



**CH. CHARAN SINGH UNIVERSITY, MEERUT**  
**DEPARTMENT OF PLANT PROTECTION**

**पादप संरक्षण विभाग, चौ० चरण सिंह विश्वविद्यालय, मेरठ**

University Campus, Meerut- 250 004 (U.P.), India

Ref. No.: PP/PB/2025-26/

Date: 13<sup>th</sup> October 2025

To,  
Dy. Registrar (Committee Cell)  
Ch. Charan Singh University,  
Meerut.

**Subject:** Regarding agende for Acadamic Council for approval of BoS Proceeding in the subjects of Plant Pathology and Entomology, Department of Plan Protection.

Dear Sir,

As per the letter no. Committee Cell (BoS-Ag. Plant Path)/7365, dated 11-09-2025 BoS was held on September 13<sup>th</sup>, 2025 at 11.00 am and letter no. Committee Cell (BoS-M.Sc. Ag. Ento.)/7397, dated 06-10-2025 BoS was held on October 9<sup>th</sup>, 2025 at 11.00 am in the Department of Plan Protection to finalize the syllabus of M.Sc. Ag. Plant Pathology-CBCS (Only University Campus) and M.Sc. Ag. Entomology-CBCS (Only University Campus). The proceedings of both the BoS were approved by the Hon'ble Vice Chancellor. In this regard, you are requested to put the agenda of BoS Proceeding, Departmen of Plan Protection for the approval of upcoming Academic Council.

**Encl.:**

- (1) Original BoS Proceeding with details Syllabus of M.Sc. Ag. Plant Pathology-CBCS
- (2) Original BoS Proceeding with details Syllabus of M.Sc. Ag. Entomology-CBCS

Thanking you

Yours sincerely,

**Prof. Shailendra Sharma**  
Coordinator

**Department of Plant Protection**  
**Ch. Charan Singh University, Meerut**

**COORDINATOR,**

**Deptt. of Plant Protection**

**Ch. Charan Singh University**

**MEERUT-250004**

# CH. CHARAN SINGH UNIVERSITY, MEERUT



A.C. meeting date:

E.C. meeting date:

## Minutes of the Meeting of Board of Studies in Plant Pathology

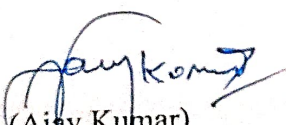
As per the letter no. Committee Cell (BoS-Ag. Plant Path)/7365, dated 11-09-2025, a meeting of the **Board of Studies in the subject of Plant Pathology** (Only University Campus) in Faculty of Agriculture of the University was held on **13.09.2025** at 11:00 a.m. through hybrid mode (online and offline) in the Department of Plant Protection to finalize the syllabus for M.Sc. Ag. (Plant Pathology) as per Choice Based Credit System (CBCS) and according to ICAR-BSMA Committee- 2020. Following Committee members were present in the meeting: Link for online meeting is: <https://meet.google.com/aib-yqir-kjn>

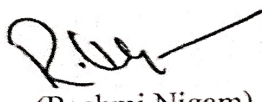
1. Prof. Shailendra Sharma, Dean, Faculty of Agriculture and Convener-I, C.C.S. University, Meerut.
2. Dr. Rashmi Nigam, (Convener-II) Janta Vedic College, Baraut.
3. Prof. Purshottam, SVP University of Agri. & Technology, Meerut (External Subject Expert).
4. Prof. Gopal Singh, Dept. of Plant Pathology, SVP University of Agri. & Technology, Meerut (External Subject Expert).
5. Prof. Rashmi Aggarwal, Retd. Joint Director Academic, IARI, New Delhi (External Subject Expert).
6. Dr. Ajay Kumar, Dept. of Plant Protection, C.C.S. University, Meerut (Special Invitee)


The Board went critically through the course contents of two year (four semesters) M.Sc. Ag. (Plant Pathology) degree programme, under CBCS involving core courses, core elective courses and two open electives.


The Board unanimously approved the syllabus whose signed copy by the Board members is enclosed herewith. The syllabus may be made effective from the academic session 2025-26.

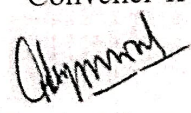
The rest of the conditions/ rules shall be same as are applicable in Choice Based Credit System of the Faculty of Agriculture/ other faculties of Ch. Charan Singh University, Meerut.


  
(Ajay Kumar)  
Member

  
(Rashmi Nigam)  
Convener-II

  
(Purshottam)  
External Expert

  
(Gopal Singh)  
External Expert

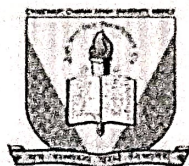
  
(Rashmi Aggarwal)  
External Expert

  
(Shailendra Sharma)  
Dean, Faculty of Agriculture

**For the kind perusal and approval:**

(Hon'ble Vice Chancellor)

**CH. CHARAN SINGH UNIVERSITY, MEERUT**



(NAAC A++ Accredited)

**PROGRAMME SYLLABUS**

**For**

**M. Sc. (Ag.) PLANT PATHOLOGY**

Course outline and its distribution as per the recommendation of  
{ICAR - Broad Subject Matter Area (BSMA) Committee}

**Effective from**

**ACADEMIC SESSION 2025-2026**

**FACULTY OF AGRICULTURE  
DEPARTMENT OF PLANT PROTECTION**

## ABOUT THE DEPARTMENT

The Department of Plant Protection was established in 1998 under the self-financed scheme (SFS) of the UP-State Government and the University to meet the long-standing demand of students, farmers, pesticide companies, bio-control laboratories, and government and private organizations. The study of plant protection aims at developing strategies, and means for overall improvement in crop production by minimizing crop losses due to insect-pests, diseases, weeds, nematodes, rodents, etc. The department has modern laboratories, which are well equipped for under-taking isolation, purification, identification and maintenance of cultures, mass rearing of natural enemies, mass production of bio-pesticides. Major equipments in the Department are BOD incubator, hot air oven, autoclave, Laminar air flow, GEL documentation system, deep freezer, high quality research microscopes, high quality inverted phase contrast microscopes, double distillation unit, bio-safety cabinets, PCR machines, electronic balances, horizontal electrophoresis unit, deep freezer, refrigerated centrifuge, pH meter, sprayers, etc. The department has its own departmental library, which consists of more than 1000 books of different titles, and journals. A separate computer laboratory with online internet facility was also set-up in the department to cater the teaching and research needs of the postgraduate students. The department is having active academic collaboration with several national Institutes /laboratories in India like– Central Potato Research Institute (ICAR-CPRI), Shimla; National Research Centre for Integrated Pest Management (ICAR-NCIPM) New Delhi; National Bureau of Plant Genetic Resources (ICARNBPGR) New Delhi; National Research Centre on Litchi (ICAR-NRCL), Muzaffarpur (Bihar); Indian Institute of Wheat & Barley Research (ICAR-IIWBR), Karnal; Indian Institute of Pulses Research (ICAR-IIPR), Kanpur; Indian Institute of Sugarcane Research, Lucknow (ICARIISR); ICAR- Central Institute for Subtropical Horticulture, Lucknow, Uttar Pradesh (ICARCISH) and Indian Institute of Farming Systems Research (ICAR-IIFSR), Modipuram, Meerut, etc. where the students have an opportunity to undertake their thesis work in collaboration of the department. The students of the department have shown good performance in ARS, ICAR-NET and have obtained various scholarships from various agencies. Several students of the department are presently occupying important positions in both public and private sector organizations; including universities, colleges, and research institutes, state agriculture departments, krishi vigyan kendra (KVKs), FCI, DPPQS, private pesticides companies, etc.

**Course Structure of M.Sc. Ag. (Plant Pathology) degree programme:**

M.Sc. Ag. (Plant Pathology) is two years (four semesters) full time CBCS course, including the thesis work. In each semester, there will be one open elective/ minor course of 4 credits each. First semester open elective are self-study courses and the limit of credits earned can be upto 4 credits. A minimum of 108 credits are required to be earned for successful completion of the Master's degree programme. Each student has to undertake a thesis work on any aspect related to the course of study and submit the same at the end of fourth semester to Department. The students are also facilitated to receive training during their master's research work in different research institutes, laboratories and other Universities. Minimum 30 credits are required for master's research/ thesis. There shall be an advisory board consisting up to 3 members (major and minor) for guiding students for master's research from the department and minor can be from outside of the department/university.

**Major Courses/ Core Compulsory:** These are main (major) courses of the subject which every student has to study who has taken admission in PG (First and Second Year).

**Supporting Courses/ Core Elective:** The subject not related to the major subject. It could be any subject considered relevant for student's research work (such as Statistical Methods, Information Technology in Agriculture, etc.) or necessary for building his/ her overall competence.

**Minor Courses/ Open Elective:** From the subjects closely related to a student's major subject

**Examination and Evaluation:** The examination and evaluation patterns in each course will be according to the University norms as provided for CBCS system in this regard. Each theory paper will carry 80 marks (40+40 marks of internal and external evaluation). In each semester, there shall be one joint external practical examination carrying 80 marks based on all the four compulsory core courses (20+20+20+20 marks). The M.Sc. (Ag.) thesis shall be of 300 marks (200+100 marks for thesis evaluation and viva – voce examination, respectively).

Internal assessment in each course will be based on:

Quizzes- Two: each for 5 marks.	= 10 marks
Tests- Two: each for 10 marks.	= 20 marks
Seminar/Term paper: 10 marks in each paper	= 10 marks

**Pass Percentage:** Theory- A minimum of 30% marks separately in internal and external assessment of each course, Practical- 30%. Overall- An aggregate of 40% marks in all the courses (including practical) is required for passing (Plant Pathology / M.Sc. Ag.)

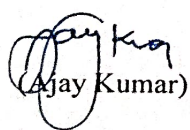
**Attendance Criterion:** As per the norms decided by the statutory body

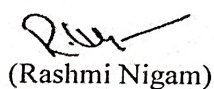
**Maximum marks:** 2000

Percentage range for Division: First = 60% (6 = CGPA  $\leq$  10)

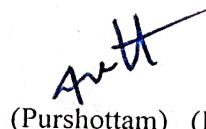
Percentage range for Division: Second = 45% (4.5 = CGPA  $<$  6)

Percentage range for Division: Third = 40% (4 = CGPA  $<$  4.5)

  
(Ajay Kumar)

  
(Rashmi Nigam)

  
(Gopal Singh)

  
(Purshottam)

  
(Rashmi Aggarwal)

  
(Shailendra Sharma)

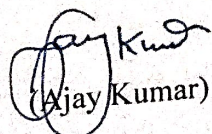
**Marks Range for Grades:**

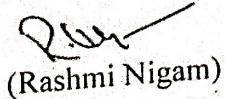
Marks Range (Out of 100)	Grade	Grade Points
0-29	F/F	0
30-39	D	4
40-49	D <sup>+</sup>	5
50-54	D <sup>++</sup>	5.5
55-59	C	6
60-64	C <sup>+</sup>	6.5
65-69	C <sup>++</sup>	7
70-74	B	7.5
75-79	B <sup>+</sup>	8
80-84	B <sup>++</sup>	8.5
85-89	A	9
90-94	A <sup>+</sup>	9.5
95-100	A <sup>++</sup>	10

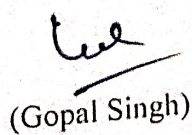
CBCS Regulations and grade card shall be as per Ordinances of the university in this regards.

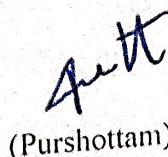
**Eligibility for Admission to M.Sc. Ag. (Plant Pathology) CBCS Programme:** Bachelor's degree in Agriculture/ Horticulture/ Forestry with 50% marks.

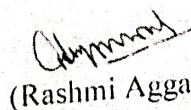
**Intake (Number of Seats):** 30

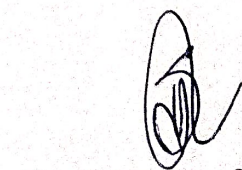
  
(Ajay Kumar)

  
(Rashmi Nigam)

  
(Gopal Singh)

  
(Purshottam)

  
(Rashmi Aggarwal)

  
(Shailendra Sharma)  
C.C.S. University, Meerut

Program: M.Sc. Ag.  
Program (Specific): M.Sc. (Ag.) Plant Pathology (CBCS)  
Program Code: CPDD07

**Program Outcomes**

After successful completion of the M.Sc. (Ag.) Plant Pathology program, students will be able to explore diverse opportunities in the agriculture sector. They will be equipped to plan and execute independent research, design course curricula in various sub-disciplines of Plant Pathology, develop projects for the advancement of plant health management, and contribute towards sustainable agriculture for the welfare of society.

**PO1:** To provide opportunities for higher education and enhance students' professional growth. The program also opens pathways for career advancement in teaching, research, and agricultural industries.


**PO2:** Plant Pathologists commonly collaborate with Plant Breeders, Entomologists, Agronomists, Horticulturists, and Farmers in fields, farms, and greenhouses to manage plant diseases effectively.

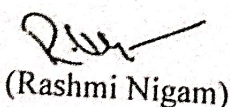
**PO3:** Engage with biotechnologists, microbiologists, and agricultural engineers to develop eco-friendly, innovative, and sustainable disease management strategies. thereby boosting agricultural productivity and ensuring food security.

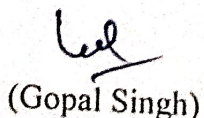
**PO4:** Addressing farmers' problems related to plant diseases of regional and national significance and devising effective management practices.

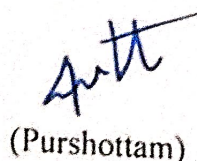
**PO5:** To address environmental concerns regarding chemical use in plant disease management by promoting bio-control agents, integrated disease management (IDM), and organic approaches.

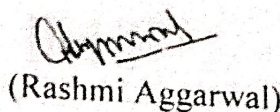
**PO6:** Students will be able to establish plant pathology-based consultancies, diagnostic services, and extension activities. They will develop suitable disease management packages to minimize post-harvest losses and deliver modern plant health technologies to stakeholders.

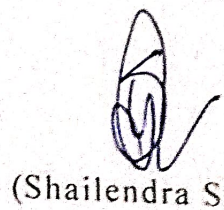
  
(Ajay Kumar)

  
(Rashmi Nigam)

  
(Gopal Singh)

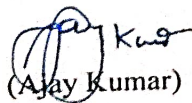
  
(Purshottam)

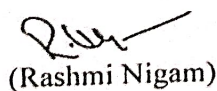
  
(Rashmi Aggarwal)

  
(Shailendra Sharma)

## PROGRAMME SPECIFIC OUTCOMES (PSOs)

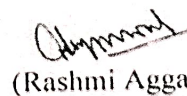
- PSO 1:** Demonstrate advanced and comprehensive knowledge of plant pathogenic organisms (fungi, bacteria, viruses, phytoplasmas, nematodes, etc.) and their molecular, physiological, and ecological interactions with host plants to ensure accurate diagnosis and mitigate potential yield losses.
- PSO 2:** Employ advanced and cutting-edge diagnostic methodologies, including conventional, serological, molecular, and genomic tools, for rapid, sensitive, and specific detection and identification of plant diseases.
- PSO 3:** Design, develop, and implement economically viable, eco-friendly, and sustainable Integrated Disease Management (IDM) strategies incorporating resistant cultivars, cultural practices, biocontrol agents, and precision application of agrochemicals.
- PSO 4:** Develop and apply epidemiological models, disease forecasting systems, and digital decision-support tools for early detection, prediction, and real-time surveillance of plant disease outbreaks.
- PSO 5:** Cultivate entrepreneurial skills through the commercialization of mushroom cultivation, bioagent production, and mass multiplication of beneficial microorganisms to promote sustainable agriculture and generate employment opportunities.
- PSO 6:** Formulate and disseminate innovative, region-specific plant health management packages to minimize pre- and post-harvest losses, enhance agricultural productivity, and ensure food security.
- PSO 7:** Conduct advanced research, publish scholarly work, and provide extension services to address emerging and re-emerging plant disease challenges at regional, national, and global scales.
- PSO 8:** Demonstrate professional ethics, leadership qualities, and effective scientific communication to serve as resource persons, consultants, entrepreneurs, and policy advisors in academia, research organizations, agro-industries, and field-level plant health advisory systems.

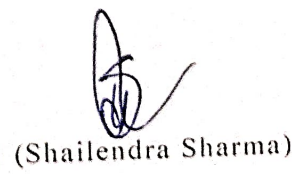
  
(Ajay Kumar)

  
(Rashmi Nigam)

  
(Gopal Singh)

  
(Purshottam)

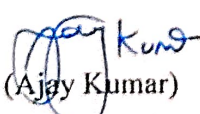
  
(Rashmi Aggarwal)

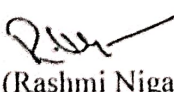
  
(Shailendra Sharma)


**STRUCTURE OF THE PROGRAMME**


Semester-wise titles of the papers in M.Sc. (Ag.) Plant Pathology as per Choice Based Credit System (CBCS) and according to ICAR-BSMA Committee- 2020 w.e.f. 2025-26

Course Type	Course Title	Course Code	Credits L+P+T	Maximum Marks			
				Int.	Ext.	Practical	Total
<b>Semester: First</b>							
Core Compulsory/ Major Course	Mycology	CJ-1531	4+1+0	40	40	20	100
	Principles of Plant Pathology	CJ-1532	4+1+0	40	40	20	100
	Techniques for Detection and Diagnosis of Plant Diseases	CJ-1533	4+1+0	40	40	20	100
Core Elective/ Supporting Course	Statistical Methods for Applied Science	CJ-1534	4+1+0	40	40	20	100
Practical-I	Based on courses I-IV	CJ-531	1+1+1+1				
Open Elective/ Minor Course	Hindi/ English/ Urdu/ Sanskrit		4+0+0				100
	<b>Total of Credits/ marks</b>		<b>24</b>				<b>500</b>
<b>Semester: Second</b>							
Core Compulsory/ Major Course	Plant Virology	CJ-2531	4+1+0	40	40	20	100
	Diseases of Field and Medicinal Crops	CJ-2532	4+1+0	40	40	20	100
	Biological Control of Plant Pathogens	CJ-2533	4+1+0	40	40	20	100
	Epidemiology and Forecasting of Plant Diseases	CJ-2534	4+1+0	40	40	20	100
Practical-II	Based on courses V-VIII	CJ-631	1+1+1+1				
Open Elective/ Minor Course	Ecology of Soil Borne Plant Pathogens	CO-6625	4+0+0	50	50		100
	<b>Total of Credits/ marks</b>		<b>24</b>				<b>500</b>
<b>Semester: Third</b>							
Core Compulsory/ Major Course	Plant Pathogenic Prokaryotes	CJ-3531	4+1+0	40	40	20	100
	Plant Nematology	CJ-3532	4+1+0	40	40	20	100
	Diseases of Vegetable and Spices Crops	CJ-3533	4+1+0	40	40	20	100
Core Elective/ Supporting Course	Information Technology in Agriculture	CJ-3534	4+1+0	40	40	20	100
Practical-III	Based on courses IX-XII	CJ-731	1+1+1+1				
Open Elective/ Minor Course	Integrated Disease Management	CO-7625	4+0+0	50	50		100
	<b>Total of Credits/ marks</b>		<b>24</b>				<b>500</b>
<b>Semester: Fourth</b>							
Core Compulsory/ Major Course	Master's Seminar	CJ-4531	0+4+0	100			100
	Master's Research	CJ-4532	0+30+0	150	150		300
Common Course	Basic Concepts in Laboratory Techniques	CJ-4533	0+4+0			100	100
	<b>Total</b>		<b>38</b>				<b>500</b>
	<b>Grand Total of Credits/ marks</b>		<b>110</b>				<b>2000</b>

 (Ajay Kumar)

 (Rashmi Nigam)

 (Gopal Singh)

 (Purshottam)

 (Rashmi Aggarwal)

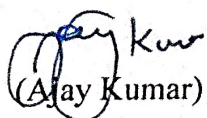
 (Shailendra Sharma)

# **Compulsory Core Courses (Major Course)**

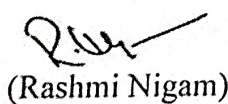
## DETAILED COURSES OF STUDY FOR M.Sc. (Ag.) PLANT PATHOLOGY

### FIRST SEMESTER

Programme/ Class: <b>M.Sc. (Ag.)</b>		Year: <b>First</b>	Semester: <b>First</b>
Subject: <b>PLANT PATHOLOGY</b>		Subject Code: <b>CPDD07</b>	
Course Code: <b>CJ-1531</b>		Course Title: <b>Mycology</b>	
<b>Aim of the course:</b> To study the nomenclature, classification and characters of fungi.			
<b>Course Outcomes:</b> <b>CO1-</b> Explain the basics, history, and importance of mycology, including fungal classification, nomenclature, and their role in agriculture. <b>CO2-</b> Describe the morphology, reproduction, and life cycles of major fungal and fungal-like groups (Protists, Stramenopila). <b>CO3-</b> Knowledge on importance of fungus in agriculture and human welfare. <b>CO4-</b> Enable students to identify of plant pathogenic fungi which is helpful for job creation.			
Credit: <b>4+1</b>		Core: <b>Compulsory/ Major Course</b>	
Maximum Marks: <b>80+20</b>		Minimum Passing Marks:	
Total numbers of Lectures-Practical's-Tutorials (in hours per week): <b>4-1-0</b>			
Units	Topics	No. of Lectures (60 Hrs.)	
<b>I</b>	Introduction, definition of different terms, basic concepts. Importance of mycology in agriculture, relation of fungi to human affairs. History of mycology. Somatic characters and reproduction in fungi. Modern concept of nomenclature and classification, Classification of kingdom fungi: Stramenopila and Protists.	15	
<b>II</b>	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.	15	
<b>III</b>	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.	20	
<b>IV</b>	Basidiomycota; general characters, mode of reproduction, types of basidiocarps and economic importance of Hymenomycetes. Uridinales and Ustilaginales; host specificity and life cycle pattern in rusts and smuts. Mitosporic fungi; status of asexual fungi.	10	
	<b>Practical:</b> <ul style="list-style-type: none"> <li>• Detailed study of different groups of fungi; collection, identification.</li> <li>• Preservation of specimens. Isolation and identification of Phytopathogenic fungi.</li> <li>• Vegetative structures and different types of fruiting bodies produced by slime molds, stramenopiles and true fungi.</li> <li>• Somatic and reproductory structures of <i>Pythium</i>, <i>Phytophthora</i>, downy mildews and <i>Albugo</i>, Zygomycetes: structures of <i>Mucor</i>, <i>Rhizopus</i>.</li> <li>• Characters of Hyphomycetes and Coelomycetes and their teliomorphic and anamorphic states, Collection, preservation, culturing and identification of plant parasitic fungi.</li> </ul>		



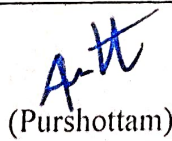
(Alay Kumar)



(Rashmi Nigam)



(Gopal Singh)



(Purshottam)



(Rashmi Aggarwal)



(Shailendra Sharma)

**Teaching methods:**

- ❖ Classroom lectures
- ❖ Power point presentations
- ❖ Exposure/ field visits
- ❖ Laboratory experiments
- ❖ Hands on training.

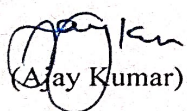
**Home Assignments, Quizzes, and Surprise Class Tests:** The continuing evaluation process through Home Assignments, Quizzes, and Surprise Tests will be done by the concerned teacher teaching that course at regular interval of time.

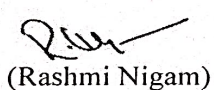
**Learning Outcome:**

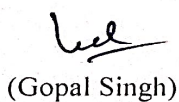
- ❖ Gain foundational knowledge of mycology, its historical evolution, and its relevance to agriculture and plant health.
- ❖ Differentiate major fungal and fungal-like taxa based on their structural traits, reproduction, and life cycle patterns.
- ❖ Develop competency in utilizing taxonomic keys, culture techniques, and molecular tools for accurate diagnosis and management of fungal plant diseases.

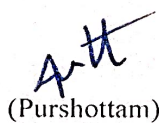
**Suggested Readings:**

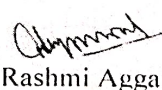
1. Ainsworth GC, Sparrow FK and Susman HS. 1973. *The Fungi – An Advanced Treatise*. Vol. IV (A & B). Academic Press, New York.
2. Alexopoulos CJ, Mims CW and Blackwell M. 2000. *Introductory Mycology*. 5th Ed. John Wiley & Sons, New York.
3. Maheshwari R. 2016. *Fungi: Experimental Methods in Biology* 2nd edn. CRC Press, US.
4. Mehrotra RS and Arneja KR. 1990. *An Introductory Mycology*. Wiley Eastern, New Delhi.
5. Sarbhoy AK. 2000. *Text book of Mycology*. ICAR, New Delhi.
6. Singh RS. 1982. *Plant Pathogens – The Fungi*. Oxford & IBH, New Delhi.
7. Webster J. 1980. *Introduction to Fungi*. 2nd Ed. Cambridge Univ. Press, Cambridge, New York.

  
(Ajay Kumar)

  
(Rashmi Nigam)

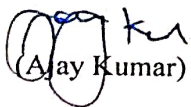
  
(Gopal Singh)

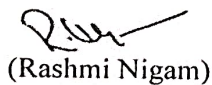
  
(Purshottam)

  
(Rashmi Aggarwal)

  
(Shailendra Sharma)

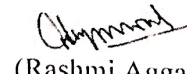
Programme/ Class: M.Sc. (Ag.)		Year: First	Semester: First
Subject: PLANT PATHOLOGY			Subject Code: CPDD07
Course Code: CJ-1532		Course Title: Principles of Plant Pathology	
<p><b>Aim of the course:</b> To introduce the subject of Plant Pathology, its concepts and principles.</p> <p><b>Course Outcomes:</b></p> <p>CO1- Gain knowledge of the fundamental concepts, history, and significance of plant pathology, including biotic and abiotic causes of plant diseases.</p> <p>CO2- Understand the disease cycle, growth, reproduction, and survival of plant pathogens, and evaluate the role of environmental factors in disease development.</p> <p>CO3- Acquire knowledge on pathogenesis, including host-pathogen interactions, infection processes, and symptom expression.</p> <p>CO4- Learn about plant defence mechanisms and their biochemical and molecular basis.</p> <p>CO5- Develop understanding of strategies for effective, eco-friendly, and sustainable management of plant diseases.</p>			
Credit: 4+1		Core: Compulsory/ Major Course	
Maximum Marks: 80+20		Minimum Passing Marks:	
Total numbers of Lectures-Practical's-Tutorials (in hours per week): 4-1-0			
Units	Topics	No. of Lectures (60 Hrs.)	
I	Importance, definitions and concepts of plant diseases, history and growth of plant pathology, biotic and abiotic causes of plant diseases.	15	
II	Growth, reproduction, survival and dispersal of plant pathogens, role of environment and host nutrition on disease development.	10	
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.	20	
IV	Genetics of resistance; 'R' genes; mechanism of genetic variation in pathogens; molecular basis for resistance; marker-assisted selection; genetic engineering for disease resistance.	15	
	<p><b>Practical:</b></p> <ul style="list-style-type: none"> <li>• Basic plant pathological techniques;</li> <li>• Preparation of culture media for fungi and bacteria;</li> <li>• Isolation, inoculation and purification of plant pathogens.</li> <li>• Proving Koch's postulates;</li> <li>• Techniques to study variability in different plant pathogens.</li> </ul>		

  
(Ajay Kumar)

  
(Rashmi Nigam)

  
(Gopal Singh)

  
(Purshottam)

  
(Rashmi Aggarwal)

  
(Shaileendra Sharma)

**Teaching methods:**

- ❖ Classroom lectures
- ❖ Power point presentations
- ❖ Exposure/ field visits
- ❖ Laboratory experiments
- ❖ Hands on training.


**Home Assignments, Quizzes, and Surprise Class Tests:** The continuing evaluation process through Home Assignments, Quizzes, and Surprise Tests will be done by the concerned teacher teaching that course at regular interval of time.

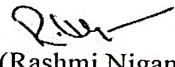
**Learning Outcome:**

- ❖ Explain the importance, history, and basic concepts of plant diseases along with their biotic and abiotic causes.
- ❖ Describe the disease cycle, pathogen growth, reproduction, and the role of environmental factors in disease development.
- ❖ Apply integrated strategies for effective and eco-friendly management of plant diseases.


**Suggested Readings:**

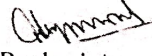
1. Agrios GN. 2005. *Plant Pathology*. 5th Ed. Academic Press, New York.
2. Heitefuss R and Williams PH. 1976. *Physiological Plant Pathology*. Springer Verlag. Berlin, New York.
3. Mehrotra RS and Aggarwal A. 2003. *Plant Pathology*. 2nd Ed. Oxford & IBH, New Delhi.
4. Singh RP. 2012. *Plant Pathology*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

  
(Ajay Kumar)

  
(Rashmi Nigam)

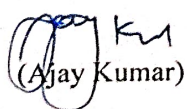
  
(Gopal Singh)

  
(Purshottam)

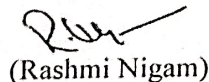
  
(Rashmi Aggarwal)

  
(Shailendra Sharma)

Programme/ Class: M.Sc. (Ag.)		Year: First	Semester: First
Subject: PLANT PATHOLOGY		Subject Code: CPDD07	
Course Code: CJ-1533		Course Title: Techniques for Detection and Diagnosis of Plant Diseases	
<p><b>Aim of the course:</b> To impart training on various methods/ techniques/ instruments used in the study of plant diseases/ pathogens.</p> <p><b>Course Outcomes:</b></p> <p>CO1- Demonstrate proficiency in handling laboratory instruments and performing basic lab techniques for plant pathology research.</p> <p>CO2- Apply methods for preservation of plant pathogens, cultures, and disease specimens for long-term study.</p> <p>CO3- Utilize serological, biochemical, and molecular techniques for accurate disease diagnosis.</p> <p>CO4- Evaluate the efficacy of fungicides, bactericides, and other plant protection chemicals using laboratory and field methods.</p>			
Credit: 4+1		Core: Compulsory/ Major Course	
Maximum Marks: 80+20		Minimum Passing Marks:	
Total numbers of Lectures-Practical's-Tutorials (in hours per week): 4-1-0			
Units	Topics	No. of Lectures (60 Hrs.)	
I	Methods of studying plant disease: Methods to prove Koch's postulates with biotroph and necrotroph pathogens, pure culture techniques and use of selective media to isolate pathogens.	15	
II	Fungal and bacterial disease diagnosis: Symptomatology, collection of samples and their preservation, isolation techniques, purification and single spore isolation, long term storage and preservation of fungal and bacterial cultures.	20	
III	Micrometry, pH meter and Camera-Lucida: Use of haemocytometer, centrifuge, pH meter and camera lucida.	10	
IV	Modern analytical techniques: Chromatography, spectrophotometer, ultracentrifuge and electrophoretic apparatus, ELISA and PCR-based diagnosis.	15	
	<p><b>Practical:</b></p> <ul style="list-style-type: none"> <li>Detection of plant pathogens: Based on visual symptoms, using microscopic techniques, and Cultural studies; use of selective media to isolate pathogens.</li> <li>Microscopic techniques and staining methods, phase contrast system.</li> <li>Use of haemocytometer, centrifuge, in disease diagnosis.</li> <li>ELISA and PCR-based diagnosis of plant disease.</li> <li>Molecular identification (16S rDNA and 16s-23S rDNA intergenic spacer region sequences-prokaryotic organisms; and eukaryotic organism by ITS region) and whole genome sequencing.</li> </ul>		



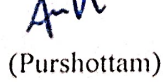
(Ajay Kumar)



(Rashmi Nigam)



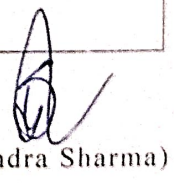
(Gopal Singh)



(Purshottam)



(Rashmi Aggarwal)



(Shailendra Sharma)

**Teaching methods:**

- ❖ Classroom lectures
- ❖ Power point presentations
- ❖ Exposure/ field visits
- ❖ Laboratory experiments
- ❖ Hands on training.

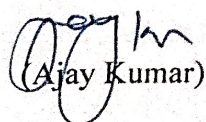
**Home Assignments, Quizzes, and Surprise Class Tests:** The continuing evaluation process through Home Assignments, Quizzes, and Surprise Tests will be done by the concerned teacher teaching that course at regular interval of time.

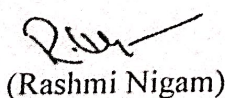
**Learning Outcome:**

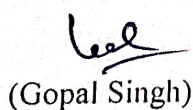
- ❖ Acquire practical skills in handling laboratory instruments and performing standard techniques in plant pathology.
- ❖ Understand preservation protocols for microbial cultures and disease specimens.
- ❖ Analyze plant diseases using serological and molecular diagnostic tools.
- ❖ Assess the effectiveness of chemical and biological control measures against plant pathogens.

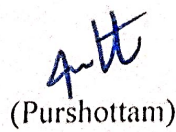
**Suggested Readings:**

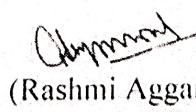
1. Baudoin ABAM, Hooper GR, Mathre DE and Carroll RB. 1990. *Laboratory Exercises in Plant Pathology: An Instructional Kit*. Scientific Publ., Jodhpur.
2. Dhingra OD and Sinclair JB. 1986. *Basic Plant Pathology Methods*. CRC Press, London, Tokyo.
3. Fox RTV. 1993. *Principles of Diagnostic Techniques in Plant Pathology*, CABI Wallington.
4. Forster D and Taylor SC. 1998. *Plant Virology Protocols: From Virus Isolation to Transgenic Resistance. Methods in Molecular Biology*. Humana Press. Totowa, New Jersey.
5. Mathews REF. 1993. *Diagnosis of Plant Virus Diseases*. CRC Press. Boca Raton, Tokyo.
6. Matthews REF. 1993. *Diagnosis of Plant Virus Diseases*. CRC Press, Florida.
7. Noordam D. 1973. *Identification of Plant Viruses, Methods and Experiments*. Cent. Agric. Pub. Doc. Wageningen.
8. Pathak VN. 1984. *Laboratory Manual of Plant Pathology*. Oxford & IBH, New Delhi.
9. Trigliano RN, Windham MT and Windham AS. 2004. *Plant Pathology-Concepts and Laboratory*
10. *Exercises*. CRC Press, Florida. Chakravarti BP. 2005. *Methods of Bacterial Plant Pathology*. Agrotech, Udaipur.

  
(Ajay Kumar)

  
(Rashmi Nigam)

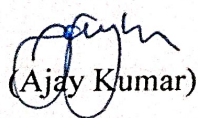
  
(Gopal Singh)

  
(Purshottam)

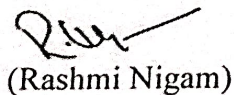
  
(Rashmi Aggarwal)

  
(Shailendra Sharma)

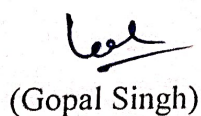
Programme/ Class: M.Sc. (Ag.)		Year: First	Semester: First
Subject: PLANT PATHOLOGY		Subject Code: CPDD07	
Course Code: CJ-1534		Course Title: Statistical Methods for Applied Sciences	
<p><b>Aim of the course:</b> This course is meant for students who do not have sufficient background of Statistical Methods. The students would be exposed to concepts of statistical methods and statistical inference that would help them in understanding the importance of statistics. It would also help them in understanding the concepts involved in data presentation, analysis and interpretation. The students would get an exposure to presentation of data, probability distributions, parameter estimation, tests of significance, regression and multivariate analytical techniques.</p>			
<p><b>Course Outcomes:</b></p> <p><b>CO1-</b> Understand basic statistical concepts, including averages, variability, and data visualization.</p> <p><b>CO2-</b> Use probability, random variables, and exploratory data analysis to study agricultural data.</p> <p><b>CO3-</b> Apply correlation, regression, and estimation methods to examine relationships and make predictions.</p> <p><b>CO4-</b> Use sampling distributions, chi-square, t-test, F-test, and ANOVA for hypothesis testing and data analysis.</p> <p><b>CO5-</b> Understand and apply common probability distributions and their uses in research.</p>			
Credit: 4+1		Core: Compulsory/ Major Course	
Maximum Marks: 80+20		Minimum Passing Marks:	
Total numbers of Lectures-Practical's-Tutorials (in hours per week): 4-1-0			
Units	Topics	No. of Lectures (60 Hrs.)	
I	Frequency distribution, Box-plot, Measures of central tendency (Mean, Mode, Median), Measures of dispersion (range, variance, mean & standard deviation), Graphical representations of data by histogram, frequency polygon, frequency curve and cumulative frequency curves).	10	
II	Exploratory data analysis, Theory of probability, Random variable and mathematical expectation.	10	
III	Introduction to theory of estimation and confidence-intervals, Simple and multiple correlation coefficient, partial correlation, rank correlation, Simple and multiple linear regression model, test of significance of correlation coefficient and regression coefficients, Coefficient of determination, Fitting of quadratic models.	10	
IV	Concept of sampling distribution: chi-square, t and F distributions. Tests of significance based on Normal, chi-square, t and F distributions. Introduction to ANOVA: One way and Two Way, Introduction to Sampling Techniques, Introduction to Multivariate Analysis, Transformation of Data.	10	
V	Discrete and continuous probability distributions, Binomial, Poisson, Negative Binomial, Normal distribution, Beta and Gamma distributions and their applications.	10	
VI	Non-parametric tests – sign, Wilcoxon, Mann-Whitney U-test, Run test for the randomness of a sequence. Median test.	10	



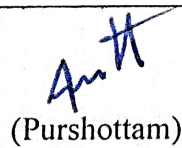
(Ajay Kumar)



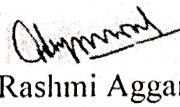
(Rashmi Nigam)




(Gopal Singh)



(Purshottam)



(Rashmi Aggarwal)



(Shailendra Sharma)

<b>Practical:</b> <ul style="list-style-type: none"><li>• Exploratory data analysis, fitting of distributions ~ Binomial, Poisson, Negative Binomial, Normal.</li><li>• Large sample tests, testing of hypothesis based on exact sampling distributions ~ chi square, t and F.</li><li>• Confidence interval estimation and Correlation and regression analysis, fitting of Linear and Quadratic Model.</li><li>• Non-parametric tests. ANOVA: One way, Two Way, SRS.</li></ul>	
---	--

**Teaching methods:**

- ❖ Classroom lectures
- ❖ Power point presentations
- ❖ Exposure/ field visits
- ❖ Laboratory experiments
- ❖ Hands on training.

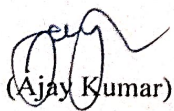
**Home Assignments, Quizzes, and Surprise Class Tests:** The continuing evaluation process through Home Assignments, Quizzes, and Surprise Tests will be done by the concerned teacher teaching that course at regular interval of time.

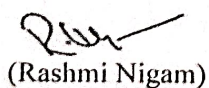
**Learning Outcome:**

- ❖ Understand basic statistical measures, including averages, variability, and data visualization.
- ❖ Apply probability concepts and exploratory data analysis to study agricultural data.
- ❖ Analyze relationships between variables using correlation, regression, and estimation techniques.
- ❖ Use probability distributions and non-parametric tests to handle different types of data in agricultural research.

**Suggested Readings:**

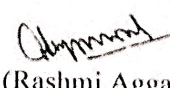
1. Goon A.M, Gupta M.K and Dasgupta B. 1977. An Outline of Statistical Theory. Vol. I. The World Press.
2. Goon A.M, Gupta M.K. and Dasgupta B. 1983. Fundamentals of Statistics. Vol. I. The World Press.
3. Hoel P.G. 1971. Introduction to Mathematical Statistics. John Wiley.
4. Hogg R.V and Craig T.T. 1978. Introduction to Mathematical Statistics. Macmillan.
5. Morrison D.F. 1976. Multivariate Statistical Methods. McGraw Hill.
6. Hogg RV, McKean JW, Craig AT. 2012. Introduction to Mathematical Statistics 7th Edition.
7. Siegel S, Johan N & Casellan Jr. 1956. Non-parametric Tests for Behavior Sciences. John Wiley.
8. Anderson TW. 2009. An Introduction to Multivariate Statistical Analysis, 3rd Ed. John Wiley

  
(Ajay Kumar)

  
(Rashmi Nigam)

  
(Gopal Singh)

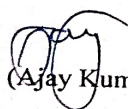
  
(Purshottam)

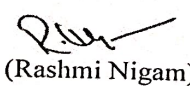
  
(Rashmi Aggarwal)



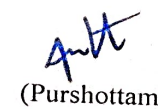
**SECOND SEMESTER**

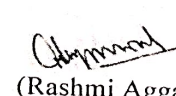
Programme/ Class: <b>M.Sc. (Ag.)</b>		Year: <b>First</b>	Semester: <b>Second</b>
Subject: <b>PLANT PATHOLOGY</b>		Subject Code: <b>CPDD07</b>	
Course Code: <b>CJ-2531</b>		Course Title: <b>Plant Virology</b>	
<p><b>Aim of the course:</b> To acquaint with the structure, virus- vector relationship, biology and management of plant viruses.</p> <p><b>Course Outcomes:</b></p> <p><b>CO1-</b> Knowledge on structure, virus-vector relationship, biology of virus.</p> <p><b>CO2-</b> Provide knowledge on management of plant viruses.</p> <p><b>CO3-</b> Enable students to know method of raising antisera, serological tests.</p> <p><b>CO4-</b> Classifies plant viruses on the basis of taxonomic characterization, symptomatology, replication and mode of transmission.</p>			
Credit: <b>4+1</b>		Core: <b>Compulsory/ Major Course</b>	
Maximum Marks: <b>80+20</b>		Minimum Passing Marks:	
Total numbers of Lectures-Practical's-Tutorials (in hours per week): <b>4-1-0</b>			
Units	Topics	No. of Lectures (60 Hrs.)	
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.	20	
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 symptomatic changes. Transmission of viruses and virus-vector relationship. Isolation and purification of viruses.	20	
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.	10	
IV	Virus epidemiology and ecology (spread of plant viruses in fields, host range and survival). Management of diseases caused by plant viruses.	10	
	<p><b>Practical:</b></p> <ul style="list-style-type: none"> <li>• Study of symptoms caused by plant viruses.</li> <li>• Isolation and biological purification of plant virus cultures.</li> <li>• Bioassay of virus cultures on indicator plants and host differentials;</li> <li>• Transmission of plant viruses (Mechanical, graft and vector and study of disease development).</li> <li>• Plant virus purification (clarification, concentration, centrifugation, high resolution separation and analysis of virions).</li> <li>• Antisera production, Detection and diagnosis of plant viruses with serological (ELISA), nucleic acid (Non-PCR-LAMP, Later flow micro array and PCR based techniques).</li> </ul>		

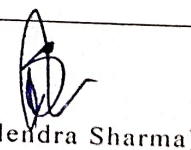
  
(Ajay Kumar)

  
(Rashmi Nigam)

  
(Gopal Singh)

  
(Purshottam)

  
(Rashmi Aggarwal)

  
(Shailendra Sharma)

**Teaching methods:**

- ❖ Classroom lectures
- ❖ Power point presentations
- ❖ Exposure/ field visits
- ❖ Laboratory experiments
- ❖ Hands on training.

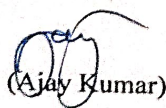
**Home Assignments, Quizzes, and Surprise Class Tests:** The continuing evaluation process through Home Assignments, Quizzes, and Surprise Tests will be done by the concerned teacher teaching that course at regular interval of time.

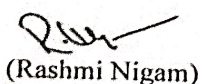
**Learning Outcome:**

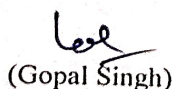
- ❖ Understand the history, structure, classification, replication, transmission, and diagnosis of plant viruses, including their interactions with hosts and vectors.
- ❖ Apply this knowledge to identify plant viruses, assess their impact on crops, and suggest suitable management strategies.

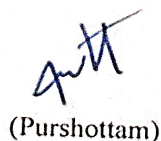
**Suggested Readings:**

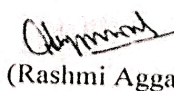
1. Bos L. 1964. *Symptoms of Virus Diseases in Plants*. Oxford & IBH., New Delhi.
2. Brunt AA, Krabtree K, Dallwitz MJ, Gibbs AJ and Watson L. 1995. *Virus of Plants: Descriptions and Lists from VIDE Database*. CABI, Wallington.
3. Gibbs A and Harrison B. 1976. *Plant Virology – The Principles*. Edward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

  
(Ajay Kumar)

  
(Rashmi Nigam)

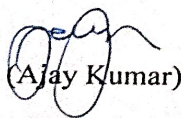
  
(Gopal Singh)

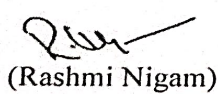
  
(Purshottam)

  
(Rashmi Aggarwal)

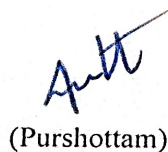
  
(Shailendra Sharma)

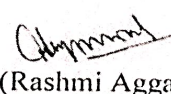
Programme/ Class: M.Sc. (Ag.)		Year: First	Semester: Second
Subject: PLANT PATHOLOGY		Subject Code: CPDD07	
Course Code: CJ-2532		Course Title: Diseases of Field and Medicinal Crops	
<p><b>Aim of the course:</b> To acquaint with the structure, virus- vector relationship, biology and management of To impart knowledge about symptoms, epidemiology of different diseases of vegetables and spices and their management.</p>			
<p><b>Course Outcomes:</b></p> <p>CO1- Identify various diseases based on symptoms diagnose pathogens based on etiology and understand disease cycle for the management of cereal crop, pulse crop, oil seed crop, and cash crop diseases.</p> <p>CO2- Knowledge on host pathogen interaction of important diseases of vegetable and spice crops.</p> <p>CO3- Student will know about pathogen responsible for the disease and their management.</p>			
Credit: 4+1		Core: Compulsory/ Major Course	
Maximum Marks: 80+20		Minimum Passing Marks:	
Total numbers of Lectures-Practical's-Tutorials (in hours per week): 4-1-0			
Units	Topics	No. of Lectures (60 Hrs.)	
I	Diseases of Cereal crops- Rice, wheat, barley, pearl millet, sorghum and maize.	10	
II	Diseases of Pulse crops- Gram, urdbean, mungbean, lentil, pigeonpea, soybean and cowpea.	10	
III	Diseases of Oilseed crops- Rapeseed and mustard, sesame, linseed, sunflower, groundnut, castor.	10	
IV	Diseases of Cash crops- Cotton, sugarcane.	10	
V	Diseases of Fodder legume crops- Berseem, oats, guar, lucerne.	10	
VI	Medicinal crops- <i>Plantago</i> , liquorice, mulathi, rosagrass, sacred basil, mentha, ashwagandha, Aloe vera.	10	
	<p><b>Practical:</b></p> <ul style="list-style-type: none"> <li>Detailed study of symptoms and host parasite relationship of important diseases of above-mentioned crops;</li> <li>Collection and dry preservation of diseased specimens of important crops.</li> <li>Isolation and Microscopic Examination of Pathogens.</li> <li>Preparation of Herbarium and Records.</li> <li>Disease Assessment and Management Practices.</li> </ul>		

  
(Ajay Kumar)

  
(Rashmi Nigam)

  
(Gopal Singh)

  
(Purshottam)

  
(Rashmi Aggarwal)

  
(Shailendra Sharma)

**Teaching methods:**

- ❖ Classroom lectures
- ❖ Power point presentations
- ❖ Exposure/ field visits
- ❖ Laboratory experiments
- ❖ Hands on training.

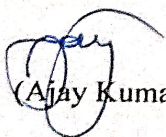
**Home Assignments, Quizzes, and Surprise Class Tests:** The continuing evaluation process through Home Assignments, Quizzes, and Surprise Tests will be done by the concerned teacher teaching that course at regular interval of time.

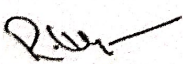
**Learning Outcome:**


- ❖ Identify and describe major diseases of cereal, pulse, oilseed, cash, fodder, and medicinal crops, along with their causal organisms.
- ❖ Apply this knowledge to suggest suitable management practices for effective disease control in different crop categories.

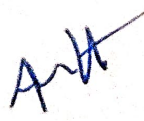
**Suggested Readings:**

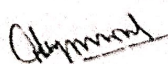
1. Joshi LM, Singh DV and Srivastava KD. 1984. *Problems and Progress of Wheat Pathology in South Asia*. Malhotra Publ. House, New Delhi.
2. Rangaswami G. 1999. *Diseases of Crop Plants in India*. 4th Ed. Prentice Hall of India, New Delhi.
3. Ricanel C, Egan BT, Gillaspie Jr AG and Hughes CG. 1989. *Diseases of Sugarcane, Major Diseases*. Academic Press, New York.
4. Singh RS. 2017. *Plant Diseases*. 10th Ed. Medtech, New Delhi.
5. Singh US, Mukhopadhyay AN, Kumar J and Chaube HS. 1992. *Plant Diseases of International Importance*. Vol. I. Diseases of Cereals and Pulses. Prentice Hall, Englewood Cliffs, New Jersey
6. *Importance*. Vol. I. *Diseases of Cereals and Pulses*. Prentice Hall, Englewood Cliffs, New Jersey.

  
(Ajay Kumar)

  
(Rashmi Nigam)

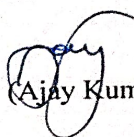
  
(Gopal Singh)

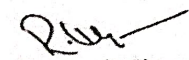
  
(Purshottam)


  
(Rashmi Aggarwal)

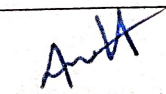


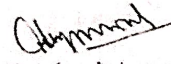
Programme/ Class: M.Sc. (Ag.)		Year: First	Semester: Second
Subject: PLANT PATHOLOGY		Subject Code: CPDD07	
Course Code: CJ-2533		Course Title: Biological Control of Plant Pathogens	
<p><b>Aim of the course:</b> To study principles and application of ecofriendly and sustainable management strategies of plant diseases.</p> <p><b>Course Outcomes:</b></p> <p><b>CO1-</b> It will enable the students about Isolation, characterization and maintenance of antagonists.</p> <p><b>CO2-</b> It will be helpful for students to know about different method of application of antagonists against pathogen in vitro and in vivo conditions.</p> <p><b>CO3-</b> It will enable students to produce antagonists in commercial scale for empowering organic farming.</p>			
Credit: 4+1		Core: Compulsory/ Major Course	
Maximum Marks: 80+20		Minimum Passing Marks:	
Total numbers of Lectures-Practical's-Tutorials (in hours per week): 4-1-0			
Units	Topics	No. of Lectures (60 Hrs.)	
I	Concept of biological control, definitions, importance, principles of plant disease management with bioagents, history of biological control, merits and demerits of biological control.	10	
II	Types of biological interactions, competition: mycoparasitism, exploitation for hypovirulence, rhizosphere colonization, competitive saprophytic ability, antibiosis, induced resistance, mycorrhizal associations, operational mechanisms and its relevance in biological control.	20	
III	Factors governing biological control, role of physical environment, agroecosystem, cultural practices in biological control of pathogens, pathogens and antagonists and their relationship, biocontrol agents, comparative approaches to biological control of plant pathogens by resident and introduced antagonists, control of soil-borne and foliar diseases.	20	
IV	Commercial production of antagonists, their delivery systems, application and monitoring, biological control in IDM, IPM and organic farming system, biopesticides available in market. Quality control system of biocontrol agents.	10	
	<p><b>Practical:</b></p> <ul style="list-style-type: none"> <li>Isolation, characterization and maintenance of antagonists, methods of study of antagonism and antibiosis, application of antagonists against pathogen <i>in-vitro and in vivo</i> conditions;</li> <li>Preparation of different formulations of selected bioagents and their mass production;</li> <li>Quality parameters of biocontrol agents;</li> <li>One week exposure visit to commercial biocontrol agents production unit.</li> </ul>		

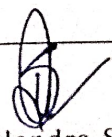
  
(Ajay Kumar)

  
(Rashmi Nigam)

  
(Gopal Singh)

  
(Purshottam)

  
(Rashmi Aggarwal)

  
(Shailendra Sharma)

**Teaching methods:**

- ❖ Classroom lectures
- ❖ Power point presentations
- ❖ Exposure/ field visits
- ❖ Laboratory experiments
- ❖ Hands on training.

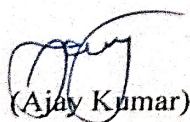
**Home Assignments, Quizzes, and Surprise Class Tests:** The continuing evaluation process through Home Assignments, Quizzes, and Surprise Tests will be done by the concerned teacher teaching that course at regular interval of time.

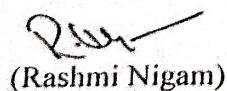
**Learning Outcome:**

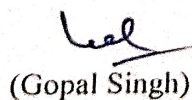
- ❖ Understand the concept, principles, mechanisms, and factors influencing biological control of plant diseases, including interactions between pathogens, antagonists, and the environment.
- ❖ Apply knowledge of bioagents, their production, delivery, and integration in IDM, IPM, and organic farming systems for effective disease management.

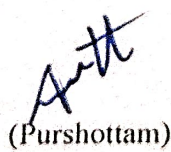
**Suggested Readings:**

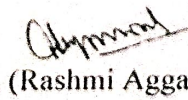
1. Campbell R. 1989. *Biological Control of Microbial Plant Pathogens*. Cambridge Univ. Press, Cambridge.
2. Cook RJ and Baker KF. 1983. *Nature and Practice of Biological Control of Plant Pathogens*. APS, St. Paul, Minnesota.
3. Fokkema MJ. 1986. *Microbiology of the Phyllosphere*. Cambridge Univ. Press, Cambridge.
4. Gnanamanickam SS (Eds). 2002. *Biological Control of Crop Diseases*. CRC Press, Florida.
5. Heikki MT and Hokkanen James M. (Eds.). 1996. *Biological Control – Benefits and Risks*. Cambridge Univ. Press, Cambridge.
6. Mukerji KG, Tewari JP, Arora DK and Saxena G. 1992. *Recent Developments in Biocontrol of Plant Diseases*. Aditya Books, New Delhi.

  
(Ajay Kumar)

  
(Rashmi Nigam)


  
(Gopal Singh)

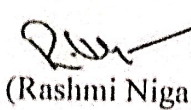
  
(Purshottam)

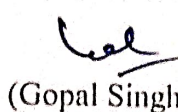
  
(Rashmi Aggarwal)

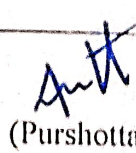
  
(Shailendra Sharma)

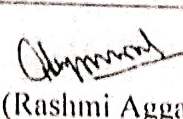
Programme/ Class: M.Sc. (Ag.)		Year: First	Semester: Second
Subject: PLANT PATHOLOGY		Subject Code: CPDD07	
Course Code: CJ-2534		Course Title: Epidemiology and Forecasting of Plant Diseases	
Aim of the course: To acquaint with the principles of epidemiology and its application in disease forecasting.			
<b>Course Outcomes:</b>			
CO1- Explain epidemic concepts, historical development, and key elements influencing plant disease outbreaks.			
CO2- Analyze epidemic models, inoculum dynamics, and population biology of plant pathogens.			
CO3- Utilize survey, surveillance, remote sensing, and crop loss assessment techniques for disease monitoring.			
CO4- Apply forecasting principles and models to predict plant disease epidemics and develop effective management strategies.			
Credit: 4+1		Core: Compulsory/ Major Course	
Maximum Marks: 80+20		Minimum Passing Marks:	
Total numbers of Lectures-Practical's-Tutorials (in hours per week): 4-1-0			
Units	Topics	No. of Lectures (60 Hrs.)	
I	Epidemic concepts, simple interest and compound interest disease, historical development. Elements of epidemics and their interaction. Structures and patterns of epidemics. Modelling, system approaches and expert systems in plant pathology.	10	
II	Genetics of epidemics. Models for development of plant disease epidemics. Common and natural logarithms, function fitting, area under disease progress curve and correction factors, inoculum dynamics. Population biology of pathogens, temporal and spatial variability in plant pathogens.	20	
III	Epidemiological basis of disease management. Survey, surveillance and vigilance. Remote sensing techniques and image analysis. Crop loss assessment.	10	
IV	Principles and pre-requisites of forecasting, systems and factors affecting various components of forecasting, some early forecasting and procedures based on weather and inoculum potential, modelling disease growth and disease prediction. Salient features of important forecasting models.	20	
	<b>Practical:</b> <ul style="list-style-type: none"> <li>• Assessment of spore germination and germ tube growth under different temperature and humidity conditions.</li> <li>• Calculation of Area under Disease Progress Curve (AUDPC) using controlled inoculation data.</li> <li>• Detached leaf assay to study disease progress and function fitting.</li> <li>• Survey and surveillance of plant diseases to assess incidence and severity in a field.</li> <li>• Study of simple and compound interest diseases under field or pot conditions.</li> </ul>		

  
(Ajay Kumar)

  
(Rashmi Nigam)

  
(Gopal Singh)

  
(Purshottam)

  
(Rashmi Aggarwal)

  
(Shailendra Sharma)

**Teaching methods:**

- ❖ Classroom lectures
- ❖ Power point presentations
- ❖ Exposure/ field visits
- ❖ Laboratory experiments
- ❖ Hands on training.

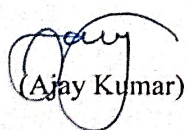
**Home Assignments, Quizzes, and Surprise Class Tests:** The continuing evaluation process through Home Assignments, Quizzes, and Surprise Tests will be done by the concerned teacher teaching that course at regular interval of time.

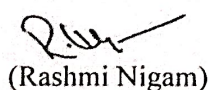
**Learning Outcome:**

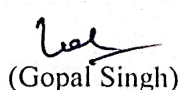
- ❖ Explain epidemic concepts, elements, and models related to the development and spread of plant diseases.
- ❖ Analyze pathogen population dynamics, disease progress, and forecasting techniques using epidemiological tools and models.
- ❖ Apply knowledge of surveys, surveillance, and forecasting to predict epidemics and design effective disease management strategies.

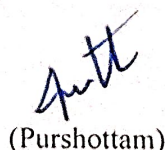
**Suggested Readings:**

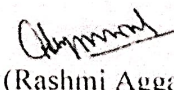
1. Campbell CL and Madden LV. 1990. *Introduction to Plant Disease Epidemiology*. John Wiley & Sons, New York.
2. Cooke B, Jones DM and Gereth KB. 2018 *The Epidemiology of Plant Diseases*. Springer Publications.
3. Cowling EB and Horsefall JG. 1978. *Plant Disease*. Vol. II. Academic Press, New York.
4. Laurence VM, Gareth H and Frame Van den Bosch (Eds.). *The Study of Plant Disease Epidemics*. APS, St. Paul, Minnesota.
5. Nagarajan S and Murlidharan K. 1995. *Dynamics of Plant Diseases*. Allied Publ., New Delhi.
6. Thresh JM. 2006. *Plant Virus Epidemiology*. Advances in Virus Research 67, Academic Press, New York.
7. Van der Plank JE. 1963. *Plant Diseases Epidemics and Control*. Academic Press, New York.
8. Zadoks JC and Schein RD. 1979. *Epidemiology and Plant Disease Management*. Oxford Univ. Press, London.

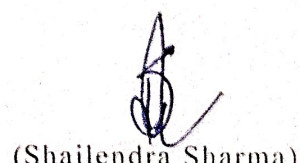
  
(Ajay Kumar)

  
(Rashmi Nigam)

  
(Gopal Singh)

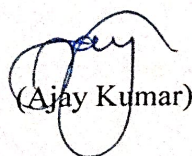
  
(Purshottam)

  
(Rashmi Aggarwal)

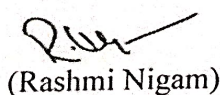
  
(Shailendra Sharma)

## THIRD SEMESTER

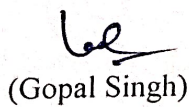
Programme/ Class: <b>M.Sc. (Ag.)</b>		Year: <b>Second</b>	Semester: <b>Third</b>
Subject: <b>PLANT PATHOLOGY</b>		Subject Code: <b>CPDD07</b>	
Course Code: <b>CJ-3531</b>		Course Title: <b>Plant Pathogenic Prokaryotes</b>	
<b>Aim of the course:</b> To acquaint with plant pathogenic prokaryote (procarya) and their structure, nutritional requirements, survival and dissemination.			
<b>Course Outcomes:</b>			
<b>CO1-</b> Explain the structure, evolution, and taxonomy of plant pathogenic prokaryotes including bacteria, phytoplasmas, and spiroplasmas.			
<b>CO2-</b> Analyze growth, infection mechanisms, variability, and genetic exchange in phytopathogenic bacteria.			
<b>CO3-</b> Apply knowledge of bacteriophages, plasmids, and management strategies to control bacterial plant diseases.			
Credit: <b>4+1</b>		Core: <b>Compulsory/ Major Course</b>	
Maximum Marks: <b>80+20</b>		Minimum Passing Marks:	
Total numbers of Lectures-Practical's-Tutorials (in hours per week): <b>4-1-0</b>			
Units	Topics	No. of Lectures (60 Hrs.)	
<b>I</b>	Prokaryotic cell: History and development of Plant bacteriology, history of plant bacteriology in India. Evolution of prokaryotic life, Prokaryotic cytoskeletal proteins. Structure of bacterial cell. Structure and composition of gram negative and gram-positive cell wall; Surface proteins; Lipopolysaccharide structure; Membrane transport; fimbriae and pili (Type IV pili); Mechanism of flagellar rotatory motor and locomotion, and bacterial movement; Glycocalyx (Slayer; capsule); the bacterial chromosomes and plasmids; Morphological feature of fastidious bacteria, spiroplasmas and Phytoplasmas.	15	
<b>II</b>	Growth and nutritional requirements. Infection mechanism, role of virulence factors in expression of symptoms. Survival and dispersal of phytopathogenic prokaryotes	10	
<b>III</b>	Taxonomy of phytopathogenic prokarya: Taxonomic ranks hierarchy; Identification, Classification and nomenclature of bacteria, phytoplasma and spiroplasma. The codes of Nomenclature and characteristics. Biochemical and molecular characterization of phytopathogenic prokaryotes.	10	
<b>IV</b>	Variability among phytopathogenic prokarya: general mechanism of variability (mutation); specialized mechanisms of variability (sexual like process in bacteria conjugation; transformation; transduction); and horizontal gene transfer.	10	
<b>V</b>	Bacteriophages, L form of bacteria, plasmids and bdellovibrios: Structure; Infection of host cells; phage multiplication cycle; Classification of phages, Use of phages in plant pathology/ bacteriology, Lysogenic conversion; H Plasmids and their types, plasmid borne phenotypes. Introduction to bacteriocins. Strategies for management of diseases caused by phytopathogenic prokaryotes.	15	



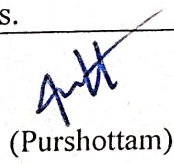
(Ajay Kumar)



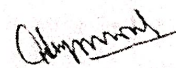
(Rashmi Nigam)



(Gopal Singh)



(Purshottam)



(Rashmi Aggarwal)



(Shailendra Sharma)

<b>Practical:</b> <ul style="list-style-type: none"><li>• Study of symptoms produced by phytopathogenic prokaryotes. Preservation of bacterial cultures;</li><li>• Isolation, enumeration, purification, identification and host inoculation of phytopathogenic bacteria;</li><li>• Stains and staining methods, Biochemical and serological characterization.</li><li>• Use of antibacterial chemicals/ antibiotics;</li><li>• Diagnosis and management of diseases caused by bacteria.</li></ul>	
--	--

**Teaching methods:**

- ❖ Classroom lectures
- ❖ Power point presentations
- ❖ Exposure/ field visits
- ❖ Laboratory experiments
- ❖ Hands on training.

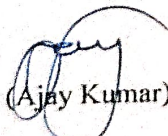
**Home Assignments, Quizzes, and Surprise Class Tests:** The continuing evaluation process through Home Assignments, Quizzes, and Surprise Tests will be done by the concerned teacher teaching that course at regular interval of time.

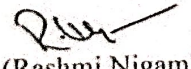
**Learning Outcome:**

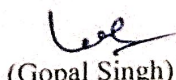
- ❖ Describe the structural and functional features of plant pathogenic prokaryotes and their role in disease development.
- ❖ Identify and classify phytopathogenic bacteria using basic taxonomic, biochemical, and molecular techniques.


**Suggested Readings:**

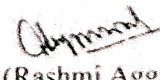
1. Goto M. 1990. *Fundamentals of Plant Bacteriology*. Academic Press, New York.
2. Jayaraman J and Verma JP. 2002. *Fundamentals of Plant Bacteriology*. Kalyani Publishers, Ludhiana.
3. Mount MS and Lacy GH. 1982. *Phytopathogenic Prokaryotes*. Vols. I, II Academic Press, New York.
4. Salle AJ. 1979. *Fundamental Principles of Bacteriology 7th edn*.
5. Verma JP, Varma A and Kumar D. (Eds). 1995. *Detection of Plant Pathogens and their Management*. Angkor Publ., New Delhi.

  
(Ajay Kumar)

  
(Rashmi Nigam)

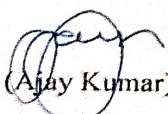
  
(Gopal Singh)

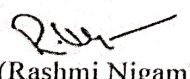
  
(Purshottam)

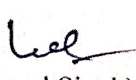
  
(Rashmi Aggarwal)




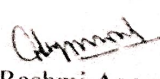
Programme/ Class: M.Sc. (Ag.)		Year: Second	Semester: Third
Subject: PLANT PATHOLOGY		Subject Code: CPDD07	
Course Code: CJ-3532		Course Title: Plant Nematology	
Aim of the course: To project the importance of nematodes in agriculture and impart basic knowledge on all aspects of plant nematology.			
Course Outcomes:			
CO1- Explain the characteristics, diversity, and economic importance of nematodes in agriculture, horticulture, and forestry.			
CO2- Analyze the morphology, biology, parasitism types, and plant-nematode interactions of important plant-parasitic nematodes.			
CO3- Apply integrated nematode management practices and address emerging nematode problems in plant health and quarantine.			
Credit: 4+1		Core: Compulsory/ Major Course	
Maximum Marks: 80+20		Minimum Passing Marks:	
Total numbers of Lectures-Practical's-Tutorials (in hours per week): 4-1-0			
Units	Topics	No. of Lectures (60 Hrs.)	
I	Characteristics of Phylum Nematoda and its relationship with other related phyla, history and growth of Nematology; nematode habitats and diversity- plant, animal and human parasites; useful nematodes; economic importance of nematodes to agriculture, horticulture and forestry.	10	
II	Gross morphology of plant parasitic nematodes; broad classification, nematode biology, physiology and ecology.	10	
III	Types of parasitism; nature of damage and general symptomatology; interaction of plant-parasitic nematodes with other organisms.	10	
IV	Plant nematode relationships, cellular responses to infection by important phytonematodes; physiological specialization among phytonematodes.	10	
V	Principles and practices of nematode management; integrated nematode management.	10	
VI	Emerging nematode problems, Importance of nematodes in international trade and quarantine.	10	
	<b>Practical:</b> <ul style="list-style-type: none"> <li>• Studies on kinds of nematodes- free-living, animal, insect and plant parasites;</li> <li>• Nematode extraction from soil;</li> <li>• Extraction of migratory endoparasites, staining for sedentary endoparasites;</li> <li>• Examination of different life stages of important plant parasitic nematodes, their symptoms and histopathology.</li> </ul>		

  
(Ajay Kumar)

  
(Rashmi Nigam)

  
(Gopal Singh)

  
(Purshottam)

  
(Rashmi Aggarwal)

  
(Shailendra Sharma)

**Teaching methods:**

- ❖ Classroom lectures
- ❖ Power point presentations
- ❖ Exposure/ field visits
- ❖ Laboratory experiments
- ❖ Hands on training.

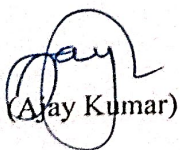
**Home Assignments, Quizzes, and Surprise Class Tests:** The continuing evaluation process through Home Assignments, Quizzes, and Surprise Tests will be done by the concerned teacher teaching that course at regular interval of time.

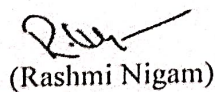
**Learning Outcome:**

- ❖ Identify major plant-parasitic nematodes based on their morphological characteristics.
- ❖ Recommend suitable integrated management practices for nematode problems in different crops.

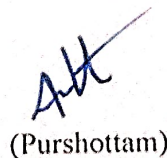
**Suggested Readings:**

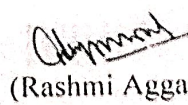
1. Dropkin VH. 1980. *An Introduction to Plant Nematology*. John Wiley & Sons, New York.
2. Maggenti AR. 1981. *General Nematology*. Springer-Verlag, New York.
3. Perry RN and Moens M. 2013. *Plant Nematology*. 2nd Ed. CABI Publishing: Wallingford, UK.
4. Perry RN, Moens M, and Starr JL. 2009. *Root-knot nematodes*, CABI Publishing: Wallingford, UK.
5. Sikora RA, Coyne D, Hallman J and Timper P. 2018. *Plant Parasitic Nematodes in Subtropical and Tropical Agriculture*. 3rd edn. CABI Publishing, England.
6. Thorne G. 1961. *Principles of Nematology*. McGraw Hill, New Delhi.
7. Walia RK and Bajaj HK. 2003. *Text Book on Introductory Plant Nematology*. ICAR, New Delhi.
8. Walia RK and Khan MR. 2018. *A Compendium of Nematode Diseases of Crop Plants*. ICARAICRP (Nematodes), IARI, New Delhi.

  
(Ajay Kumar)

  
(Rashmi Nigam)

  
(Gopal Singh)

  
(Purshottam)

  
(Rashmi Aggarwal)

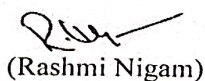
  
(Shailendra Sharma)

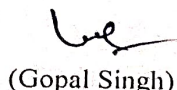
Programme/ Class: M.Sc. (Ag.)		Year: Second	Semester: Third
Subject: PLANT PATHOLOGY		Subject Code: CPDD07	
Course Code: CJ-3533		Course Title: Diseases of Vegetable and Spices Crops	
Aim of the course: To impart knowledge about symptoms, epidemiology of different diseases of vegetables and spices and their management.			
<b>Course Outcomes:</b>			
CO1- Knowledge about symptoms different diseases of vegetables and spices.			
CO2- Student will know about pathogen responsible for the disease and their management.			
CO3- Knowledge on host pathogen interaction of important diseases of vegetable and spice crops.			
Credit: 4+1		Core: Compulsory/ Major Course	
Maximum Marks: 80+20		Minimum Passing Marks:	
Total numbers of Lectures-Practical's-Tutorials (in hours per week): 4-1-0			
Units	Topics	No. of Lectures (60 Hrs.)	
I	Nature, prevalence, factors affecting disease development of tuber, bulb, leafy vegetable, crucifers, cucurbits and solanaceous vegetables. Diseases of crops under protected cultivation.	20	
II	Symptoms and management of diseases of different root, tuber, bulb, leafy vegetables, crucifers, cucurbits and solanaceous vegetable crops.	16	
III	Symptoms, epidemiology and management of diseases of different spice crops such as black pepper, nutmeg, saffron, cumin, coriander, turmeric, fennel, fenugreek and ginger. Biotechnological approaches in developing disease resistant transgenics.	24	
	<b>Practical:</b> <ul style="list-style-type: none"> <li>• Study of nature, prevalence, and factors affecting disease development in vegetable crops (tuber, bulb, leafy, crucifers, cucurbits, solanaceous).</li> <li>• Identification, symptoms, and management of diseases in vegetable crops.</li> <li>• Study of diseases of crops under protected cultivation.</li> <li>• Symptoms, epidemiology, and management of diseases in spice crops (black pepper, nutmeg, saffron, cumin, coriander, turmeric, fennel, fenugreek, ginger).</li> <li>• Demonstration of biotechnological approaches for developing disease-resistant.</li> </ul>		

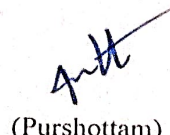
**Teaching methods:**

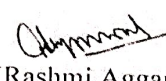
- ❖ Classroom lectures
- ❖ Power point presentations
- ❖ Exposure/ field visits
- ❖ Laboratory experiments
- ❖ Hands on training.

  
(Ajay Kumar)

  
(Rashmi Nigam)

  
(Gopal Singh)

  
(Purshottam)

  
(Rashmi Aggarwal)

  
(Shailendra Sharma)

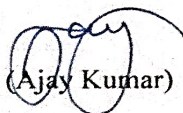
**Home Assignments, Quizzes, and Surprise Class Tests:** The continuing evaluation process through Home Assignments, Quizzes, and Surprise Tests will be done by the concerned teacher teaching that course at regular interval of time.

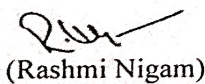
**Learning Outcome:**

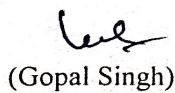
- ❖ Describe the nature, prevalence, and factors influencing disease development in root, tuber, bulb, leafy, cruciferous, cucurbit, and solanaceous vegetable crops.
- ❖ Identify major diseases of vegetable and spice crops along with their symptoms and causal agents.
- ❖ Discuss biotechnological approaches for developing disease-resistant transgenic vegetable and spice crops.

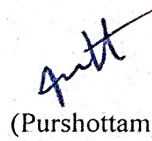
**Suggested Readings:**

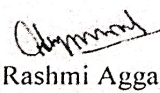
1. Chaube HS, Singh US, Mukhopadhyay AN and Kumar J. 1992. Plant Diseases of International Importance. Vol. II. Diseases of Vegetable and Oilseed Crops. Prentice Hall, Englewood Cliffs, New Jersey.
2. Gupta VK and Paul YS. 2001. Diseases of Vegetable Crops. Kalyani Publishers, New Delhi
3. Gupta SK and Thind TS. 2006. Disease Problem in Vegetable Production. Scientific Publ., Jodhpur.
4. Sherf AF and Mcnab AA. 1986. Vegetable Diseases and their Control. Wiley Inter Science, Columbia.
5. Singh RS. 1999. Diseases of Vegetable Crops. Oxford & IBH, New Delhi.
6. Walker JC. 1952. Diseases of Vegetable Crops. McGraw-Hill, New York.

  
(Ajay Kumar)

  
(Rashmi Nigam)

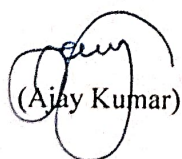
  
(Gopal Singh)

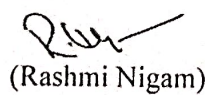
  
(Purshottam)

  
(Rashmi Aggarwal)

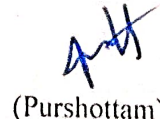


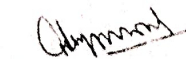
Programme/ Class: <b>M.Sc. (Ag.)</b>		Year: <b>Second</b>	Semester: <b>Third</b>
Subject: <b>PLANT PATHOLOGY</b>			
Course Code: <b>CJ-3534</b>		Subject Code: <b>CPDD07</b>	
Course Title: <b>Information Technology in Agriculture</b>			
<p><b>Aim of the course:</b> This is a course on Introduction to Networking and Internet Applications that aims at exposing the students to understand analogy of computer, basic knowledge of MS Office. Also to understand Internet and WWW, use of IT application and different IT tools in Agriculture.</p>			
<p><b>Course Outcomes:</b></p> <p><b>CO1-</b> Apply fundamental computer concepts, MS Office tools, databases, and ICT applications for data management, analysis, and agricultural decision-making.</p> <p><b>CO2-</b> Utilize modern IT tools such as computer models, automated systems, geospatial technologies, and smartphone applications to enhance crop planning, resource management, and postharvest operations.</p>			
Credit: <b>4+1</b>		Core: <b>Core Elective/ Supporting Course</b>	
Maximum Marks: <b>80+20</b>		Minimum Passing Marks:	
Total numbers of Lectures-Practical's-Tutorials (in hours per week): 4-1-0			
Units	Topics	No. of Lectures (60 Hrs.)	
<b>I</b>	Introduction to Computers, Anatomy of computer, Operating Systems, definition and types, Applications of MS Office for document creation & Editing, Data presentation, interpretation and graph creation, statistical analysis, mathematical expressions.	15	
<b>II</b>	Database, concepts and types, uses of DBMS in Agriculture, World Wide Web (WWW): Concepts and components, Introduction to computer programming languages, concepts and standard input/output operations. e-Agriculture, concepts and applications.	15	
<b>III</b>	Use of ICT in Agriculture, Computer Models for understanding plant processes. IT application for computation of water and nutrient requirement of crops, Computer controlled devices (automated systems) for Agri-input management, Smartphone Apps in Agriculture for farm advises, market price, postharvest management etc.	15	
<b>IV</b>	Geospatial technology for generating valuable agri-information. Decision support systems, concepts, components and applications in Agriculture, Agriculture Expert System, Soil Information Systems etc. for supporting Farm decisions, Preparation of contingent crop-planning using IT tools.	15	
	<p><b>Practical:</b></p> <ul style="list-style-type: none"> <li>• Study of operating systems – definition, types, and basic operations, Use of MS Word for document creation and editing.</li> <li>• Preparation of data presentation using MS Power Point, Graph creation, data interpretation, &amp; statistical analysis using MS Excel.</li> <li>• Use of smartphone applications for farm advisory, market prices, and postharvest management, Application of geospatial technology in generating agricultural information.</li> </ul>		

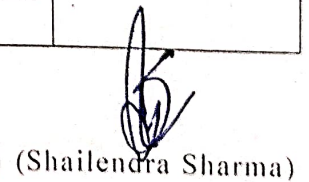
  
(Ajay Kumar)

  
(Rashmi Nigam)

  
(Gopal Singh)

  
(Purshottam)

  
(Rashmi Aggarwal)

  
(Shailendra Sharma)

**Teaching methods:**

- ❖ Classroom lectures
- ❖ Power point presentations
- ❖ Exposure/ field visits
- ❖ Laboratory experiments
- ❖ Hands on training.

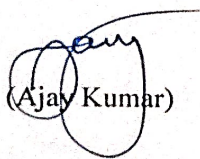
**Home Assignments, Quizzes, and Surprise Class Tests:** The continuing evaluation process through Home Assignments, Quizzes, and Surprise Tests will be done by the concerned teacher teaching that course at regular interval of time.

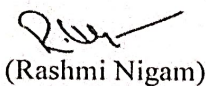
**Learning Outcome:**

- ❖ Apply computer and ICT tools – including MS Office, databases, e-Agriculture, geospatial technologies, and decision support systems – for data management, analysis, and farm decision-making.
- ❖ Utilize modern IT applications – such as computer models, automated systems, and smartphone apps – to optimize crop water and nutrient management, market linkages, and postharvest operations.

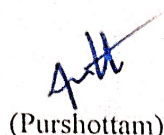
**Suggested Readings:**

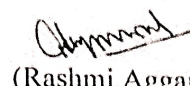
1. Vanitha G. 2011. Agro-informatics
2. Niederst J. 2001. *Web Design in a Nutshell*. O'Reilly Media.
3. Tanenbaum A.S. 2003. *Computer Networks*. Prentice Hall of India.
4. Gear C.W. 1974. *Computer Organization and Programming*. McGraw Hill.
5. Hayes J.P. 1988. *Computer Architecture and Organisation*. McGraw Hill.
6. <http://www.agrimoon.com>
7. <http://www.agriinfo.in>
8. <http://www.eagri.org>
9. <http://www.agriglance.com>
10. <http://agritech.tnau.ac.in>

  
(Ajay Kumar)

  
(Rashmi Nigam)

  
(Gopal Singh)

  
(Purshottam)

  
(Rashmi Aggarwal)

  
(Shailendra Sharma)

**FOURTH SEMESTER**

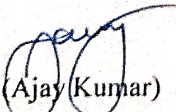
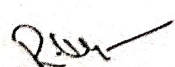




Programme/ Class: M.Sc. (Ag.)		Year: Second	Semester: Fourth
Subject: PLANT PATHOLOGY		Subject Code: CPDD07	
Course Code: CJ-4531		Course Title: Master's Seminar	
<p><b>Aim of the course:</b> The objective of this course is to enhance the student's ability to critically analyze, interpret, and communicate scientific knowledge through seminar presentations.</p> <p><b>Course Outcomes:</b></p> <p>CO1- Identify and select a suitable seminar topic based on recent advancements in their academic discipline.</p> <p>CO2- Conduct a thorough literature survey and compile relevant information.</p> <p>CO3- Prepare a structured seminar report using standard academic writing formats.</p> <p>CO4- Deliver effective oral presentations using audio-visual tools.</p>			
Credit: 01		Core: Compulsory/ Major Course	
Maximum Marks: 100		Minimum Passing Marks:	
Total numbers of Lectures-Practical's-Tutorials (in hours per week): 4-0-0			
Units	Topics	No. of Lectures (60 Hrs.)	
I	Selection of seminar topic (current/recent research in discipline), Objectives, scope, and importance of seminar in Agriculture education.	10	
II	Literature collection and organization from primary and secondary sources, Critical review of relevant research papers, reports, and case studies.	12	
III	Preparation of seminar report: structure, format, referencing styles (APA/MLA/ICAR style) & scientific writing skills: coherence, clarity, flow of ideas.	12	
IV	Designing effective seminar presentations: PowerPoint skills, charts, graphs, tables, images, and presentation ethics.	12	
V	Evaluation of seminar based on content, presentation skills, and discussion handling, submission of written seminar report.	14	

**Teaching methods:**

- Class discussions.
- PowerPoint-based presentations.
- Group discussions and peer feedback
- Mock seminars for practice and improvement

**Learning Outcome:**

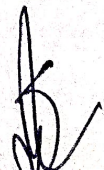
- ❖ Identify, review, and analyze relevant literature to select and frame a suitable seminar topic.
- ❖ Prepare and present a well-structured seminar report and oral presentation using scientific writing and communication skills.
- ❖ Demonstrate confidence and critical thinking by effectively engaging in academic discussion and defending their seminar work.

 (Ajay Kumar)
  (Rashmi Nigam)
  (Gopal Singh)
  (Purshottam)
  (Rashmi Aggarwal)
  (Shailendra Sharma)

**Suggested Readings:**

1. Wayne Booth, Gregory Colomb, Joseph Williams (2008). *The Craft of Research*. University of Chicago Press.
2. Michael Alley (2013). *The Craft of Scientific Presentations: Critical Steps to Succeed and Critical Errors to Avoid*. Springer.
3. C.R. Kothari (2009). *Research Methodology: Methods and Techniques*. 2nd Edition, New Age International Publishers, New Delhi.
4. Zeigler, Bernard P. (2000). *Presentation Skills for Scientists and Engineers*. Morgan & Claypool Publishers.
5. Relevant recent research articles, reviews, reports, and seminar proceedings.

✓



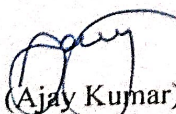
Programme/ Class: M.Sc. (Ag.)		Year: Second	Semester: Fourth
Subject: PLANT PATHOLOGY		Subject Code: CPDD07	
Course Code: CJ-4532		Course Title: Master's Research	
<p><b>Aim of the course:</b> The objective of this course is to train students in independent research work, including formulation of research problems, planning and execution of experiments, analysis of data, and preparation of a thesis/dissertation.</p>			
<p><b>Course Outcomes:</b></p> <p>CO1- Formulate research problems and hypotheses based on a review of literature.</p> <p>CO2- Plan and conduct experiments/field work/laboratory work systematically.</p> <p>CO3- Prepare a comprehensive dissertation following academic and ethical standards.</p>			
Credit: 30		Core: Compulsory/ Major Course	
Maximum Marks: 300		Minimum Passing Marks:	
Total numbers of Lectures-Practical's-Tutorials (in hours per week): 0-4-0			
Units	Topics		
I	Identification of research problem in the chosen discipline. Formulation of objectives, hypotheses, and methodology, Designing experimental layout/field trials/lab experiments.		
II	Collection of literature related to the research problem. Standardization of methods, tools, and techniques, Preliminary experiments/trials.		
III	Execution of main research experiments (field, laboratory, or bioinformatics-based).		
IV	Compilation and statistical analysis of data, Preparation of tables, graphs, and illustrations.		
V	Preparation of dissertation (Introduction, Review of Literature, Materials & Methods, Results & Discussion, Summary & Conclusion, References, Appendices).		
VI	Evaluation of thesis based on content, data presentation, and major findings, Submission of written thesis report.		

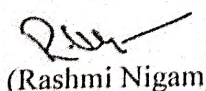
**Teaching methods:**

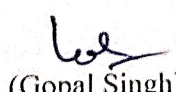
- Individual guidance by research supervisor
- Laboratory and field-based practical work
- Data analysis using appropriate statistical tools/software
- Regular progress presentations and discussions
- Thesis writing and final defense.

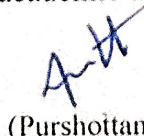
**Learning Outcome:**

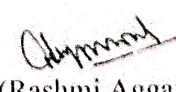
- ❖ Formulate a relevant research problem, objectives, hypotheses, and design appropriate experimental/field/laboratory methodologies.
- ❖ Conduct and Manage Research by reviewing literature, standardizing methods, executing experiments, and maintaining accurate records.
- ❖ Analyze and Interpret Data using statistical tools, graphical representation, and critical discussion with reference to existing studies.
- ❖ Prepare and Communicate Research Findings through a well-structured dissertation, abstracts, and presentations adhering to academic and ethical standards.

  
(Ajay Kumar)

  
(Rashmi Nigam)

  
(Gopal Singh)

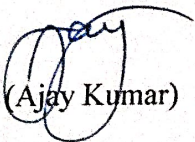
  
(Purshottam)

  
(Rashmi Aggarwal)

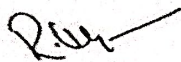


**Suggested Readings:**

1. C.R. Kothari and Gaurav Garg (2019). *Research Methodology: Methods and Techniques*. New Age International Publishers, New Delhi.
2. John W. Creswell (2014). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. SAGE Publications.
3. Patrick Dunleavy (2003). *Authoring a Ph.D.: How to Plan, Draft, Write and Finish a Doctoral Thesis or Dissertation*. Palgrave Macmillan.
4. Wayne Booth, Gregory Colomb, Joseph Williams (2008). *The Craft of Research*. University of Chicago Press.
5. Relevant recent theses, dissertations, and peer-reviewed journal articles.



(Ajay Kumar)



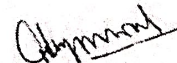
(Rashmi Nigam)



(Gopal Singh)



(Purshottam)

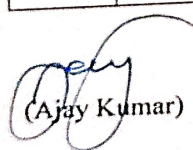



(Rashmi Aggarwal)

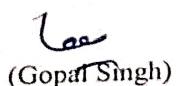


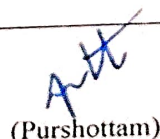
(Shailendra Sharma)

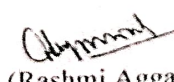
Programme/ Class: M.Sc. (Ag.)		Year: Second	Semester: Fourth
Subject: PLANT PATHOLOGY		Subject Code: CPDD07	
Course Code: CJ-4533		Course Title: Basic Concepts in Laboratory Techniques	
Aim of the course: To acquaint the students about the basics of commonly used techniques in laboratory.			
Course Outcomes:			
CO1- Demonstrate safe laboratory practices and proper handling of chemicals, glassware, and laboratory equipment.			
CO2- Prepare and manage solutions, agro-chemical doses, buffers, and media for laboratory and field applications.			
CO3- Apply basic techniques in seed and pollen viability testing, plant tissue culture, and botanical description for taxonomic studies.			
Credit: 04		Core: Common Course	
Maximum Marks: 100		Minimum Passing Marks:	
Total numbers of Lectures-Practical's-Tutorials (in hours per week): 0-4-0			
Units	Topics	No. of Lectures (60 Hrs.)	
	<p><b>Practical:</b></p> <ul style="list-style-type: none"> <li>• Safety measures while in Lab;</li> <li>• Handling of chemical substances;</li> <li>• Use of burettes, pipettes, measuring cylinders, flasks, separatory funnel, condensers, micropipettes and vaccupets;</li> <li>• Washing, drying and sterilization of glassware;</li> <li>• Drying of solvents/ chemicals;</li> <li>• Weighing and preparation of solutions of different strengths and their dilution;</li> <li>• Handling techniques of solutions;</li> <li>• Preparation of different agro-chemical doses in field and pot applications;</li> <li>• Preparation of solutions of acids;</li> <li>• Neutralisation of acid and bases;</li> <li>• Preparation of buffers of different strengths and pH values;</li> <li>• Use and handling of microscope, laminar flow, vacuum pumps, viscometer, thermometer, magnetic stirrer, micro-ovens, incubators, sandbath, waterbath, oilbath;</li> <li>• Electric wiring and earthing;</li> <li>• Preparation of media and methods of sterilization;</li> <li>• Seed viability testing, testing of pollen viability;</li> <li>• Tissue culture of crop plants;</li> <li>• Description of flowering plants in botanical terms in relation to taxonomy.</li> </ul>		

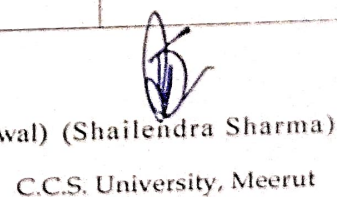
  
(Ajay Kumar)

  
(Rashmi Nigam)

  
(Gopal Singh)

  
(Purshottam)

  
(Rashmi Aggarwal)

  
(Shailendra Sharma)  
C.C.S. University, Meerut

**Teaching methods:**

- ❖ Classroom lectures
- ❖ Power point presentations
- ❖ Exposure/ field visits
- ❖ Laboratory experiments
- ❖ Hands on training.

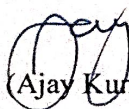
**Home Assignments, Quizzes, and Surprise Class Tests:** The continuing evaluation process through Home Assignments, Quizzes, and Surprise Tests will be done by the concerned teacher teaching that course at regular interval of time.

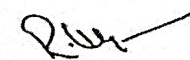
**Learning Outcome:**


- ❖ Follow essential laboratory safety protocols for handling chemicals, glassware, and equipment.
- ❖ Accurately prepare and dilute solutions, buffers, and agro-chemical doses for laboratory and field use.
- ❖ Operate and maintain key laboratory instruments such as microscopes, laminar flow units, and incubators etc.


**Suggested Readings:**

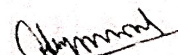
1. Furr AK. 2000. *CRC Hand Book of Laboratory Safety*. CRC Press.
2. Gabb MH and Latchem WE. 1968. *A Handbook of Laboratory Solutions*. Chemical Publ. Co.


  
(Ajay Kumar)

  
(Rashmi Nigam)

  
(Gopal Singh)

  
(Purshottam)

  
(Rashmi Aggarwal)

  
(Shailendra Sharma)

# Open Elective/ Minor Course

Programme/ Class: M.Sc. (Ag.)		Year: First	Semester: Second
Subject: PLANT PATHOLOGY		Subject Code: CPDD07	
Course Code: CO-6625		Course Title: Ecology of Soil Borne Plant Pathogens	
Aim of the course: To provide knowledge on soil-plant disease relationship.			
Course Outcomes:			
CO1- Knowledge on soil-plant disease relationship.			
CO2- Knowledge on Quantification of rhizosphere and rhizoplane microflora			
CO3- Student will know about isolation and identification of different biocontrol agents.			
CO4- Knowledge on potentiality of biocontrol agents against management of soil borne disease.			
Credit: 04		Core: Open Elective/Minor Course	
Maximum Marks: 50+50		Minimum Passing Marks:	
Total numbers of Lectures-Practical's-Tutorials (in hours per week): 4-0-0			
Units	Topics	No. of Lectures (60 Hrs.)	
I	Soil as an environment for plant pathogens, nature and importance of rhizosphere and rhizoplane, host exudates, soil and root inhabiting fungi. Interaction of microorganisms.	20	
II	Types of biocontrol agents. Inoculum potential and density in relation to host and soil variables, competition, predation, antibiosis and fungistasis. Conducive and suppressive soils.	20	
III	Biological control- concepts and potentialities for managing soil borne pathogens. Potential of <i>Trichoderma</i> and fluorescent <i>Pseudomonas</i> in managing plant diseases.	20	

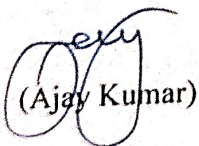
**Teaching methods:**

- ❖ Classroom lectures
- ❖ Power point presentations
- ❖ Exposure/ field visits
- ❖ Laboratory experiments
- ❖ Hands on training.

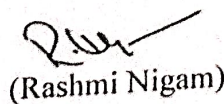
**Home Assignments, Quizzes, and Surprise Class Tests:** The continuing evaluation process through Home Assignments, Quizzes, and Surprise Tests will be done by the concerned teacher teaching that course at regular interval of time.

**Learning Outcome:**

- ❖ Explain the interactions between soil, microorganisms, and plant pathogens, including the roles of rhizosphere, rhizoplane, and host exudates in disease development.
- ❖ Evaluate biological control strategies for managing soil-borne pathogens, with emphasis on the potential of *Trichoderma* and fluorescent *Pseudomonas*.



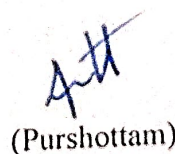
(Ajay Kumar)



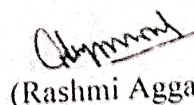
(Rashmi Nigam)



(Gopal Singh)



(Purshottam)



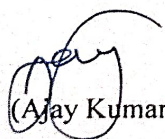
(Rashmi Aggarwal)

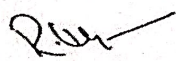



(Shailendra Sharm)

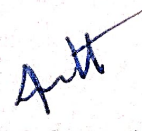
**Suggested Readings:**

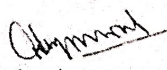
1. Baker KF and Snyder WC. 1965. *Ecology of Soil-borne Plant Pathogens*. John Wiley. New York.
2. Cook RJ and Baker KF. 1983. *The Nature and Practice of Biological Control of Plant Pathogens*. APS, St Paul, Minnesota.
3. Garret SD. 1970. *Pathogenic Root-infecting Fungi*. Cambridge Univ. Press, Cambridge, New York.
4. Hillocks RJ and Waller JM. 1997. *Soil-borne Diseases of Tropical Crops*. CABI, Wallington.
5. Mondia JL and Timper P 2016. Interactions of microfungi and plant parasitic nematodes. In: *Biology of Microfungi* (De-Wei-Lei Ed.). Springer Publications
6. Parker CA, Rovira AD, Moore KJ and Wong PTN. (Eds). 1983. *Ecology and Management of Soil-borne Plant Pathogens*. APS, St. Paul, Minnesota.

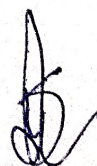
  
(Ajay Kumar)

  
(Rashmi Nigam)

  
(Gopal Singh)

  
(Purshottam)

  
(Rashmi Aggarwal)

  
(Shailendra Sharma)

Programme/ Class: M.Sc. (Ag.)		Year: Second	Semester: Third
Subject: PLANT PATHOLOGY		Subject Code: CPDD07	
Course Code: CO-7625		Course Title: Integrated Disease Management	
Aim of the course: To emphasize the importance and the need of IDM in the management of diseases of important crops.			
Course Outcomes:			
CO1- Knowledge on integrated disease management strategies of important crops.			
CO2- To acquaint the student about principles, concept, tools, limitations and implications of IDM.			
CO3- To acquire knowledge about application of various chemicals, biocontrol agents and cultural methods in integrated disease management.			
Credit: 04		Core: Open Elective/Minor Course	
Maximum Marks: 50+50		Minimum Passing Marks:	
Total numbers of Lectures-Practical's-Tutorials (in hours per week): 4-0-0			
Units	Topics	No. of Lectures (60 Hrs.)	
I	Introduction, definition, concept and tools of disease management, components of integrated disease management- their limitations and implications.	20	
II	Development of IDM-basic principles, biological, chemical and cultural disease management.	20	
III	IDM in important crops- rice, wheat, cotton, sugarcane, chickpea, rapeseed and mustard, pearl millet, pulses, vegetable crops. fruit, plantation and spice crops.	20	

**Teaching methods:**

- ❖ Classroom lectures
- ❖ Power point presentations
- ❖ Exposure/ field visits
- ❖ Laboratory experiments
- ❖ Hands on training.

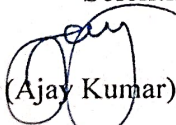
**Home Assignments, Quizzes, and Surprise Class Tests:** The continuing evaluation process through Home Assignments, Quizzes, and Surprise Tests will be done by the concerned teacher teaching that course at regular interval of time.

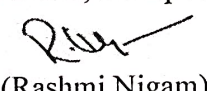
**Learning Outcome:**

- ❖ Develop and apply integrated disease management (IDM) strategies by understanding its principles, tools, and components, and implement them for effective disease control in major field, horticultural, and plantation crops.

**Suggested Readings:**

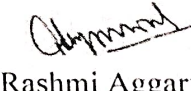
1. Gupta VK and Sharma RC. (Eds). 1995. *Integrated Disease Management and Plant Health*. Scientific Publ., Jodhpur.
2. Mayee CD, Manoharachary C, Tilak KVBR, Mukadam DS and Deshpande Jayashree (Eds.). 2004. *Biotechnological Approaches for the Integrated Management of Crop Diseases*. Daya Publ. House, New Delhi.
3. Sharma RC and Sharma JN. (Eds). 1995. *Integrated Plant Disease Management*. Scientific Publ., Jodhpur.

  
(Ajay Kumar)

  
(Rashmi Nigam)

  
(Gopal Singh)

  
(Purshottam)

  
(Rashmi Aggarwal)

  
(Shailendra Sharma)