

SHRI GURU RAM RAI UNIVERSITY

Patel Nagar, Dehradun 248001, Uttarakhand

(Estd. by Govt. of Uttarakhand, vide Shri Guru Ram Rai University Act no. 03 of 2017 & recognized by UGC
u/s (2f) of UGC Act 1956)



Syllabus for M.Sc. (Ag.) Plant Pathology School of Agricultural Sciences

Programme outcome (POs)

Students will be able to:

PO 1.	Quality education in Agriculture with special reference to Agronomy, Soil Science, Horticulture, Entomology, Plant Pathology, Seed Science & Technology and crop improvement to the solution of Agriculture related issues.
PO 2.	Understanding of analysis of complex on and off farm problems and their solution in crop improvement on sustainable manner
PO 3.	Skills to select and apply natural resources, modern techniques and IT tools for weather forecasting, soil analysis, pest management and quality seed production of food crops.
PO 4.	The methods of experimental design, analysis of data and their presentation
PO 5.	Research based knowledge of the environment and recognizes the importance of crop biodiversity in the field to preserve agro-ecosystem
PO 6.	Analytical skills by correlating and integrating viable solution to solve problems with team spirit
PO 7.	Demonstrate and understand the impact of globalization and diversification of agriculture. Extension programmes to disseminate modern technologies for farmer's welfare
PO 8.	Farm management skills for improvement of socioeconomic condition of farmers
PO 9.	The Skills to recognize and evaluate the relationships between input and outputs, cost: benefit ratio in their agricultural field to make effective decision .The programme will enhance job opportunities and entrepreneurship development
PO 10:	Self-critical opinion to solve the on farm problems on sustainable basis.
PO 11:	Know the recent development future possibilities in agriculture sector. Provide comprehensive knowledge of agriculture production.
PO 12:	The students will generate a culture of lifelong learning in an inclined environment to get personal achievement and professional ethics

Programme specific outcome (PSOs)

PSO- 1	Interpreting the identifying symptoms, etiology & life cycle of different pathogens as well as the basic principles, methods and strategies of their management in various crops of Economic importance.
PSO- 2	Executing management of plant diseases with an integrated approach.
PSO- 3	To disseminate modern agriculture knowledge as basic objective of education
PSO- 4	Develop skills in practical work experiments, equipments and laboratory use along with data collection and their interpretation

School of Agricultural Sciences

‘ACADEMIC RULES AND REGULATIONS’

01. Regulations

The Regulations provided herein shall apply to M.Sc. (Ag.) Plant Pathology Degree Programme offered by the Shri Guru Ram Rai University.

02. Short Title and Commencement

These regulations shall be called “M.Sc. (Ag.) Plant Pathology Degree Programme Academic Rules and Regulations 2020”. They shall come into force from the academic year 2020-21.

03. Definitions & Abbreviations

3.1 ‘University’ means the Shri Guru Ram Rai University, Dehradun.

3.2 ‘Curriculum’ is a group of courses and other specified requirements for the fulfillment of the Degree Programme.

3.3 ‘Curricula and syllabi’ It includes a list of approved courses for the Degree Programme wherein each course is identified by course code, outline of syllabus, credit assigned and semester wise distribution.

3.4 ‘Semester’ means a period consisting of 90 working days inclusive of the mid-semester and practical examinations but excluding the study holidays and final theory examinations in each semester.

3.5 ‘Academic Year’ means a period consisting of two consecutive semesters including the inter-semester break as announced by the University. The first year of study shall be the first and second semesters following student’s admission. The second year of study shall be the third and fourth semesters.

3.6 ‘Course’ is a teaching unit of a discipline to be covered within a semester as detailed in the Curricula and Syllabi issued by the University.

3.7 Core Course: Core course means the list of courses specified by the University in the curricula and syllabi to be registered compulsorily by the students of M.Sc. (Ag.) Plant Pathology Degree Programme.

3.8 Other Course: Other courses include Master’s seminar & Thesis Research to be registered compulsorily by the students of M.Sc. (Ag.) Plant Pathology Degree Programme.

3.9 ‘A credit’ in theory means one hour of class room lecture and a credit in practical means two and half hour of laboratory or field work per week.

Explanation:

A 1+1 course (2 credits) means 1 hour theory and two and half hour practical per week.

A 0+1 course (1 credit) means two and half hour practical per week.

A 1+0 course (1 credit) means 1 hour theory per week.

3.10 ‘C’ is abbreviated for **Credit**

‘L’ for lecture

‘T’ for Tutorial

‘P’ for Practical or Lab work or Field work

04. Eligibility for admission to M.Sc. (Ag.) Plant Pathology Degree Programme:

A candidate passes in the B.Sc. Agriculture/ or equivalent degree programme from a recognized college/Institute/University.

05. Admission Procedure: As per the University Norms.

06. System of Education

6.1 The system of education for M.Sc. (Ag.) Plant Pathology Degree programme is Semester System with duration of two academic years (4 Semesters). The maximum duration permissible for a student shall be 06 consecutive semesters (3 years). If a student at any stage of his/her course is found unable to complete it within the said time, he/she shall not be allowed to continue the studies further.

6.2 The date of commencement and closure of semesters as well as inter-semester break and schedule of final theory examinations shall be announced by the University.

6.3 Credits are assigned to each course in M.Sc. (Ag.) Plant Pathology on the basis of the number of theory classes or lectures and Practical classes or laboratory work or field work as well as other form of learning required to complete course content in a scheduled period as decided by the University.

6.4 An academic calendar shall be prepared by the University for every semester indicating the date of commencement and closure of semesters, date of mid semester examinations, final practical and theory examinations, inter semester break and holidays.

6.5 Summary of Credits in M.Sc. (Ag.) Plant Pathology (All Semesters)

Semester	Core course	Elective course	Total credits
I	13	-	13
II	12	-	12
III	07	03	10
IV	30	-	20
Grand Total			55

6.6 A student must successfully complete a total of 60 credits which include 52 credits for core courses, 03 credits elective courses as per the Curriculum requirement of M.Sc. (Ag.) Plant Pathology Degree Programme.

6.7A course shall be offered only once in an academic year during the semester as listed in the course curricula and syllabi.

07. The Medium of Instruction: The medium of instruction will be in English.

08. Reservation: The reservation will be as per the State Government rules / University Norms and
Shri Guru Ram Rai University Department of Plant Pathology

Policies.

09. Total Seats: The total seats in M.Sc. (Ag.) Plant Pathology degree programme will be as per the guidelines of the University.

10. Fee structure: As decided by the University.

11. Attendance: As per University Norms.

12. Examination and Evaluation: As per University Norms with following guidelines:

12.1 The medium of Examination:

The medium of Examination will be English.

12.2 Duration of examinations: The examinations shall be conducted according to the description given below:

Examination	Courses with theory and practical	Courses with only theory	Courses with only practical
Mid-semester Examination (internal)	1.0 hour	1.0 hour	--
Final Theory Examination	3.0 hours	3.0 hours	--
Final Practical Examination	3.0 hours	--	3.0 hours

12.3 Distribution of marks in External and Internal Exams:

(a) Courses with Theory and Practical both (Maximum Marks 100):

- External Theory Examination (50% or 50 marks) in each paper
- Internal Mid-term theory Examinations (30% or 30 marks) in each paper
- Internal Practical Examination (20% or 20 marks) in each paper

(b) Courses with only Theory (Maximum Marks 100):

- External Theory Examination (50% or 50 marks) in each paper
- Internal Mid-term theory Exams (40% or 40 marks) + Assignment (10% or 10 marks) in each paper

(c) Courses with only Practical (Maximum Marks 100):

- Internal Practical Examination (100% or 100 marks) in each paper

12.4 Assessment Norms: As per University Norms

12.5 Question paper pattern:

(a) External theory Examinations for courses with theory and practical:

The question paper pattern for External theory Examination (Maximum Marks: 50) for courses with theory and practical is given below:

SECTION	Type of question	Number of questions	Number of questions to be answered	Mark per question	Total Marks
A	Objectives	10	10	01	10
B	Short answer type	06	04	05	20
C	Long answers type	04	02	10	20
Total					50

(b) External theory Examinations for courses with theory only:

The question paper pattern for External theory Examinations (Maximum marks: 50) for courses with only theory shall be as per given in section 12.5 (a).

(c) Mid-term Exam:

Courses with theory and practical both shall contain two Mid-term Exams of 15 marks each. Courses with only theory shall contain two mid-term Exams of 20 marks each plus an assignment of 10 marks. Question paper for Mid-term Exams can be designed by Examiner as per the requirement of course content including objective and short answer type questions.

(d) Practical Exam:

Courses with theory and practical shall contain one practical Exam of 20 marks including Written (5 marks) + Spotting (2.5 marks) + Viva (5 marks) + Lab record (2.5 marks) + assignment (5 marks).

(e) Practical Examinations for courses with practical only:

Courses with practical only shall contain one practical Exam of 100 marks including Written (30 marks) + Spotting (10 marks) + Viva (15 marks) + Lab record (15 marks) + Attendance (15 marks) + Assignment (15 marks).

13. Submission of Master's Thesis: As per University Norms.

14. Promotion of students to next semester: Cases of students' promotion to next semester such as Back papers, Carry over system, Ex – Studentship, Special examination, Grace marks, Candidate leaving the semester will be as per the University Norms and policies.

15. Approval of Final Results, Award of Degree and Issue of Provisional Certificates

And Transcripts or Mark sheet: As per University Norms

16. Removal of Difficulties:

16.1 If any difficulty arises in giving effect to the Provisions of these regulations, the University may issue necessary orders which appear to be necessary or expedient for removing the difficulty.

16.2 Every order issued by the University under this provision shall be laid before the Academic Council of the University immediately after the issuance.

16.3 Notwithstanding anything contained in the rules and regulations, the Board of Studies or Academic Council shall make changes whenever necessary.

COURSE CURRICULUM
M. Sc. (Ag.) Plant Pathology

A. Core Courses			
S. No.	Course Number	Name of the Courses	Credit Hours
1.	MSPC-101	Statistical Methods and Experimental Designs	4 (3-0-1)
2.	MSPC-102	Mycology	3 (2-0-1)
3.	MSPC-103	Detection and Diagnosis of Plant Diseases	3 (0-0-3)
4.	MSPC-104	Principles of Plant Pathology	3 (3-0-0)
5.	MSPC-201	Diseases of Vegetables and Spices Crops	3 (2-0-1)
6.	MSPC-202	Ecology of Soil-borne Plant Pathogens	3 (2-0-1)
7.	MSPC-203	Plant Virology	3 (2-0-1)
8.	MSPC-204	Plant Bacteriology	3 (2-0-1)
9.	MSPC-301	Principles of Plant Disease Management	3 (2-0-1)
10.	MSPC-302	Diseases of Field and Medicinal Plants	3 (2-0-1)
11.	MSPS-303	Master's Seminar	01
Total			32
B. Elective Courses			
12.	MSPE-304	Biological control of plant disease	3 (2-0-1)
13.	MSPE-305	Chemicals in plant disease control	3 (2-0-1)
14.	MSPE-306	Seed health technology	3 (2-0-1)
Total			09
C. Research			
15.	MSPT-401	Master's Thesis Research	20

SEMESTER WISE DISTRIBUTION OF COURSES

Elective Course System (ECS)

M.Sc. (Ag.) Plant Pathology

First Semester

S. No.	Course Code	Course Title	Periods				MM
			L	T	P	C	
Core Courses							
1.	MSPC-101	Statistical Methods and Experimental Designs	3	0	1	4	100
2.	MSPC-102	Mycology	2	0	1	3	100
3.	MSPC-103	Detection and Diagnosis of Plant Diseases	0	0	3	3	100
4.	MSPC-104	Principles of Plant Pathology	3	0	0	3	100
Total			8	0	5	13	400

Semester-II

S. No.	Course Code	Course Title		Periods			MM
			L	T	P	C	
Core Courses							
1.	MSPC-201	Diseases of Vegetables and Spices Crops	2	0	1	3	100
2.	MSPC-202	Ecology of Soil-borne Plant Pathogens	2	0	1	3	100
3.	MSPC-203	Plant Virology	2	0	1	3	100
4.	MSPC-204	Plant Bacteriology	2	0	1	3	100
Total			8	0	4	12	400

Semester-III

S. No.	Course Code	Course Title		Periods				MM
			L	T	P	C		
Core Courses								
1.	MSPC-301	Principles of Plant Disease Management	2	0	1	3	100	
2.	MSPC-302	Diseases of Field and Medicinal Plants	2	0	1	3	100	
3.	MSPC-303	Master’s Seminar	0	0	1	1	100	
4.	Elective Course (from the list of elective courses)		2	0	1	3	100	
Total			06	0	4	10	400	

Semester-IV

S. No.	Course Code	Course Title		Periods				MM
			L	T	P	C		
1.	MSPC-401	Master’s Thesis	0	0	20	20	-	

L-Lecture-Tutorial-Practical-Credit

DESCRIPTION OF COURSES

M.Sc. (Ag.) Plant Pathology

Programme Name	MSc.Ag. PlantPathology	Programme Code	MSCAG1096
Course Code	MSAS-104	Credit	4(3+1)
Year/Sem	1/I	L-T-P	3-0-1
Course Name	Statistical Methods and Experimental Designs		

Course Objectives: The objectives of this course are:

1. To acquaint with the basic concept of statistics, experimental designs, analysis of variance, hypothesis.
2. To develop understanding of growth and yield parameters of crops and collection of data.
3. To develop the ability to select problem and layout field experiments.
4. To develop the skills to conduct experiments and their statistical analysis.

UNIT-I (Total Topics-8 and Hrs-7)

Processing of data: Classification and tabulation of statistical data by categories and measurements, graphical and diagrammatic representation-histogram. Frequency polygon, frequency curve and cumulative frequency curves.

UNIT- II (Total Topics-7 and Hrs-6)

Measure of location and dispersion: Mean, median, mode, partition values (quartiles, deciles and percentiles). Range, quartile deviation, mean deviation about mean and median, standard deviation coefficient of variation, moment kurtosis

UNIT –III (Total Topics-6 and Hrs-7)

Probability & distribution: Random experiment, sample space (discrete case only), events mathematical and statistical definition of probability, random variable (discrete and continuous), bermoulli trials, binomial distribution. poisson distn. Poisson distn as a limiting case of the binominal distn, normal distn, properties of the above distributions and fitting with available data, Test for their goodness of fit

UNIT- IV (Total Topics-8 and Hrs-7)

Correlation and regression : Bivariate data, bivariate frequency distribution, correlation coefficient, rank correlation, Regression lines, regression coefficients and their relation with correlation coefficient, Multiple regression, multiple and partial correlation coefficients

UNIT –V (Total Topics-7 and Hrs-6)

Estimation: Concept of population and sample; parameters and statistics: criteria for a good estimate or unbiasedness, consistency of population mean and its confidence interval in the normal case.

UNIT- VI (Total Topics-7 and Hrs-6)

Testing of hypothesis: Null and alternative hypotheses, two type of errors, level of significance

UNIT- VII (Total Topics-6 and Hrs-7)

Tests of significance: (a) large sample tests for mean & equality of means of two populations (2 tests). Student's statistic and its use of testing the mean equality of means of two populations (with independent and paired observations) correlation coefficient and regression coefficients.
Chi-Square statistics and its use as a test of goodness of fit, independence of attributes (contingency table)

with Yates correction, and testing for the variance of a population. (c) Fishers statistic and its use in testing the equality of two variances and homogeneity of means (analysis of variance).

UNIT- VIII (Total Topics-7 and Hrs-7)

Analysis of variance and covariance (ANOVA and ANCOVA): Analysis of variance and covariance with one way and two-way classifications (one observation per cell). Bartlettin test for testing the homogeneity of variances.

UNIT –IX (Total Topics-8 and Hrs-7)

Design of experiments: Need: uniformity trials, Principles of experimental design replication, randomization and local control, (a) Completely Randomized Design, Randomized Block Design and Latin Square Designs and their analysis, missing plot technique in RBD. (b) Simple factorial experiments of the type 22, 33, 24, 32, confounding in factorial experiments. (c) Split-plot experiments

Practical Experiments-(7 and Hrs-14)

- Presentation of data-tabulation, histograms and frequency polygons
- Calculation of mean, mode, standard deviation, skewness and kurtosis
- Calculation of expected frequencies in binomial, poisson and normal distributions testing the observed results against expected frequencies
- Tests of significance as prescribed in theory
- Regression and correlation coefficients and their significance
- Analysis of variance for different designs prescribed
- Analysis of covariance

CO.1	Define the basic concept of statistics, t-test, f-test, hypothesis, and sampling.
CO.2	Understand the role of statistics in research experiments.
CO.3	Choose and prepare experimental designs.
CO.4	analyze the results of statistical calculations and their validation
CO.5	Compare the analysis of variance and uniformity
CO.6	Compose of design of experiment of uniformity trial

Suggested Readings

- Agricultural statistics – Dr. S.R.S. Chandel
- Agricultural statistics – S.P.Singh and R.P.S.Verma
- An introduction to experimental design – Williams S. Ray
- Statistical methods in agriculture – Dr.F.S.Chaudhary
- Agril. Stat. & Coept. Designs – Panse and P.K.Sukhatme

CO-PO/PSO Mapping

COs POs/ PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	1	2	-	1	-	-	2	1	1	1	1	2	2	1	1
CO2	-	2	1	-	1	2	1	1	1	-	2	1	-	1	2	1
CO3	1	1	2	-	-	1	-	1	1	2	1	2	2	-	-	1
CO4	1	1	1	1	2	1	-	1	-	1	1	1	-	-	1	-
CO5	1	-	-	1	-	-	1	-	-	1	1	1	-	1	-	2
CO6	1	-	-	2	1	-	1	2	-	2	1	2	1	1	1	-
Average	1.2	1.25	1.5	1.3	1.25	1.3	1	1.4	1	1.4	1.16	1.33	1.66	1.25	1.25	1.25

Programme Name	M.Sc.(Ag.) Plant Pathology	Programme Code	MSCAG1096
Course Code	MSPC-102	Credit	3 (2+1)
Year/Sem	1/I	L-T-P	2-0-1
Course Name	Mycology		

Course Objectives: The objectives of this course are:

1. To label the fungi morphology and reproduction.
2. To explain role of fungi in agriculture and human welfare.
3. To identify concept of nomenclature, genetics and variability of fungi.
4. To analyze the comparative morphology of different groups of fungi.
- 5.

UNIT-I (Total topics-5 and Hrs. 8)

Introduction, definition of different terms, basic concepts.

UNIT- II (Total topics-5 and Hrs. 7)

Importance of mycology in agriculture, relation of fungi to human affairs.

UNIT- III (Total topics-6 and Hrs. 7)

History of mycology. Concepts of nomenclature and classification, fungal biodiversity, reproduction in fungi. Lichens types and importance, fungal genetics and variability in fungi.

UNIT- IV (Total topics-5 and Hrs. 8)

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.

Practical (Experiments-4 and Hrs-8)

- Detailed comparative study of different groups of fungi.
- Collection, identification
- Preservation of specimens.
- Isolation and identification of plant pathogenic fungi.

Upon successful completion of the course a student will be able to:

CO.1	Choose and define basic concept and importance of mycology
CO.2	Outline & summarize the concept of nomenclature and classification of fungi
CO.3	Identify the morphology of different genera of fungi
CO.4	Contrast the lichens and genetic variability of fungi
CO.5	To justify the importance of fungi in agriculture.
CO.6	To compose the role of fungi in plant pathology

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.

CO-PO/PSO Mapping

COs POs/ PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	1	2	-	1	-	-	2	1	1	1	1	2	2	1	1
CO2	-	2	1	-	1	2	1	1	1	-	2	1	-	1	2	1
CO3	1	1	2	-	-	1	-	1	1	2	1	2	2	-	-	1
CO4	1	1	1	1	2	1	-	1	-	1	1	1	-	-	1	-
CO5	1	-	-	1	-	-	1	-	-	1	1	1	-	1	-	2
CO6	1	-	-	2	1	-	1	2	-	2	1	2	1	1	1	-
Average	1.2	1.25	1.5	1.3	1.25	1.3	1	1.4	1	1.4	1.16	1.33	1.66	1.25	1.25	1.25

Programme Name	M.Sc.Ag. Plant Pathology	Programme Code	MSCAG1096
Course Code	MSPC-103	Credit	3(0+3)
Year/Sem	1/I	L-T-P	0-0-3
Course Name	Detection and Diagnosis of Plant Diseases		

Course Objectives: The objectives of this course are:

1. To acquaint with the basic concept of Koch's postulates.
2. To develop understanding of pure culture techniques and pathogen isolation.
3. To learn the use of microscopic instruments used for pathogen study.
4. To develop the ability of evaluation of fungicides, field experiments and data collection.

Practical Experiments-(11 and Hrs-22)

- 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.
- Preparation of manuscripts.

Upon successful completion of the course a student will be able to:

CO.1	Define the symptoms of plant diseases.
CO.2	Illustrate the knowledge of lab instruments.
CO.3	Experiment with Koch's postulates hypothesis.
CO.4	Contrast the identifying symptoms of plant diseases.
CO.5	Decide the effective control measure for the management of disease.
CO.6	Formulate new management practices for control of plant diseases.

Suggested Readings

- Baudoin ABAM, Hooper G R, Mathre D E & Carroll R B. 1990. Laboratory Exercises in Plant Pathology: An Instructional Kit. Scientific Publ., Jodhpur.
- Dhingra O D & Sinclair J B. 1986. Basic Plant Pathology Methods. CRC Press, London, Tokyo. Fox R T V. 1993. Principles of Diagnostic Techniques in Plant Pathology. CABI Wallington. Mathews R E F. 1993. Diagnosis of Plant Virus Diseases. CRC Press, Boca Raton, Tokyo.
- Pathak V N. 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 R E F. 1993. Diagnosis of Plant Virus Diseases. CRC Press, Florida.
- Noordam D. 1973. Identification of Plant Viruses, Methods and Experiments. Cent. Agric. Pub. Doc.
- Wageningen. Trigiano R N, Windham M T & Windham A S. 2004. Plant Pathology- Concepts and Laboratory Exercises. CRC Press, Florida.
- Chakravarti B P. 2005. Methods of Bacterial Plant Pathology. Agrotech, Udaipur.

CO-PO/PSO Mapping

COs POs/ PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	1	2	-	1	-	-	2	1	1	1	1	2	2	1	1
CO2	-	2	1	-	1	2	1	1	1	-	2	1	-	1	2	1
CO3	1	1	2	-	-	1	-	1	1	2	1	2	2	-	-	1
CO4	1	1	1	1	2	1	-	1	-	1	1	1	-	-	1	-
CO5	1	-	-	1	-	-	1	-	-	1	1	1	-	1	-	2
CO6	1	-	-	2	1	-	1	2	-	2	1	2	1	1	1	-
Average	1.2	1.25	1.5	1.3	1.25	1.3	1	1.4	1	1.4	1.16	1.33	1.66	1.25	1.25	1.25

Programme Name	M.S.c Ag. Plant Pathology	Programme Code	MSCAG1096
Course Code	MSPC-104	Credit	3(3+0)
Year/Sem	1/I	L-T-P	3-0-0

Course Name	Principles of plant pathology		
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Course Objectives: The objectives of this course are: 1. To acquaint with the basic concept and definition of plant diseases. 2. To understand the biotic and abiotic factors responsible for plant diseases, growth and reproduction of plant pathogens. 3. To expressing the host parasitic interaction, symptomatology and role of enzyme and toxins in disease development. 4. To illustrate the genetics of resistance and variation.			
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UNIT-I (Total Topics-8 and Hrs-4) Importance, definitions and concepts of plant diseases.			
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UNIT- II (Total Topics-7 and Hrs-4) History and growth of plant pathology, biotic and abiotic causes of plant diseases			
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UNIT –III (Total Topics-6 and Hrs-4) Growth, reproduction, survival and dispersal of important plant pathogens. Role of environment and host nutrition on disease development.			
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UNIT- IV (Total Topics-8 and Hrs-5) Hostparasite interaction, recognition concept and infection. Symptomatology			
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UNIT –V (Total Topics-6 and Hrs-5) 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.			
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UNIT- VI (Total Topics-6 and Hrs-4) Genetics of resistance; ‘R’ genes; mechanism of genetic variation in pathogens. Molecular basis for resistance, marker-assisted selection. Genetic engineering for disease resistance.			
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UNIT- VII (Total Topics-5 and Hrs-4) Disease management strategies.			
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Upon successful completion of the course a student will be able to:

CO.1	Describe the concept of growth, reproduction, survival and dispersal of plant diseases		
CO.2	Outline & summarize the host parasitic reaction and disease development		
CO.3	Identify the genetics of resistance and genetic engineering concept of plant diseases		
CO.4	Analyze the role of enzymes, toxins and growth regulators in disease development.		
CO.5	Assess the genetics of resistance in plant disease development.		
CO.6	Construct disease management practices.		

CO-PO/PSO Mapping

COs POs/PS Os	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1	2	-	1	-	-	2	1	1	1	1	2	2	1	1
CO2	-	2	1	-	1	2	1	1	1	-	2	1	-	1	2	1
CO3	1	1	2	-	-	1	-	1	1	2	1	2	2	-	-	1
CO4	1	1	1	1	2	1	-	1	-	1	1	1	-	-	1	-
CO5	1	-	-	1	-	-	1	-	-	1	1	1	-	1	-	2
CO6	1	-	-	2	1	-	1	2	-	2	1	2	1	1	1	-
Average	1.2	1.25	1.5	1.3	1.25	1.3	1	1.4	1	1.4	1.16	1.33	1.66	1.25	1.25	1.25

Programme Name	M.S.c Ag. Plant Pathology	Programme Code	MSCAG1096
Course Code	MSPC-201	Credit	3(2+1)
Year/Sem	1/II	L-T-P	2-0-1
Course Name	Diseases of Vegetables and Spices Crops		

Course Objectives: The objectives of this course are:

1. To understand the symptoms, disease development and management of leafy vegetables, crucifers and solanaceous vegetables.
2. To understand the symptoms, disease development and management of different root, bulb, vegetables,
3. To understand the symptoms and disease development and management of black pepper, saffron, cumin, coriander, turmeric, fennel, fenugreek and ginger.
4. To understand the symptoms and disease development and management of crucifers, cucurbits.

UNIT- I (Total Topics-7 and Hrs-8)

Nature, prevalence, factors affecting disease development of bulb, leafy vegetable, crucifers, cucurbits and solanaceous vegetables.

UNIT- II (Total Topics-6 and Hrs-7)

Diseases of protected cultivation. Symptoms and management of diseases of different root, bulb, leafy vegetables,

UNIT- III (Total Topics-9 and Hrs-8)

Diseases of crucifers, cucurbits and solanaceous vegetable crops.

UNIT –IV (Total Topics-8 and Hrs-7)

Symptoms, epidemiology and management of diseases of different spice crops such as black pepper, saffron, cumin, coriander, turmeric, fennel, fenugreek and ginger.

Practicals (Experiments-13 and Hrs-20)

- Study of symptoms and host parasite relationship of diseases of potato
- Study of symptoms and host parasite relationship of diseases of tomato
- Study of symptoms and host parasite relationship of diseases of crucifers
- Study of symptoms and host parasite relationship of diseases of cucurbits
- Study of symptoms and host parasite relationship of diseases of chilli
- Study of symptoms and host parasite relationship of diseases of brinjal

COs POs/PS Os	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	2	1	2	-	1	-	-	2	1	1	1	1	2	2	1	1
CO2	-	2	1	-	1	2	1	1	1	-	2	1	-	1	2	1
CO3	1	1	2	-	-	1	-	1	1	2	1	2	2	-	-	1
CO4	1	1	1	1	2	1	-	1	-	1	1	1	-	-	1	-
CO5	1	-	-	1	-	-	1	-	-	1	1	1	-	1	-	2
CO6	1	-	-	2	1	-	1	2	-	2	1	2	1	1	1	-
Average	1.2	1.25	1.5	1.3	1.25	1.3	1	1.4	1	1.4	1.16	1.33	1.66	1.25	1.25	1.25

CO-PO/PSO Mapping

Program me Name	MSc Ag. Plant Pathology	Programe Code	MSCAG1096
Course Code	MSPC-202	Credit	3(2+1)
Year/Sem	1/II	L-T-P	2-0-1
Course Name	Ecology of soil borne plant pathogens		

Course Objectives: The objectives of this course are:

1. To Acquaint with the basics of rhizosphere and phyllosphere
2. To develop understanding of bioagents and inoculums potential.
3. To understand the mechanism of biocontrol of soil borne plant pathogens.
4. To find out the potentialities for managing soil borne pathogens.

UNIT –I(Total Topics-8 and Hrs-6)

Soil as an environment for plant pathogens, nature and importance of rhizosphere and rhizoplane, host exudates, soil and root inhabiting fungi.

UNIT II(Total Topics-8 and Hrs-6)

Types of biocontrol agents. Inoculum potential and density in relation to host and soil variables

UNIT III(Total Topics-8 and Hrs-6)

Competition, predation, antibiosis and fungistasis.

UNIT IV(Total Topics-8 and Hrs-6)

Suppressive soils, biological control- concepts and potentialities for managing soil borne pathogens.

Practicals (Experiments-9 and Hrs-18)

- Isolation and enumeration of organisms in soil
- Soil dilution plate method
- Isolation from rhizosphere
- Isolation of *Trichoderma*
- Isolation of bacteria from soil.
- Pathogenicity test by soil inoculation technique.
- Pathogenicity test by seed inoculation technique.
- Correlation between inoculum density of test pathogens and disease incidence.
- Demonstration of fungistasis natural soils; suppression of test soil-borne pathogens by antagonistic microorganisms

Upon successful completion of the course a student will be able to:

CO.1	Define the effect of rhizosphere and rhizoplane on host exudates and root inhabiting fungi.
CO.2	Explain types of bio-control agent their inoculums potential and density.
CO.3	Identify the mechanism of competition, predation, antibiosis, and fungistasis.
CO.4	Assume the impact of suppressive soil in the management of soil borne plant pathogens.
CO.5	Assess the role of bio control agents in controlling plant diseases.
CO.6	Modify the application of bio control agents to increase efficiency.

Suggested Readings:

- Baker KF & Snyder WC. 1965. *Ecology of Soil-borne Plant Pathogens*. John Wiley, New York.
- Cook RJ & Baker KF. 1983. *The Nature and Practice of Biological Control of Plant Pathogens*. APS, St Paul, Minnesota.
- Garret SD. 1970. *Pathogenic Root-infecting Fungi*. Cambridge Univ. Press, Cambridge, New York. Hillocks RJ & Waller JM. 1997. *Soil-borne Diseases of Tropical Crops*. CABI, Wallington.
- Parker CA, Rovira AD, Moore KJ & Wong PTN. (Eds). 1983. *Ecology and Management of Soil-borne Plant Pathogens*. APS, St. Paul, Minnesota.

CO-PO/PSO Mapping

COs POs/P SOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	1	2	-	1	-	-	2	1	1	1	1	2	2	1	1
CO2	-	2	1	-	1	2	1	1	1	-	2	1	-	1	2	1
CO3	1	1	2	-	-	1	-	1	1	2	1	2	2	-	-	1
CO4	1	1	1	1	2	1	-	1	-	1	1	1	-	-	1	-
CO5	1	-	-	1	-	-	1	-	-	1	1	1	-	1	-	2
CO6	1	-	-	2	1	-	1	2	-	2	1	2	1	1	1	-
Average	1.2	1.25	1.5	1.3	1.25	1.3	1	1.4	1	1.4	1.16	1.33	1.66	1.25	1.25	1.25

Programme Name	MSc Ag. Plant Pathology	Programme Code	MSCAG1096
Course Code	MSPC-203	Credit	3(2+1)
Year/Sem	1/II	L-T-P	2-0-1
Course Name	Plant Virology		

Course Objectives: The objectives of this course are:

1. To acquaint with the basics of structures and compositions of plant viruses.
2. To develop understanding the symptomatology of plant viral diseases.
3. To understand the mechanical transmission, and host viral interactions.
4. To develop the of skill of plant viral diseases management.

UNIT I(Total Topics-5 and Hrs-4)

History of plant viruses, composition and structure of viruses.

UNIT II(Total Topics-6 and Hrs-4)

Symptomatology of important plant viral diseases.

UNIT III(Total Topics-5 and Hrs-5)

Transmission, chemical and physical properties, host virus interaction, virus vector relationship.

Unit IV(Total Topics-6 and Hrs-5)

Virus nomenclature and classification, genome organization, replication and movement of viruses.
Unit V(Total Topics-7and Hrs-4) Isolation and purification, electron microscopy, protein and nucleic acid based diagnostics.Mycoviruses, phytoplasma arbo and baculoviruses, satellite viruses, satellite RNAs, phages,
Unit VI (Total Topics-8 and Hrs-4) Viroids, prions. Principles of the working of electron-microscope and ultra- microtome. Origin and evolution, mechanism of resistance.
Unit VII(Total Topics-7 and Hrs-4) Genetic engineering, ecology, and listing of important diseases and their management.
Practical (Experiments-8 and Hrs-16) • Study of symptoms caused by viruses • Transmission of viruses • Assay of viruses • Physical properties of viruses • Purification of viruses • Methods of raising anti-sera • Serological tests • Electron microscopy, Ultratomy, PCR

Upon successful completion of the course a student will be able to:

CO.1	Label the compositions, structure and symptomatology of viral diseases
CO.2	Explain the nomenclature classification and transmission of plant viruses
CO.3	Identify the isolation, purification and electron microscopy of different viruses
CO.4	Assuming the genetic engineering, ecology on listing of important viral diseases
CO.5	Compare origin and evolution of plant viruses.
CO.6	Compose the genetic engineering, ecology, and listing of important diseases and their management.

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, New York.
- Noordam D. 1973. Identification of Plant Viruses, Methods and Experiments. Oxford& IBH, New Delhi.

COs POs/ PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	1	2	-	1	-	-	2	1	1	1	1	2	2	1	1
CO2	-	2	1	-	1	2	1	1	1	-	2	1	-	1	2	1
CO3	1	1	2	-	-	1	-	1	1	2	1	2	2	-	-	1
CO4	1	1	1	1	2	1	-	1	-	1	1	1	-	-	1	-
CO5	1	-	-	1	-	-	1	-	-	1	1	1	-	1	-	2
CO6	1	-	-	2	1	-	1	2	-	2	1	2	1	1	1	-
Average	1.2	1.25	1.5	1.3	1.25	1.3	1	1.4	1	1.4	1.16	1.33	1.66	1.25	1.25	1.25

Programme Name	MSc Ag. Plant Pathology	Programme Code	MSCAG1096
Course Code	MSPC-204	Credit	3(2+1)
Year/Sem	1/II	L-T-P	2-0-1
Course Name	Plant Bacteriology		

Course Objectives: The objectives of this course are:

1. To develop understanding of water management.
2. To develop the skills of water resources of India.
3. To develop the skills of soil-water-plant relationships.
4. To develop the ability to manage moisture stress conditions.

UNIT- I(Total Topics-6 and Hrs-5)

History and introduction to phytopathogenic procarya, viz., bacteria, MLOs, spiroplasmas and other fastidious procarya.

UNIT II(Total Topics-8 and Hrs-7)

Importance of phytopathogenic bacteria. Evolution, classification and nomenclature of phytopathogenic procarya and list of important diseases caused by them.

UNIT- III(Total Topics-6 and Hrs-7)

. Growth, nutrition requirements, reproduction, preservation of bacterial cultures and variability among phytopathogenic procarya.

UNIT -IV (Total Topics-8 and Hrs-6)

General biology of bacteriophages, L form bacteria, plasmids and bdellovibrios. Procaryotic inhibitors and their mode of action against phytopathogenic bacteria.

UNIT -V(Total Topics-6 and Hrs-5)

Survival and dissemination of phytopathogenic bacteria.

Practical (Experiments-7 and Hrs-14)

- Isolation of bacteria
- Purification and identification of bacteria
- Inoculation and Pathogenicity of bacteria
- Staining methods
- Biochemical and serological characterization of bacteria
- Isolation of plasmid
- Use of antibacterial chemicals/antibiotics

Upon successful completion of the course a student will be able to:

CO.1	Recall the concept of phytopathogenic procarya and their importance
CO.2	Illustrate the evolution and important plant diseases caused by bacteria
CO.3	Apply the effect of nutrient requirement on the growth of bacteria
CO.4	Contrast the biology, survival and dissemination of bacteria
CO.5	Compare the biology of bacteriophages, L form bacteria, plasmids and bdellovibrios and their role.
CO.6	Compose the survival and dissemination of phytopathogenic bacteria

Suggested Readings

- . Goto M. 1990. *Fundamentals of Plant Bacteriology*. Academic Press, NewYork.
- Jayaraman J & Verma JP. 2002. *Fundamentals of Plant Bacteriology*. Kalyani Publ., Ludhiana. Mount MS & Lacy GH. 1982. *Phytopathogenic Prokaryotes*. Vols. I, II Academic Press, New York.
- Verma JP, Varma A & Kumar D. (Eds). 1995. *Detection of Plant pathogens and their Management*.
 - Angkor Publ., New Delhi.
- Verma JP. 1998. *The Bacteria*. Malhotra Publ. House, New Delhi.

CO-PO/PSO Mapping

COs POs/ PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	1	2	-	1	-	-	2	1	1	1	1	2	2	1	1
CO2	-	2	1	-	1	2	1	1	1	-	2	1	-	1	2	1
CO3	1	1	2	-	-	1	-	1	1	2	1	2	2	-	-	1
CO4	1	1	1	1	2	1	-	1	-	1	1	1	-	-	1	-
CO5	1	-	-	1	-	-	1	-	-	1	1	1	-	1	-	2
CO6	1	-	-	2	1	-	1	2	-	2	1	2	1	1	1	-
Average	1.2	1.25	1.5	1.3	1.25	1.3	1	1.4	1	1.4	1.16	1.33	1.66	1.25	1.25	1.25

Programme Name	MSc. Ag. Plant Pathology	Programme Code	MSCAG1096
Course Code	MSPC-301	Credit	3(2+1)
Year/Sem	1I/III	L-T-P	2-0-1
Course Name	Principles of Plant Disease Management		

Course Objectives: The objectives of this course are:

1. To develop understanding of different principles of plant disease management.
2. To develop skill to understand disease resistance and molecular basis of plant disease management.
3. Basic nature, sources, effect of stickers and adjuvants.
4. To develop the ability to assess chemicals in plant disease management.

UNIT-I(Total Topics-6 and Hrs-6)

Principles of plant disease management by cultural, physical, biological, chemical, organic amendments and botanicals methods of plant disease control.

Unit II(Total Topics-7and Hrs-6)

Integrated control measures of plant diseases. Disease resistance and molecular approach for disease management.

UNIT –III(Total Topics-7 and Hrs-6)

Foliage, seed and soil application of chemicals, role of stickers, spreaders and other adjuvants, health vis-a-vis environmental hazards, residual effects and safety measures.

UNIT- IV(Total Topics-8 and Hrs-6)

History of fungicides, bactericides, antibiotics, concepts of pathogen, immobilization, chemical protection and chemotherapy.

UNIT- V(Total Topics-6 and Hrs-6)

Nature, properties and mode of action of antifungal, antibacterial and antiviral chemicals.

Practical (Experiments-4 and Hrs-8)

- *In vitro* evaluation of chemicals against plant pathogens
- *in vivo* evaluation of chemicals against plant pathogens
- Study of structural details of sprayers
- Study of structural details of dusters

Upon successful completion of the course a student will be able to:

CO.1	Define the principles of plant disease management practices by cultural, physical, chemical, botanical and biological methods.
CO.2	Explain the disease resistance and molecular approach of disease management.
CO.3	Identify the effect of stickers, spreaders and their environmental hazards.
CO.4	Analyze the impact of antifungal, antibacterial, antiviral and antibiotic chemicals.
CO.5	Assess the effective and ecofriendly control measure for plant diseases.
CO.6	Design a new module for the management of plant diseases.

Suggested Readings

- Fry WE. 1982. Principles of Plant Disease Management. Academic Press, New York. Hewitt HG. 1998. Fungicides in Crop Protection. CABI, Wallington.
- Marsh RW. 1972. Systemic Fungicides. Longman, New York.
- Nene YL & Thapliyal PN. 1993. Fungicides in Plant Disease Control. Oxford & IBH, N Delhi. Palti J. 1981.
- Cultural Practices and Infectious Crop Diseases. Springer- Verlag, New York. Vyas SC. 1993
- Handbook of Systemic Fungicides. Vols. I-III. Tata McGraw Hill, New Delhi.

CO-PO/PSO Mapping

COs POs/ PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	1	2	-	1	-	-	2	1	1	1	1	2	2	1	1
CO2	-	2	1	-	1	2	1	1	1	-	2	1	-	1	2	1
CO3	1	1	2	-	-	1	-	1	1	2	1	2	2	-	-	1
CO4	1	1	1	1	2	1	-	1	-	1	1	1	-	-	1	-
CO5	1	-	-	1	-	-	1	-	-	1	1	1	-	1	-	2
CO6	1	-	-	2	1	-	1	2	-	2	1	2	1	1	1	-

Programme Name	M.Sc .Ag. Plant Pathology	Programe Code	MSCG1096
Course Code	MSPC-302	Credit	3(2+1)
Year/Sem	1/III	L-T-P	2-0-1
Course Name	Diseases of field and medicinal plants		

Course Objectives: The objectives of this course are:

1. To develop understanding of crop diseases focus on field and medicinal plants.
2. To develop knowledge of biotic and abiotic factors responsible for plant diseases.
3. To develop skills of plant diseases management.
4. To develop understanding of management skill by adopting and integrated approach.

UNIT- I(Total Topics-7 and Hrs-6)

Diseases of Cereal crops- wheat, barley, rice, pearl millet, sorghum and maize

UNIT -II(Total Topics-6 and Hrs-7)

Diseases of Pulse crops- gram, urdbean, mothbean, mungbean, lentil, pigeonpea, soybean

UNIT -III(Total Topics-5 and Hrs-6)

Diseases of Oilseed crops- rapeseed and mustard, sesame, linseed, sunflower, groundnut, castor

UNIT- IV(Total Topics-7and Hrs-5)

Diseases of Cash crops- cotton, sugarcane. Diseases of Fodder legume crops- berseem, oats, guar, lucerne, cowpea.

UNIT V(Total Topics-8 and Hrs-6)

Medicinal crops- plantago, liquorice, mulathi, rosagrass, sacred basil, mentha, ashwagandha, Aloe vera.

Practical's (Experiments-4 and Hrs-8)

- Detailed study of symptoms and host parasite relationship of important diseases of above mentioned crops.
- Collection and identifications.
- Dry preservation of diseased specimens of important crops.

Average	1.2	1.25	1.5	1.3	1.25	1.3	1	1.4	1	1.4	1.16	1.33	1.66	1.25	1.25	1.25
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Upon successful completion of the course a student will be able to:

CO.1	Define the symptoms of diseases of cereals crops pulse crops cash crops and oil seed crops medicinal crops
CO.2	Explain the factors helpful in the incidence and development of plant diseases.
CO.3	Identify the causal organism of diseases.
CO.4	Contrast on the effective control measures of plant diseases.
CO.5	Assess the use of chemical to control plant diseases.
CO.6	Compose the most suitable management practice to control plant diseases.

Suggested Readings

- Chaube HS, Singh US, Mukhopadhyay AN & Kumar J. 1992. *Plant Diseases of International Importance*. Vol.II. *Diseases of Vegetable and Oilseed Crops*. Prentice Hall, Englewood Cliffs, New Jersey.
- Godara, S.I., Kapoor, BBS and Rathore, B.S. 2010. Madhu Publications, Bikaner-3, India. Gupta VK & Paul YS. 2001. *Diseases of Vegetable Crops*. Kalyani Publ., New Delhi
- Sherf AF & McNab AA. 1986. *Vegetable Diseases and their Control*. Wiley InterScience, Columbia. Singh RS. 1999. *Diseases of Vegetable Crops*. Oxford & IBH, New Delhi.
- Gupta SK & Thind TS. 2006. *Disease Problem in Vegetable Production*. Scientific Publ., Jodhpur. Walker JC. 1952. *Diseases of Vegetable Crops*. McGraw-Hill, New York.

CO-PO/PSO Mapping

COs POs/ PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	1	2	-	1	-	-	2	1	1	1	1	2	2	1	1
CO2	-	2	1	-	1	2	1	1	1	-	2	1	-	1	2	1
CO3	1	1	2	-	-	1	-	1	1	2	1	2	2	-	-	1
CO4	1	1	1	1	2	1	-	1	-	1	1	1	-	-	1	-
CO5	1	-	-	1	-	-	1	-	-	1	1	1	-	1	-	2
CO6	1	-	-	2	1	-	1	2	-	2	1	2	1	1	1	-
Average	1.2	1.25	1.5	1.3	1.25	1.3	1	1.4	1	1.4	1.16	1.33	1.66	1.25	1.25	1.25

Programme Name	M.Sc Ag. Plant Pathology	Program Code	MSCAG1096
Course Code	MSPE-304	Credit	3(2+1)
Year/Sem	1/III	L-T-P	2-0-1
Course Name	Biological control of plant diseases		

Course Objectives: The objectives of this course are:

1. To develop understanding basics of biological control.
2. To develop knowledge of mechanism of biological control.
3. To develop skills of using bio-control agents in different crops.
4. To develop knowledge of factors helpful in biocontrol.

UNIT-I (Total Topics-7 and Hrs-8)

Concept of biological control, definition, importance, principles of plant disease management with bioagents, history of biological control, merits and demerits of biological control.

UNIT- II (Total Topics-8 and Hrs-6)

Types of biological interactions, competitions, mycoparasitism, exploitation for hypovirulence , rhizosphere colonization, competitive saprophytic ability, antibiosis, induced mechanism and its relevance in biological control.

UNIT- III (Total Topics-10 and Hrs-8)

Factors governing biological control, role of physical environment, agroecosystem, operational mechanisms and cultural practices in biological control of plant pathogens, biocontrol agents, comparative approaches to biological control of plant pathogens b resident and introduced antagonists, control of soil-borne and foliar diseases. Compatibility of different bio-agents.

UNIT- IV (Total Topics-9and Hrs-8)

Commercial production of antagonists, their delivery systems, application and monitoring . biological control in IDM, IDM and organic farming system, bio-pesticides available in market. Quality control system of bio-control agents

Practical (Experiments-4 and Hrs-8)

- Isolation
- Characterization and maintenance of antagonists.
- Methods of study of antagonism and antibiosis.
- Application of antagonists against pathogen in in vivo conditions. Study of cfu/g of formulated products.

Upon successful completion of the course a student will be able to:

CO.1	Define the concept of biological control its merits and demerits and history
CO.2	Explain about myco-parasitism, antibiosis, hypo virulence and induced mechanism
CO.3	Apply the compatibility of different bio control agent
CO.4	Analyze the use of bio-control agents in IDM
CO.5	Assess the use of different biocontrol agents.
CO.6	Compose the application , monitoring of bio-control in integrated diseases management.

Suggested Readings

- Campbell R. 1989. *Biological control of Microbial Plant Pathogens*. Cambridge Univ. Press, Cambridge.
- Cook RJ & Baker KF. 1983. *Nature and practice of biological control of plant pathogens*. APS, St. Paul, Mennisota.

CO-PO/PSO Mapping

COs POs/ PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	1	2	-	1	-	-	2	1	1	1	1	2	2	1	1
CO2	-	2	1	-	1	2	1	1	1	-	2	1	-	1	2	1
CO3	1	1	2	-	-	1	-	1	1	2	1	2	2	-	-	1
CO4	1	1	1	1	2	1	-	1	-	1	1	1	-	-	1	-
CO5	1	-	-	1	-	-	1	-	-	1	1	1	-	1	-	2
CO6	1	-	-	2	1	-	1	2	-	2	1	2	1	1	1	-
Average	1.2	1.25	1.5	1.3	1.25	1.3	1	1.4	1	1.4	1.16	1.33	1.66	1.25	1.25	1.25

Program me Name	M.Sc.Ag. Plant Pathology	Program Code	MSCAG1096
Course Code	MSPE-305	Credit	3(2+1)
Year/Sem	2/III	L-T-P	2-0-1
Course Name	Chemicals in plant disease management		

Course Objectives: The objectives of this course are:

1. To develop understanding basics of chemicals used to control plant diseases.
2. To develop knowledge of different groups of chemicals.
3. To develop skills of applying chemicals on plant diseases.
4. To develop knowledge of mechanism of working of chemicals.

UNIT-I (Total Topics-7 and Hrs-6)

History and development of chemicals, definition of pesticides and related terms; advantages and disadvantages of chemicals.

UNIT –II (Total Topics-8 and Hrs-6)

Classification of chemicals based on chemical nature and mode of action used in plant disease control and their management.

UNIT –III (Total Topics-6 and Hrs-5)

Chemicals in plant disease control, viz., fungicides bactericides and botanicals.

UNIT –IV(Total Topics-7and Hrs-5)

Formulations and applications of different fungicides; chemotherapy and phytotoxicity of fungicides.

UNIT- V (Total Topics-8 and Hrs-4)

Handling, storage and precautions to be taken while using fungicides; compatibility with other agrochemicals, persistence, cost-benefit ratio, factor affecting fungicides.

UNIT- VI (Total Topics 8 and Hrs-4)

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

Practical (Experiments-4 and Hrs-8)

- Acquaintance with formulation of different fungicides and plant protection appliances.
- In-vitro evaluation techniques
- Preparation of different concentrations of chemicals including botanicals pesticides based on active ingredients against pathogens.
- Method of application of chemicals

Upon successful completion of the course a student will be able to:

CO.1	Define the classification of chemicals on the basis of chemical nature and mode of action
CO.2	Explain the use of fungicide, bactericide, botanicals and antibiotic in plant disease control
CO.3	Organize the application of different fungicide and their phyto-toxic effect
CO.4	Analyze about plant protection appliances, residual effect and environmental pollution.
CO.5	Assess compatibility with other agrochemicals, persistence, cost-benefit ratio, factor affecting fungicides.
CO.6	Improvement on environmental pollution, residues and health hazards, fungicidal resistance in plant pathogens and its management.

Suggested Readings

- Bindra OS & Singh H. 1977. *Pesticides – An Application Equipment*. Oxford & IBH, New Delhi.
- Nene YL & Thapliyal PN. 1993. *Fungicides in plant disease control*. 3rd Ed. Oxford & IBH, New Delhi.

CO-PO/PSO Mapping

COs POs/ PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	1	2	-	1	-	-	2	1	1	1	1	2	2	1	1
CO2	-	2	1	-	1	2	1	1	1	-	2	1	-	1	2	1
CO3	1	1	2	-	-	1	-	1	1	2	1	2	2	-	-	1
CO4	1	1	1	1	2	1	-	1	-	1	1	1	-	-	1	-
CO5	1	-	-	1	-	-	1	-	-	1	1	1	-	1	-	2
CO6	1	-	-	2	1	-	1	2	-	2	1	2	1	1	1	-
Average	1.2	1.25	1.5	1.3	1.25	1.3	1	1.4	1	1.4	1.16	1.33	1.66	1.25	1.25	1.25

Programme Name	M.Sc Ag. Plant Pathology	Programme Code	MSCAG1096
Course Code	MSPE-306	Credit	3(2+1)
Year/Sem	2/III	L-T-P	2-0-1
Course Name	Seed health technology		

Course Objectives: The objectives of this course are:

1. To develop understanding of seed pathology in seed industry.
2. To develop knowledge of seed transmission in relation to seed infection.
3. To develop understanding of epidemiology of seed borne diseases.
4. To develop knowledge of seed production and seed health testing.

UNIT-I (Total Topics-7 and Hrs-8)

History and economic importance of seed pathology in seed industry, plant quarantine and SPS under WTO. Morphology and anatomy of typical monocotyledonous and dicotyledonous infected seeds

UNIT-II (Total Topics-8 and Hrs-7)

Recent advances in the establishment and subsequent causes of disease development in seed and seedling. Localization and mechanism of seed transmission in relation to seed infection, seed to plant transmission of pathogens.

UNIT-III (Total Topics-7 and Hrs-8)

Seed certification and tolerance limits, types of losses caused by seed borne diseases in true and vegetative propagated seeds. Epidemiological factors influencing the transmission of seed borne diseases, forecasting of epidemics through seed borne infection.

UNIT-IV (Total Topics-9 and Hrs-7)

Production of toxic metabolites affecting seed quality and its impact on human, animal and plant health, management of seed borne pathogens/diseases and procedure for healthy seed production, seed health testing, methods for detecting the microorganism.

Practical (Experiments-2 and Hrs-4)

- Conventional and advanced techniques in the detection
- Identification of seed borne fungi, virus and bacteria.

Upon successful completion of the course a student will be able to:

CO.1	Define the concept of seed pathology, monocotyledons and dicotyledons seeds
CO.2	Explain the mechanism of seed transmission in relation to seed infection
CO.3	Identify the losses caused by seed borne diseases and their limit in seed certification
CO.4	Analyze seed certification and tolerance limit of seed borne diseases.
CO.5	Evaluate epidemiological factors for the seed borne diseases.
CO.6	Compose the management of seed borne pathogens and procedure for healthy seed production

Suggested Readings

- Agarwal VK & JB Sinclair. 1993. *Principles of Seed Pathology*. Vols. I & II, CBS Publ., New Delhi.
- Paul Neergaard. 1988. *Seed Pathology*. MacMillan, London.
- Suryanarayana D. 1978. *Seed Pathology*. Vikash Publ., New Delhi.

CO-PO/PSO Mapping

COs POs/ PSOs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2	PSO 3	PSO 4
CO1	2	1	2	-	1	-	-	2	1	1	1	1	2	2	1	1
CO2	-	2	1	-	1	2	1	1	1	-	2	1	-	1	2	1
CO3	1	1	2	-	-	1	-	1	1	2	1	2	2	-	-	1
CO4	1	1	1	1	2	1	-	1	-	1	1	1	-	-	1	-
CO5	1	-	-	1	-	-	1	-	-	1	1	1	-	1	-	2
CO6	1	-	-	2	1	-	1	2	-	2	1	2	1	1	1	-
Average	1.2	1.25	1.5	1.3	1.25	1.3	1	1.4	1	1.4	1.16	1.33	1.66	1.25	1.25	1.25