DISCIPLINE SPECIFIC ELECTIVE COURSE –DSE-15

Course title& Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Plant Diseases and Management (BS-DSE-15)	**4**	**2**		**2**	Class XII pass with Biology	**NA**

Learning Objectives:

Plant diseases have resulted in severe losses to humans in ways more than one. To quote a few, Irish famine caused due to potato late blight (caused by Phytophthora infestans) led to the loss of many lives, the American chestnut was virtually lost by chestnut blight (caused by Cryphonectria parasitica). The goal of plant disease management is to impart awaren ess about the economic and aesthetic damage caused by plant diseases. The course focuses on various plant diseases and multifaceted approaches to disease management, and integrated disease management.

2. Course Learning Outcomes:

The purpose of this course is

- To introduce the subject of Plant pathology, its concepts and principles.
- To impart training on various methods/instruments used in the study of plant diseases/pathogens.
- To acquaint the students with different strategies for management of plant diseases.
- To emphasize the importance and need of IDM in the management of diseases of important crops.

3. Course Contents:

3.1 THEORY

CREDITS: 2 TOTAL HOURS: 30

Unit 1: Introduction to Plant Diseases **No. of Hours: 4**

Scope and significance of plant pathology; milestones of phytopathology, terminology of plant pathology, Diseases: causative agents (Bacteria, viruses, prions, fungi, nematodes, insect pests with suitable examples). Survival of important plant pathogens and their dispersal; role of environment and host nutrition on disease development.

Unit 2: Host- parasite interactions **No. of Hours: 6**

Molecular mechanisms of pathogenesis: recognition concept, penetration, invasion and infection, symptomatology. Role of enzymes and toxins in disease development. Defence strategies, oxidative burst, phenolics, phytoalexins, PR proteins and elicitors. Altered plant metabolism as affected by plant pathogens, molecular basis of host plant-pathogen interaction (gene for gene concept).

Unit 3: Plant Diseases **No. of hours: 7**

Introduction, characteristic features, general symptoms, survival and spread of pathogens and control of - Bacterial diseases: Citrus canker, Angular leaf spot of Cotton, Leaf blight of rice, Red stripe of sugarcane; Fungal diseases: Root rot in Cucurbits, Late blight of Potato, Ergot of bajra, Black stem rust of Wheat and Loose smut of Barley; Viral Diseases: TMV, Yellow mosaic of Ladyfinger, Leaf curl of Papaya. Nematode & Prion Diseases: General account.

Unit 4: Integrated Disease Management **No. of Hours: 13**

Introduction, definition, concept and tools of disease management, Koch's postulates, Development of IDM- basic principles, biological, chemical and cultural disease management. Disease resistance and molecular approach for disease management. Biological Control– Concept of biological control, definitions, importance, types of biological interactions (competition, mycoparasitism, exploitation for hypovirulence, rhizosphere colonization, competitive saprophytic ability, antibiosis), induced resistance, role of mycorrhiza, commercial formulations of antagonists, biopesticides available in the market. Chemical Control – classification of chemicals based on structure and function; chemical types i.e. fungicides, bactericides and botanicals. Components of integrated disease management (IDM) - their limitations and implications. IDM in important crops- rice, wheat, cotton, sugarcane, chickpea, rapeseed mustard, pearl millet, kharif pulses.

3.2 PRACTICALS

CREDITS: 2 TOTAL HOURS: 60

1. Preparation and inoculation of culture media for bacteria and fungi.
2. Study of important Bacterial diseases: Citrus canker, Angular leaf spot of cotton.
3. Study of important Nematodal (any one) and Viral diseases: TMV, (Necrosis,Chlorosis,leaf curl with suitable examples) through specimens and photographs.
4. Study of asexual stage from temporary mounts and sexual structures through permanent slides of (Red rot of Sugarcane) *Puccinia* (Black stem rust of Wheat), *Alternaria* (Early blight of Potato), *Ustilago/Claviceps*
5. Field/Museum visit- Report on collection and preservation of diseased specimens of important crops
6. Qualitative estimation of total phenols in diseased and healthy crop plants
7. Estimation of phenyl-alanine lyase activity (PAL activity) in diseased and healthy crop plants.
8. A comparative case study of Disease resistant Transgenic Plants with wild type plants

3.3 Essential Readings

1. Agrios GN. 2005. Plant Pathology. 5th Ed. Academic Press, New York.
2. Mehrotra RS & Aggarwal A. 2003. Plant Pathology. 2nd Ed. Oxford & IBH, New Delhi.
3. Singh RS. 2002. Introduction to Principles of Plant Pathology. Oxford & IBH, New Delhi.

4. Singh DP & Singh A. 2007. Disease and Insect Resistance in Plants. Oxford & IBH, New Delhi.
5. Upadhyay RK & Mukherjee KG. 1997. Toxins in Plant Disease Development and Evolving Biotechnology. Oxford & IBH, New Delhi. 69
6. Sharma PD, 2006. Plant Pathology. Narosa publishing house pvt. Ltd.. 22 Daryaganj Delhi
7. Chaube HS, Pundhir VS, 2014. Crop diseases and their management. PHI learning pvt. Ltd. Delhi – 110092
8. Gupta VK & Sharma RC. (Eds). 1995. Integrated Disease Management and Plant Health. Scientific Publ., Jodhpur.
9. Mayee CD, Manoharachary C, Tilak KVBR, Mukadam DS & Deshpande Jayashree (Eds.). 2004.
10. Biotechnological Approaches for the Integrated Management of Crop Diseases. Daya Publ. House, New Delhi.

4. Teaching Learning Process and Assessment Methods

Facilitating the achievement of Course Learning Outcomes**

Unit No.	Course Learning Outcomes	Teaching and Learning Activity	Assessment Tasks
1	Students will be introduced to the subject of plant diseases- its concept, components and causes. This introductory unit will help them understand the basics of plant pathology and disease symptoms	Teaching will be conducted both through black board mode and power point presentation mode.	Group discussions in the class will help students understand the concepts well
2	Students will learn about host parasite interactions. They will also gain an understanding of plant defences and altered plant metabolism resulting from pathogen infection	The traditional chalk and talk method along with power point presentations will be used .	Oral questions will be asked in the class. Problems will be assigned to encourage them to explore more about the concept.
3	Students will develop an understanding of Characteristic features, general symptoms, survival/ spread of pathogens and control of bacterial, fungal and viral diseases	Teaching will be conducted through black board and power point presentation. A Field/ Museum visit will help them in understanding the taught concepts better	The concepts in this unit will be taught both theoreticaly and in practical classes. Students will also prepare a report on their Field/Museum visit.
4	Students will understand the Integrated disease management approaches for the effective control of pathogen spead in economically important crops and understand different cause of epidemics. Students will also learn various methods of disease control using biocontrol	Teaching will be conducted through powepoint presentations on previous case studies explaining the causes and management of pathogens responsible for epidemic losses of crops in India.	The concept will be taught theoratically and students will be asked to prepare a report on current scenario of disease management in important crop plants.

	agents, practices to prevent multiplication of pests under conducive conditions and role of hormones in inducing resistance in plants.		

(**Assessment tasks enlisted here are indicative in nature)

5. Keywords:

Plant diseases, Integrated Disease Management, Rust, Smut, Blight, Pathogens, oxidative burst, PR proteins