledge about application of biological, cultural, chemical and biocontrol agents and to study about compatibility and integration in IDM
2. Demonstration of IDM in certain crops as project work
3. To study about IDM and its adaptation in important crops Kharif pulses, vegetable and fruit crops

SEMESTER-III

ENT-532 **Integrated Pest Management (Minor)**

Time: 3 Hours **Maximum Marks: 100**
Theory: 50
Practical: 25
Internal assessment: 25
Credit hours: 3(2+1)

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. In all nine questions should be asked, of which first question of 10 marks (Comprising of 10 short answer type questions covering the whole syllabus) will be compulsory.
4. Of the remaining eight questions, two questions should be asked from each section, of which the candidates are required to attempt one question from each section. All questions carry equal marks (10).

Course Objectives

The course aims to:

1. Be able to analyse pest problems, determine if management is necessary, and make appropriate recommendations using IPM techniques
2. Be familiar with different methods of pest management - their benefits and limitations
3. Understand the value of beneficial insects

Theory

Section A: History and origin. Definition and evolution of various related terminologies.
Concept and philosophy of IPM. Ecological principles of IPM. Constraints in IPM implementation.
Types and methods of determination of crop losses and economic thresholds.
Section B: Integration of different pest management methods. Use of semiochemicals in pest management programmes. Pest survey and surveillance, forecasting, types of surveys (Fixed and rapid survey including remote sensing methods) different sampling techniques, factors affecting surveys.
Section C: Political, social and legal implications of IPM.
Pest and pesticide risk analysis, assessment and management, Pest quarantine measures and cost benefit ratios.
Section D: Case studies of successful IPM programmes for Cotton, Rice, Sugarcane, Vegetable crops and fruit crops. National and international set-ups for integrated pest management.

Practicals

- Characterization of agro-ecosystems.
- Sampling methods and factors affecting sampling.
- Population estimation methods.
- Crop loss assessments, potential losses, avoidable losses, unavoidable losses.
- Computation of EIL and ETL.

- Crop modelling, designing and implementing IPM system.

Suggested Readings:

Dhaliwal, G.S. and Arora, R., (2013) Integrated Pest Management – Concepts and Approaches , Kalyani New Delhi ISBN: 9789327263152

Dhaliwal, G.S., Singh, R. and Jindal, V., (2013) A Textbook of Integrated Pest Management, Kalyani New Delhi ISBN: 9789327227970

Flint, M.C. and Bosch, R.V., (1981) Introduction to Integrated Pest Management, Springer

Course Outcomes:

The student will be able:

1. Students will get knowledge about origin, history, concept, philosophy and ecological principles of IPM
2. They will be able to assess crop losses, economic thresholds and cost benefit ratios
3. They will be acquainted with different sampling techniques and insect-pest population estimation methods
4. Students will learn about designing and implementation of IPM programmes for different crops and constraints in IPM implementation

M.Sc. Ag. (PLANT PATHOLOGY) 2022-24

SEMESTER-III

PPL- 591 **CREDIT SEMINAR**

Maximum Marks: 100

Credits hours: 1(1+0)

SEMESTER-III

***PGS-504 Intellectual Property & its Management in Agriculture**

Time: 3 Hours **Maximum marks: 100**
Theory: 100
Credit hours: 1 (1+0)

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of five questions, out of which first question of 20 marks (Comprising of 10 short answer type questions of 2 mark each) covering the whole syllabus will be compulsory.
4. Out of remaining eight questions, two questions should be asked from each section, out of which the candidates are required to attempt one question from each section. All question will carry equal marks (20).

Course Objective: The main objective of this course is to equip students and stakeholders with knowledge of Intellectual Property Rights (IPR) related protection systems, their significance and use of IPR as a tool for wealth and value creation in a knowledgebased economy.

Theory:

Section A: Historical perspectives and need for the introduction of Intellectual Property Right regime; TRIPs and various provisions in TRIPS Agreement; Intellectual Property and Intellectual Property Rights (IPR), benefits of securing IPRs.

Section B: Indian Legislations for the protection of various types of Intellectual Properties; Fundamentals of patents, copyrights, geographical indications, designs and layout, trade secrets and traditional knowledge, trademarks, protection of plant varieties and farmers' rights and biodiversity protection.

Section C: Protectable subject matters, protection in biotechnology, protection of other biological materials, ownership and period of protection; National Biodiversity protection initiatives; Convention on Biological Diversity.

Section D: International Treaty on Plant Genetic Resources for Food and Agriculture; Licensing of technologies, Material transfer agreements, Research collaboration Agreement, License Agreement.

Suggested Readings:

Erbisch FH and Maredia K.1998. Intellectual Property Rights in Agricultural Biotechnology. CABI.

Ganguli P. 2001. Intellectual Property Rights: Unleashing Knowledge Economy. McGraw-Hill.

Intellectual Property Rights: Key to New Wealth Generation. 2001. NRDC and Aesthetic Technologies.

Ministry of Agriculture, Government of India. 2004. State of Indian Farmer. Vol. V. Technology Generation and IPR Issues. Academic Foundation.

Rothschild M and Scott N. (Ed.). 2003. Intellectual Property Rights in Animal Breeding and Genetics. CABI.

Saha R. (Ed.). 2006. Intellectual Property Rights in NAM and Other Developing Countries: A Compendium on Law and Policies. Daya Publ. House.

Course outcomes:

After the successful completion of this course students will be able to:

- Use different tools of IPR for their rights.
- They will be able to guide the innovative farmers regarding various IPR tools and their use for protection of their rights.

SEMESTER – III

***PPL – 600** **Masters' Research**

S/US **Credits Hours: 6(0+6)**

SEMESTER-IV

PPL-541 Detection and Diagnosis of Plant Diseases (Major)

Time: 3 Hours **Maximum Marks: 100**

Theory: 50

Practical: 25

Internal assessment: 25

Credit hours: 3(2+1)

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. In all nine questions should be asked, of which first question of 10 marks (Comprising of 10 short answer type questions covering the whole syllabus) will be compulsory.
4. Of the remaining eight questions, two questions should be asked from each section, of which the candidates are required to attempt one question from each section. All questions carry equal marks (10).

Course Objectives

The course aims to:

1. To impart knowledge to the students about detection and diagnosis of various plant pathogens, their isolation, preservation
2. To impart knowledge on various plant pathological lab techniques

Theory

Section A: Isolation of pathogens using selective media, pure culture techniques. Methods to prove Koch's postulates with biotroph and necrotroph pathogens.

Section B: Preservation of plant pathogens and disease specimens, use of haemocytometer, micrometer, centrifuge, pH meter, camera lucida.

Section C: Microscopic techniques and staining methods, chromatography, phase contrast and electron microscopy, spectrophotometer, ultracentrifuge and Serological techniques

Section D: Evaluation of fungicides and bactericides. Data collection and preparation of reports.

Practical: Methods to prove Koch’s postulates with biotroph and necrotroph pathogens, pure culture techniques, use of selective media to isolate pathogens. Use of haemocytometer, micrometer, centrifuge, pH meter, camera lucida. Microscopic techniques and staining methods, phase contrast system, chromatography, use of electron microscope, spectrophotometer, ultracentrifuge and disease diagnostics

Suggested Reading

Agarwal VK and Sinclair JB. 1993. Principles of Seed Pathology. Vols. I & II, CBS Publ., New Delhi.

Hutchins JD and Reeves JE. (Eds.). 1997. Seed Health Testing: Progress Towards the 21st Century. CABI, Wallington.

Paul Neergaard. 1988. Seed Pathology. McMillan, London.

Suryanarayana D. 1978. Seed Pathology. Vikash Publ., New Delhi.

Course Outcomes:

The student will be able:

1. Thorough knowledge about Proving Koch postulates with biotrophs and necrotroph pathogens
2. To study about pure culture techniques and use of selective media to isolate pathogens and use of hemocytometer, micrometer, centrifuge, pH meter, camera lucida
3. To study about Principles, constriction and working of different microscopic techniques and staining methods
4. To demonstrate evaluation of fungicides and bactericides against different diseases

M.Sc. Ag. (PLANT PATHOLOGY) 2022-24

SEMESTER-IV

PPL 542 Chemical in Plant Disease Management (Major)

Time: 3 Hours **Maximum Marks: 100**

Theory: 50

Practical: 25

Internal assessment: 25

Credit hours: 3(2+1)

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. In all nine questions should be asked, of which first question of 10 marks (Comprising of 10 short answer type questions covering the whole syllabus) will be compulsory.
4. Of the remaining eight questions, two questions should be asked from each section, of which the candidates are required to attempt one question from each section. All questions carry equal marks (10).

Course Objectives

The course aims to:

1. To impart knowledge about history and development of agrochemicals, different terms and definitions, classification, advantages and disadvantages of chemicals
2. To impart knowledge on various formulations, mode of actions, their applications, handling and storage

Theory

Section A: History and development of chemicals; definition of pesticides and related terms; advantages and disadvantages of chemicals.

Section B: Classification of chemicals used in plant disease control and their characteristics. Chemicals in plant disease control, viz., fungicides, bactericides, nematicides, antiviral chemicals and botanicals.

Section C: Formulations, mode of action and application of different fungicides; chemotherapy and phytotoxicity of fungicides. Handling, storage and precautions to be taken while using fungicides; compatibility with other agrochemicals, persistence, cost-benefit ratio, factor affecting fungicides.

Section D: General account of plant protection appliances; environmental pollution, residues and health hazards, fungicidal resistance in plant pathogens and its management.

Practical: Acquaintance with formulation of different fungicides and plant protection appliances. Formulation of fungicides, bactericides and nematicides; in vitro evaluation techniques, preparation of different concentrations of chemicals including botanical pesticides based on active ingredients against pathogens; persistence, compatibility with

other agro-chemicals; detection of naturally occurring fungicide resistant mutants of pathogen; methods of application of chemicals.

Suggested Reading

Bindra OS and Singh H. 1977. Pesticides – And Application Equipment. Oxford & IBH, New Delhi.

Nene YL and Thapliyal PN. 1993. Fungicides in Plant Disease Control. 3rd edn. Oxford & IBH,
New Delhi.

Torgeson DC. (Ed.). 1969. Fungicides. Vol. II. An Advanced Treatise. Academic Press, New York.

Vyas SC. 1993. Handbook of Systemic Fungicides. Vols. I-III. Tata McGraw Hill, New Delhi.

M.Sc. Ag. (PLANT PATHOLOGY) 2022-24

SEMESTER-IV

PGS-505 **Disaster Management**

Time: 3 Hours **Credit hours: 1(1+0)**

Max. Marks: 100

Theory: 100

Instructions for the Paper Setters:

1. Question paper should be set strictly according to the syllabus.
2. The language of questions should be straight & simple.
3. There will be total of five questions, out of which first question of 20 marks (Comprising of 10 short answer type questions of 2 mark each) covering the whole syllabus will be compulsory.
4. Out of remaining eight questions, two questions should be asked from each section, out of which the candidates are required to attempt one question from each section. All question will carry equal marks (20).

Course objective: Objective of this course is to get the students aware about various kinds of natural disasters, man-made disasters and its its management.

Theory:

Section A: hazards and disasters, risk and vulnerability in disasters, natural and man-made disasters, earthquakes, floods drought, landside, land subsidence, cyclones, volcanoes, tsunami, avalanches, global climate extremes. Man-made disasters: terrorism, gas and radiations leaks, toxic waste disposal, oil spills, forest fires.

Section B: Earthquakes and its types, magnitude and intensity, seismic zones of India, major fault systems of India plate, flood types and its management, drought types and its management, landside and its managements case studies of disasters in Sikkim (e.g) earthquakes, landside). social economics and environmental impact of disasters.

Section C: Basic principles of disasters management, disaster management cycle, disaster management policy. national and state bodies for disaster management, early warming systems, building design and construction in highly seismic zones, retrofitting of buildings.

Section D: Training and drills for disaster preparedness, awareness generation program, usages of GIS and remote sensing techniques in disaster management, mini project on disaster risk assessment and preparedness for disasters with reference to disasters in Sikkim and its surrounding areas.

Suggested readings:

1. Disaster Management Guidelines, GOI-UND Disaster Risk Program (2009-2012)
2. Damon, P. Copola, (2006) Introduction to Intemational Disaster Management, ButterworthHeineman.
3. Gupta A.K., Niar S.S and Chatterjee S. (2013) Disaster management and Risk Reduction, Role of Environmental Knowledge, Narosa Publishing House, Delhi.
4. Murthy D.B.N. (2012) Disaster Management, Deep and Deep Publication PVT. Ltd. New
5. Modh S. (2010) Managing Natural Disasters, Mac Millan publishers India LTD.

6. Course outcomes:

- After the successful completion of this course students will be able to :
- Understand the types of natural and man-made disasters.
- They will know the management techniques in any natural or man-made disaster
- situation.
- They will also get familiar with various kinds of government policies and programmes
- for disaster prone and disaster effected places.

M.Sc. Ag. (PLANT PATHOLOGY) 2022-24

SEMESTER-IV

***PPL – 600** **Masters' Research**

S/US

Credits **Hours:**

6(0+6)