

DAV UNIVERSITY, JALANDHAR
DAV UNIVERSITY JALANDHAR



FACULTY OF AGRICULTURAL SCIENCES

COURSE CURRICULUM

FOR

M.Sc. Ag. (Plant Pathology)

1st to 4th SEMESTER

Examinations 2026-2027 session onwards

Applicable for admissions in 2026

M. Sc (Agriculture) Plant Pathology

PROGRAM EDUCATIONAL OBJECTIVES (PEO's)

PEO1: To encourage students to be creative and innovative to meet the needs of agro based industry by providing a dynamic learning environment

PEO2: To develop competent human resource in teaching and research in crop production, crop improvement, plant protection and marketing to meet national and global challenges

PEO3: Developing entrepreneurial skills in students to be 'Job providers rather than Job seekers

PEO4: To develop skills of ethical integrity and professional engagement among students to be the voice of farmers and represent them in various national and international forums

PROGRAM SPECIFIC OUTCOMES (PSO's)

PSO1: Enable students to develop skills to be the leaders of agro industry

PSO2: To be conversant with the latest state of the art innovations in agricultural sciences

PSO3: Students acquire skills in subsidiary agriculture occupations like dairy, bee keeping, mushroom cultivation and organic farming etc.

PSO4: In-depth knowledge of agriculture and skills to solve the problems of farming community enable students to be a good policy maker by framing policies for the upliftment of farmers

Program Outcomes (POs)

After successful completion of the program, the students will be able to:

PO1.Critical Thinking: Take informed actions after identifying the assumptions that frame our thinking and actions, checking out the degree to which these assumptions are accurate and valid, and looking at our ideas and decisions (intellectual, organizational, and personal) from different perspectives.

PO2.Effective Communication: Speak, read, write and listen clearly in person and through electronic media in English and in one Indian language, and make meaning of the world by connecting people, ideas, books, media and technology.

PO3. Social Interaction: Elicit views of others, mediate disagreements and help reach conclusions in group settings.

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PO4. Effective Citizenship: Demonstrate empathetic social concern and equity centered national development, and the ability to act with an informed awareness of issues and participate in civic life through volunteering.

PO5. Ethics: Recognize different value systems including your own, understand the moral dimensions of your decisions, and accept responsibility for them.

PO6. Environment and Sustainability: Understand the issues of environmental contexts and sustainable development.

PO7. Self-directed and Life-long Learning: Acquire the ability to engage in independent and life-long learning in the broadest context socio-technological changes

DAV UNIVERSITY, JALANDHAR**Scheme of Courses M.Sc. Ag. (Plant Pathology)**

Semester I							
Sr. N.	Course Code	Course name	Course type	L	T	P	Cr
1.	AGS650	Mycology	Core	2	0	2	3
2.	AGS651A	Plant Pathogenic Prokaryotes	Core	2	0	2	3
3.	AGS652	Principles of plant pathology	Core	3	0	0	3
4.	AGS657	Diseases of field and medicinal crops	Core	2	0	2	3
5.	Open Elective I (Interdisciplinary elective I)			2	0	2	3
6.	CSA559	Computer fundamentals and programming	Compulsory foundation	2	0	2	3

L: Lectures T: Tutorial P: Practical Cr: Credits

Departmental Elective I (Choose any one course)

Sr. N.	Course Code	Course name	Course type	L	T	P	Cr
1.	AGS653	Mushroom production technology	Elective	2	0	2	3
2.	AGS654	Post harvest diseases	Elective	2	0	2	3
3.	AGS655	Diseases of fruits, plantation and ornamental Crops	Elective	2	0	2	3
4.	AGS656	Diseases of vegetable and spices crops	Elective	2	0	2	3
5.	AGS658	Plant quarantine	Elective	2	0	0	2
6.	AGS659	Biological control of plant diseases	Elective	2	0	2	3
7.	AGS670	Integrated disease management	Core	2	0	2	3

DAV UNIVERSITY, JALANDHAR**Semester II**

Sr. N.	Course Code	Course name	Course type	L	T	P	Cr
1.	AGS661	Plant virology	Core	2	0	2	3
2.	AGS662	Detection and diagnosis of plant diseases	Core	0	0	4	2
	AGS664A	Plant nematology	Core	2	0	2	3
3.	Open Elective II (Interdisciplinary elective II)			2	0	2	3
4.	ENG551	Technical writing and communication skills	Compulsory Foundation	0	1	1	1
5.	AGS503	Intellectual property and its management in agriculture	Compulsory Foundation	0	1	1	1
6.	AGS500	Master's research	Core	0	4	8	4

Departmental Elective II (Choose any one course)

Sr. N.	Course Code	Course name	Course type	L	T	P	Cr
1.	AGS663	Seed health technology	Elective	2	0	2	3
2.							
3.	AGS665	Insect vectors of plant viruses and other pathogens	Elective	1	0	2	2
4.	AGS666	Chemicals in plant disease management	Elective	2	0	2	3
5.	AGS667	Ecology of soil-borne plant pathogens	Elective	2	0	2	3
6.	AGS668	Disease resistance in plants	Elective	2	0	0	2
7.	AGS669	Epidemiology and forecasting of plant Diseases	Elective	2	0	2	3
8.	AGS670	Integrated disease management	Core	2	0	2	3

Semester III

Sr. N.	Course Code	Course name	Course type	L	T	P	Cr
1.	MTH670	Statistics methods for applied sciences	Compulsory Foundation	3	0	2	4
2.	AGS501	Library and information services	Compulsory Foundation	0	1	2	1
3.	AGS504	Basic concepts of laboratory techniques	Compulsory Foundation	0	1	2	1
4.	AGS505	Agricultural research ethics and rural development programs	Compulsory Foundation	1	0	0	1
5.	Open Elective III (Interdisciplinary elective III)			2	0	2	3
6.	AGS560	Master's seminar	Core	0	0	0	1
7.	AGS500A	Master's research	Core	0	0	16	8

Semester IV

Sr. No.	Course Code	Course name	Course type	L	T	P	Cr
1	AGS500B	Master's research	Core	0	0	36	18
2	AGS500C	Thesis work	Core	0	0	10	5

Outline of the Courses

Course Code	AGS650						
Course Title	Mycology						
Hours	45 L:2, T:0, P:2						
Credits	3						
Type	Core Course						
Course Outcomes	<p>On the completion of the course, the student will gain the following knowledge and skills:</p> <p>CO1: Understand the general characteristics and basic concepts of Mycology</p> <p>CO2: Understand the history of Mycology and the importance of Fungi</p> <p>CO3: Understand the classification and reproduction in fungi</p> <p>CO4: Understand the different groups of fungi, variability and symbiotic relations of fungi</p>						
Examination Type	Theory + Practical						
Assessment Tools	Written Quiz	Assignment/Project Work	MSE	MSP	ESE	ESP	ABL/PBL
Weightage	10%	0	25%	0	35%	25%	5%
Syllabus	UNIT I (7 hours) Introduction to fungi, definition of different terms, characters and basic concepts.						CO1
	UNIT II (8 hours) Importance of mycology in agriculture. Importance of fungi and historical background.						CO2
	UNIT III: (10 hours) Concepts of nomenclature and classification, fungal biodiversity and reproduction in fungi.						CO3
	UNIT IV (5 hours) The comparative morphology, ultrastructure, characters of different groups of fungi up to generic level, Classification of fungi. Lichens and variability in fungi.						CO4

	Practical (15 hours) Detailed comparative study of different groups of fungi; collection, identification and preservation of specimens. Isolation and identification of plant pathogenic fungi.	
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Reference Books:

1. Ainsworth GC, Sparrow FK & Susman HS. 1973. The Fungi – An Advanced Treatise. Vol. IV (A & B). Academic Press, New York.
2. Alexopoulos CJ, Mims CW & Blackwell M. 2000. Introductory Mycology. 5th Ed. John Wiley & Sons, New York.
3. Mehrotra RS & Arneja KR. 1990. An Introductory Mycology. Wiley Eastern, New Delhi.
4. Singh RS. 1982. Plant Pathogens – The Fungi. Oxford & IBH, New Delhi.

Course Code	AGS651A						
Course Title	Plant Pathogenic Prokaryotes						
Hours	45 L:2, T:0, P:2						
Credits	3						
Type	Core Course						
Course Outcomes	<p>On the completion of the course, the student will gain the following knowledge and skills:</p> <p>CO1: Understanding about phytopathogenic bacteria, major events in history of Plant Bacteriology, their classification and important diseases caused by the phytopathogenic bacteria</p> <p>CO2: Learn about growth, nutrition and reproduction in phytopathogenic bacteria and different methods of their preservation</p> <p>CO3: Learn about bacteriophages, L-form bacteria, bdellovibrios and role of antibiotics and mode of action in management of phytopathogenic bacteria</p> <p>CO4: Learn about the different modes of survival and dissemination/spread in phytopathogenic bacteria</p>						
Examination Type	Theory + Practical						
Assessment Tools	Written Quiz	Assignment/Project Work	MSE	MSP	ESE	ESP	ABL/PBL
Weightage	10%	0	25%	0	35%	25%	5%
Syllabus	UNIT I (10 hours) History and introduction to phytopathogenic bacteria, MLOs, Spiroplasma and other fastidious prokarya. Importance of phytopathogenic bacteria. Evolution, classification and nomenclature of phytopathogenic bacteria and important diseases caused by them						CO1
	UNIT II (10 hours) Growth, nutrition requirements, reproduction, preservation of bacterial cultures and variability among phytopathogenic bacteria.						CO2

	Unit III: (5 hours) General biology of bacteriophages, L form bacteria, plasmids and bdellovibrios. Procaryotic illts and their mode of action against phytopathogenic bacteria	CO3
	UNIT IV (5 hours) Survival and dissemination of phytopathogenic bacteria.	CO4
	Practical (15 hours) Isolation, purification, identification and host inoculation of phytopathogenic bacteria, staining methods, biochemical and serological characterization, isolation of plasmid and use of antibacterial chemicals/antibiotics.	

Reference Books:

1. Jayaraman J and Verma JP. 2002. Fundamentals of Plant Bacteriology. Kalyani Publ., Ludhiana.
2. Verma JP 1998 The Bacteria, MPH Publishing, New Delhi
3. Kalyan K Mondal 2011 Plant Bacteriology, Kalyani Publishers, Ludhiana

Course Code	AGS652						
Course Title	Principles of Plant Pathology						
Hours	45 L:3, T:0, P:0						
Credits	3						
Type	Core Course						
Course Outcomes	<p>CO1: Learn about basic concepts in Plant Pathology, historical developments and growth in the field of Plant Pathology, components of disease and classification of plant diseases</p> <p>CO2: Learn about pathogenesis and steps involved in it and role of environment and host nutrition on disease development</p> <p>CO3: Learn about host-parasite interactions and mechanism of infection mediated by toxins, enzymes, growth regulators and defense strategies involving structural and induced defenses employed against them</p> <p>CO4: Learn about the genetic basis of disease resistance, role of R genes, genetic engineering and disease management strategies</p>						
Examination Type	Theory + Practical						
Assessment Tools	Written Quiz	Assignment/Project Work	MSE	MSP	ESE	ESP	ABL/PBL
Weightage	10%	10%	25%	0	50%	0	5%
Syllabus	UNIT I (10 hours) Importance, definitions and concepts of plant disease, history and growth of plant pathology, biotic and abiotic causes and classification of plant diseases.						CO1
	UNIT II (15 hours) Pathogenesis-survival, growth, reproduction and disposal of important plant pathogens, role of environment and host nutrition on disease development						CO2
	Unit III: (10 hours) Host parasite interactions, recognition concept and						CO3

	infection, symptomatology, mechanism of infection- role of enzymes, toxins, growth regulators, defense strategies- oxidative burst, phenolics, phytoalexins, PR proteins, elicitors, altered plant metabolism as affected by plant pathogens.	
	UNIT IV (10 hours) Genetics of resistance, 'R' genes, mechanism of genetic variation in pathogens, molecular basis for resistance, marker assisted selection, genetic engineering for disease resistance, disease management strategies.	CO4

Reference Books:

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

Course Code	AGS653						
Course Title	Mushroom production technology						
Hours	45 L:2, T:0, P:2						
Credits	3						
Type	Inter-departmental elective Course						
Course Outcomes	<p>On the completion of the course, the student will gain the following knowledge and skills:</p> <p>CO1: To understand the classification of mushroom and spawn production</p> <p>CO2: To understand substrate preparation, composting and casing methodologies</p> <p>CO3: To understand setting-up a mushroom farm</p> <p>CO4: To understand various diseases/pests and economics of mushroom production</p>						
Examination Type	Theory + Practical						
Assessment Tools	Written Quiz	Assignment/Project Work	MSE	MSP	ESE	ESP	ABL/PBL
Weightage	10%	0	25%	0	35%	25%	5%
Syllabus	UNIT I (10 hours) Historical development of mushroom cultivation and present status, taxonomy, classification, uses of mushrooms, edible and poisonous mushrooms. Maintenance of pure culture, preparation of spawn and facilities required for establishing commercial spawn laboratory and strain improvement.						CO1
	UNIT II (5 hours) Preparation of substrate for mushroom cultivation, long, short and indoor composting methods, formulae for different composts and their						CO2

	computation, qualities and testing of compost, uses of spent mushroom compost/substrate, spawning and spawn run, casing preparation and its application.	
	Unit III (10 hours) Setting up mushroom farm for seasonal and environmentally control cultivation, requirement and maintenance of temperature, relative humidity, CO ₂ , ventilation in cropping rooms, cultivation technology of <i>Agaricus bisporus</i> , <i>Pleurotus</i> sp., <i>Calocybe indica</i> , <i>Lentinus edodes</i> and <i>Ganoderma lucidum</i> .	CO3
	UNIT IV (5 hours) Insect pests, diseases and abnormalities of cultivated mushroom and their management, post-harvest processing and value addition, economics of mushroom cultivation, biotechnology and mushroom cultivation.	CO4
	Practical (15 hours) Preparation of spawn, compost, spawning, casing, harvesting and postharvest handling of edible mushroom; identification of various pathogens, competitors of various mushroom.	

Reference Books:

1. Suman, B. C. and Sharma, V. P. 2007. Mushroom Cultivation in India. Daya Publishing House, New Delhi.
2. Pandey R.K. and Ghosh S. K. 1999. A Handbook of Mushroom Cultivation. Emkay Publications, New Delhi.

Course Code	AGS654						
Course Title	Post harvest Diseases						
Hours	45 L:2, T:0, P:2						
Credits	3						
Type	Inter-departmental elective Course						
Course Outcomes	<p>On the completion of the course, the student will gain the following knowledge and skills:</p> <p>CO1: To understand the nature of post-harvest diseases and their management using plant extracts</p> <p>CO2: To understand the types of post-harvest diseases due to biotic and abiotic causes and their management</p> <p>CO3: To understand factors affecting post-harvest diseases and isolation/characterization of post-harvest pathogens</p> <p>CO4: To understand integrated approach in managing post-harvest diseases and health hazards associated with post-harvest diseases/mycotoxins</p>						
Examination Type	Theory + Practical						
Assessment Tools	Written Quiz	Assignment/Project Work	MSE	MSP	ESE	ESP	ABL/PBL
Weightage	10%	0	25%	0	35%	25%	5%
Syllabus	UNIT I (5 hours) Concept of post-harvest diseases, definitions, importance with reference to environment and health, principles of plant disease management as preharvest and post-harvest, merits and demerits of biological/ phytoextracts in controlling post-harvest diseases.						CO1
	UNIT II (5 hours) Types of post-harvest problems both by biotic and						CO2

	abiotic causes, rhizosphere colonization, competitive, saprophytic ability, antibiosis, induced resistance, microbial associations, concept, operational mechanisms and its relevance in control.	
	Unit III (15 hours) Factors governing post-harvest problems both as biotic and abiotic, role of physical environment, agro-ecosystem leading to quiescent infection, operational mechanisms and cultural practices in perpetuation of pathogens, pathogens and antagonist and their relationship, role of biocontrol agents and chemicals in controlling post-harvest diseases, comparative approaches to control plant pathogens by resident and introduced antagonists. Isolation, characterization and maintenance of pathogens, role of different storage.	CO3
	UNIT IV (5 hours) Integrated approach in controlling diseases and improving the shelf life of produce, control of aflatoxigenic and mycotoxigenic fungi, application and monitoring for any health hazard, knowledge of Codex Alimentarius for each product and commodity.	CO4
	Practical (15 hours) Isolation, characterization and maintenance of pathogens, role of different storage conditions on disease development, application of antagonists against pathogens <i>in vivo</i> and <i>in vitro</i> conditions. Comparative efficacy of different chemicals, fungicides, phytoextracts and bioagents.	

Reference Books:

1. Pathak VN. 1970. Diseases of Fruit Crops and their Control. IBH Publ., New Delhi.

2. Chaddha KL & Pareek OP. 1992. Advances in Horticulture Vol. IV,
Malhotra Publ.House, New Delhi.

Course Code	AGS655						
Course Title	Diseases of fruits, plantation and ornamental crops						
Hours	45 L:2, T:0, P:2						
Credits	3						
Type	Inter-departmental elective Course						
Course Outcomes	<p>On the completion of the course, the student will gain the following knowledge and skills:</p> <p>CO1: To understand the symptoms, epidemiology and management of temperate fruits, citrus and mango</p> <p>CO2: To understand the symptoms, epidemiology and management of tropical and sub-tropical fruits</p> <p>CO3: To understand the symptoms, epidemiology and management of plantation crops</p> <p>CO4: To understand the symptoms, epidemiology and management of ornamental crops</p>						
Examination Type	Theory + Practical						
Assessment Tools	Written Quiz	Assignment/Project Work	MSE	MSP	ESE	ESP	ABL/PBL
Weightage	10%	0	25%	0	35%	25%	5%
Syllabus	<p>UNIT I (15 hours)</p> <p>Introduction, symptoms, etiology, epidemiology and management of different diseases of fruits like apple, pear, peach, plum, apricot, cherry, walnut, almond, strawberry, citrus and mango</p>						CO1

	UNIT II (5 hours) Introduction, symptoms, etiology, epidemiology and management of different diseases of fruits like grapes, guava, <i>ber</i> , banana, pineapple, papaya, fig, pomegranate, date palm	CO2
	UNIT III (5 hours) Introduction, symptoms, etiology, epidemiology and management of different diseases of plantation crops such as tea, coffee, rubber and coconut;	CO3
	UNIT IV (5 hours) Introduction, symptoms, etiology, epidemiology and management of different diseases of ornamental plants such as roses, gladiolus, tulip, carnation, orchids, marigold, chrysanthemum.	CO4
	Practical (15 hours) Detailed study of symptoms and host parasite relationship of representative diseases of plantation crops. Collection and dry preservation of diseased specimens of important crops.	

Reference Books:

1. Rangaswami G. 1999. Diseases of Crop Plants in India. 4th Ed. Prentice Hall of India, New Delhi.
2. Singh RS. 2007. Plant Diseases. 8th Ed. Oxford & IBH, New Delhi.

Course Code	AGS656						
Course Title	Diseases of vegetable and spice crops						
Hours	45 L:2, T:0, P:2						
Credits	3						
Type	Inter-departmental elective Course						
Course Outcomes	<p>On the completion of the course, the student will gain the following knowledge and skills:</p> <p>CO1: To understand nature, symptoms, epidemiology and management of diseases of bulb crops, leafy vegetables and crucifers</p> <p>CO2: To know about nature, symptoms, epidemiology and management of diseases of cucurbits and solanaceous vegetable crops</p> <p>CO3: To learn about nature, symptoms, epidemiology and management of diseases of vegetable crops under protected cultivation</p> <p>CO4: To learn about nature, symptoms, epidemiology and management of major spice crops</p>						
Examination Type	Theory + Practical						
Assessment Tools	Written Quiz	Assignment/Project Work	MSE	MSP	ESE	ESP	ABL/PBL
Weightage	10%	0	25%	0	35%	25%	5%
Syllabus	UNIT I (5 hours) Nature, prevalence, symptoms, factors affecting disease development and management of bulb crops, leafy vegetables and crucifers						CO1
	UNIT II (10 hours) Nature, prevalence, symptoms, factors affecting disease development and management of cucurbits and solanaceous vegetables.						CO2
	UNIT III (10 hours) Nature, prevalence, symptoms, factors affecting disease						CO3

	development and management under protected cultivation	
	UNIT IV (5 hours) Symptoms, epidemiology and management of diseases of different spice crops such as black pepper, saffron, cumin, coriander, turmeric, fennel, fenugreek and ginger.	CO4
	Practical (15 hours) Detailed study of symptoms and host pathogen interaction of important diseases of vegetable and spice crops.	

Reference Books:

1. Singh RS. 1999. Diseases of Vegetable Crops. Oxford & IBH, New Delhi.
2. Gupta SK and Thind TS. 2006. Disease Problem in Vegetable Production. Scientific Publ., Jodhpur.
3. Gupta VK and Paul YS. 2001. Diseases of vegetable crops. Kalyani Publishers, Ludhiana

Course Code	AGS657						
Course Title	Diseases of Field and Medicinal crops						
Hours	45 L:2, T:0, P:2						
Credits	3						
Type	Inter-departmental elective Course						
Course Outcomes	<p>On the completion of the course, the student will gain the following knowledge and skills:</p> <p>CO1: To understand nature, symptoms, epidemiology and management of diseases of cereal and pulses crops</p> <p>CO2: To know about nature, symptoms, epidemiology and management of diseases of oilseed and cash crops</p> <p>CO3: To learn about nature, symptoms, epidemiology and management of diseases of fodder and legume crops</p> <p>CO4: To learn about nature, symptoms, epidemiology and management of medicinal crops</p>						
Examination Type	Theory + Practical						
Assessment Tools	Written Quiz	Assignment/Project Work	MSE	MSP	ESE	ESP	ABL/PBL
Weightage	10%	0	25%	0	35%	25%	5%
Syllabus	UNIT I (10 hours) Diseases of Cereal and Pulse crops- wheat, barley, rice, pearl millet, sorghum, maize, gram, common bean, urd bean, mung bean, lentil, pigeon pea and soybean.						CO1
	UNIT II (10hours) Diseases of Oilseed and Cash crops- rapeseed and mustard, sesame, linseed, sunflower, groundnut, castor, cotton and sugarcane.						CO2
	Unit III (5 hours)						CO3

	Diseases of Fodder legume crops- berseem, oats, guar, lucerne, cowpea	
	UNIT IV (5 hours) Medicinal crops- plantago, liquorice, mulathi, sacred basil, mentha, ashwagandha, <i>Aloe vera</i> .	CO4
	Practical (15 hours) Detailed study of symptoms and host-parasite relationship of important diseases of above-mentioned crops. Collection and dry preservation of diseased specimens of important crops.	

Reference Books:

1. Joshi LM, Singh DV & 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, N Delhi.
3. Ricanel C, Egan BT, Gillaspie Jr AG & Hughes CG. 1989. Diseases of Sugarcane, Major Diseases. Academic Press, New York.
4. Singh RS. 2007. Plant Diseases. 8th Ed. Oxford & IBH, New Delhi

Course Code	AGS658						
Course Title	Plant Quarantine						
Hours	30 L:2, T:0, P:0						
Credits	2						
Type	Inter-departmental elective Course						
Course Outcomes	<p>On the completion of the course, the student will gain the following knowledge and skills:</p> <p>CO1: To understand the history of plant quarantine regulations (domestic and international)</p> <p>CO2: To understand various legislations, acts and orders related to quarantine, transgenics and pesticides</p> <p>CO3: To understand symptomatic diagnosis and safer method of disinfection of plant commodities</p> <p>CO4: To understand WTO regulations, PRA, sanitary and phytosanitary methods</p>						
Examination Type	Theory + Practical						
Assessment Tools	Written Quiz	Assignment/Project Work	MSE	MSP	ESE	ESP	ABL/PBL
Weightage	10%	10%	25%	0	50%	0	5%
Syllabus	<p>UNIT I (10 hours) Definition of pest, pesticides and transgenics as per Govt. notification; relative importance; quarantine – domestic and international. Quarantine restrictions in the movement of agricultural produce, seeds and planting material; case histories of exotic pests/diseases and their status.</p>						CO1
	<p>UNIT II (10 hours) Plant protection organization in India. Acts related to registration of pesticides and transgenics. History of quarantine legislations, PQ Order 2003. Environmental Acts,</p>						CO2

	Industrial registration; APEDA, Import and Export of bio-control agents.	
	Unit III (5 hours) Identification of pest/disease free areas; contamination of food with Toxigens and microorganisms, and their elimination; Symptomatic diagnosis and other techniques to detect pest/pathogen infestations; VHT and other safer techniques of disinfestation/salvaging of infected material.	CO3
	UNIT IV (5 hours) WTO regulations; non-tariff barriers; Pest Risk Analysis (PRA), good practices for pesticide laboratories; pesticide industry; Sanitary and Phytosanitary measures.	CO4

Reference Books:

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

Course Code	AGS659						
Course Title	Biological control of plant diseases						
Hours	45 L:2, T:0, P:2						
Credits	3						
Type	Inter-departmental elective Course						
Course Outcomes	<p>On the completion of the course, the student will gain the following knowledge and skills:</p> <p>CO1: To understand the history, importance and merits/demerits of biological control</p> <p>CO2: To understand various mechanisms of biological control</p> <p>CO3: To understand different types of BCAs, compatibility of bioagents and factors affecting biological control</p> <p>CO4: To understand mass multiplication of BCAs, their role in IDM, delivery system and quality control</p>						
Examination Type	Theory + Practical						
Assessment Tools	Written Quiz	Assignment/Project Work	MSE	MSP	ESE	ESP	ABL/PBL
Weightage	10%	0	25%	0	35%	25%	5%
Syllabus	<p>UNIT I (8 hours)</p> <p>Concept of biological control, definitions, importance, principles of plant disease management with bio-agents, history of biological control, merits and demerits of biological control.</p>						CO1
	<p>UNIT II (10 hours)</p> <p>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.</p>						CO2

	Unit III (8 hours) Factors governing biological control, role of physical environment, agroecosystem, operational mechanisms and 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. Compatibility of different bioagents.	CO3
	UNIT IV (4 hours) Commercial production of antagonists-mass multiplication and preparation of formulation, 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.	CO4
	Practical (15 hours) Isolation, characterization and maintenance of antagonists, methods of study of mechanisms of antagonism <i>in vitro</i> , application of antagonists against pathogen <i>in vivo</i> conditions. Enumeration of antagonists	

Reference Books:

1. Campbell R. 1989. Biological Control of Microbial Plant Pathogens. Cambridge Univ. Press, Cambridge.
2. Cook RJ & Baker KF. 1983. Nature and Practice of Biological Control of Plant Pathogens. APS, St. Paul, Mennisota.

Course Code	AGS660						
Course Title	Principles of Plant Disease Management						
Hours	45 L:2, T:0, P:2						
Credits	3						
Type	Inter-departmental elective Course						
Course Outcomes	<p>On the completion of the course, the student will gain the following knowledge and skills:</p> <p>CO1: To understand various mechanisms of plant disease management</p> <p>CO2: To understand different types of chemical plant protectants, their formulations and adjuvants used</p> <p>CO3: To know the history of the development of various chemical plant protectants</p> <p>CO4: To understand nature, properties and mode of action of various antimicrobial chemicals</p>						
Examination Type	Theory + Practical						
Assessment Tools	Written Quiz	Assignment/Project Work	MSE	MSP	ESE	ESP	ABL/PBL
Weightage	10%	0	25%	0	35%	25%	5%
Syllabus	UNIT I (10 hours) Principles of plant disease management through cultural, physical, biological, chemical, organic amendments and botanicals methods of plant disease control, integrated control measures (IDM- module) of plant diseases. Disease resistance and molecular approach for disease management.						CO1
	UNIT II (7 hours) Foliage, seed and soil application of chemicals, role of stickers, spreaders and other adjuvants, health vis-a-vis environmental hazards, residual effects and safety measures.						CO2
	Unit III (8 hours)						CO3

	History of fungicides, bactericides, antibiotics, concepts of pathogen, immobilization, chemical protection and chemotherapy	
	UNIT IV (5 hours) Nature, properties and mode of action of antifungal, antibacterial and antiviral chemicals.	CO4
	Practical (15 hours) <i>In vitro</i> and <i>in vivo</i> evaluation of chemicals against plant pathogens; ED and MIC values, study of structural details of sprayers and dusters.	

Reference Books:

1. Fry WE. 1982. Principles of Plant Disease Management. Academic Press, New York.
2. Hewitt HG. 1998. Fungicides in Crop Protection. CABI, Wallington. 3. Marsh RW. 1972. Systemic Fungicides. Longman, New York.
3. Nene YL & Thapliyal PN. 1993. Fungicides in Plant Disease Control. Oxford & IBH, New Delhi. Palti J. 1981. Cultural Practices and Infectious Crop Diseases. Springer-Verlag, New York

Course Code	AGS661						
Course Title	Plant Virology						
Hours	45 L:2, T:0, P:2						
Credits	3						
Type	Core Course						
Course Outcomes	<p>On the completion of the course, the student will gain the following knowledge and skills:</p> <p>CO1: Learn about plant viruses, their transmission, architecture and historical events in development of field of Plant Virology</p> <p>CO2: Learn about viroids, phages and virus replication, classification, purification, serological and molecular diagnostics of plant viruses</p> <p>CO3: Learn about mycoviruses, Baculoviruses and working of electron microscope</p> <p>CO4: Learn about resistance and genetic engineering in management of plant viruses</p>						
Examination Type	Theory + Practical						
Assessment Tools	Written Quiz	Assignment/Project Work	MSE	MSP	ESE	ESP	ABL/PBL
Weightage	10%	0	25%	0	35%	25%	5%
Examination Mode	Theory + Practical						
Syllabus	<p>UNIT I (10 hours) History of plant virology, composition and structure of viruses. Symptomatology of important plant viral diseases, transmission, chemical and physical properties, virus-host interaction, virus-vector relationship.</p>						CO1
	<p>UNIT II (10 hours) Virus nomenclature and classification, genome organization, replication and movement of viruses. Virus isolation and purification, electron microscopy, protein and nucleic acid-</p>						CO2

	based on	
	Unit III (5 hours) Mycoviruses, phytoplasma, arbo and baculoviruses, satellite viruses, satellite RNAs, phages, viroids, prions. Principles of the working of electron-microscope and ultra-microtome.	CO3
	UNIT IV (5 hours) Virus origin and evolution, mechanism of resistance, genetic engineering, ecology, and management of plant viruses.	CO4
	Practical (15 hours) Study of symptoms caused by viruses, transmission, assay of viruses, physical properties, purification, method of raising antisera, serological tests, electron microscopy, PCR.	

Reference Books:

- 1) Bos L. 1964. Symptoms of Virus Diseases in Plants. Oxford & IBH., New Delhi.
- 2) Brunt AA, Krabtree K, Dallwitz MJ, Gibbs AJ & Watson L. 1995 Virus of Plants: Descriptions and Lists from VIDE Database. CABI, Wallington
- 3) Gibbs A & Harrison B. 1976. Plant Virology - The Principles. Edward Arnold, London

Course Code	AGS663						
Course Title	Seed health technology						
Hours	45 L:2, T:0, P:2						
Credits	3						
Type	Inter departmental elective						
Course Outcomes	<p>On the completion of the course, the student will gain the following knowledge and skills:</p> <p>CO1: Learn about history and economic importance of seed pathology</p> <p>CO2: Learn about recent advances in seed transmission of plant diseases</p> <p>CO3: Learn about seed-borne diseases, seed certification and epidemiological factors influencing transmission of seed borne diseases</p> <p>CO4: Learn about production of toxic metabolites in seeds and its impact on human/plant health, seed health testing methods</p>						
Examination Type	Theory + Practical						
Assessment Tools	Written Quiz	Assignment/Project Work	MSE	MSP	ESE	ESP	ABL/PBL
Weightage	10%	0	25%	0	35%	25%	5%
Syllabus	UNIT I (8 hours) History and economic importance of seed pathology in seed industry, plant quarantine and SPS under WTO. Morphology and anatomy of typical monocotyledonous and dicotyledonous infected seeds.						CO1
	UNIT II (5 hours) Recent advances in the establishment and subsequent cause of disease development in seed and seedling. Localization and mechanism of seed transmission in relation to seed infection, seed to plant transmission of pathogens.						CO2
	Unit III (10 hours)						CO3

	Seed certification and tolerance limits, types of losses caused by seed-borne diseases in true and vegetatively propagated seeds, evolutionary adaptations of crop plants to defend seed invasion by seed-borne pathogens. Epidemiological factors influencing the transmission of seed-borne diseases, forecasting of epidemics through seed-borne infection.	
	UNIT IV (6 hours) Production of toxic metabolites affecting seed quality and its impact on human, animal and plant health, management of seed-borne pathogen/diseases and procedure for healthy seed production, seed health testing, methods for detecting microorganism.	CO4
	Practical (15 hours) Conventional and advanced techniques in the detection and identification of seed-borne fungi, bacteria and viruses. Relationship between seed-borne infection and expression of the disease in the field.	

Reference Books:

1. Agarwal VK & JB Sinclair. 1993. Principles of Seed Pathology. Vols. I & II, CBS Publ., New Delhi.
2. Hutchins JD & Reeves JE. (Eds.). 1997. Seed Health Testing: Progress Towards the 21st Century. CABI, Wallington.
3. Paul Neergaard. 1988. Seed Pathology. MacMillan, London.
4. Suryanarayana D. 1978. Seed Pathology. Vikash Publ., New Delhi.

Course Code	AGS662						
Course Title	Detection and Diagnosis of Plant Pathogens						
Hours	35 L:0, T:0, P:2						
Credits	2						
Type	Core Course						
Course Outcomes	<p>On the completion of the course, the student will gain the following knowledge and skills:</p> <p>CO1: Learn about different pure culture techniques and use of different media for isolation of pathogens and proving pathogenicity by Koch Postulates</p> <p>CO2: Learn about preservation techniques of diseased specimens, use of different laboratory equipment's for disease management</p> <p>CO3: Learn about techniques of microscopic characterization of pathogens, types of microscopes and serological and molecular diagnostics for detection of pathogen</p> <p>CO4: Learn about techniques for checking efficacy of plant protectants, laying out of field experiments, data collection and preparation of references etc.</p>						
Examination Type	Practical						
Assessment Tools	Written Quiz	Assignment/Project Work	MSE	MSP	ESE	ESP	ABL/PBL
Weightage	0	20%	0	30%	0	50%	0
Syllabus	UNIT I (15 hours) Methods to prove Koch's postulates with biotroph and necrotroph pathogens, pure culture techniques, use of selective media to isolate pathogens.						CO1
	UNIT II (5 hours) Preservation of plant pathogens and disease specimens, use of haemocytometer, micrometer, centrifuge, pH meter, camera lucida.						CO2
	UNIT III (10 hours)						CO3

	Microscopic techniques and staining methods, phase contrast system, chromatography, use of electron microscope, spectrophotometer, ultracentrifuge, DNA isolation, electrophoresis, disease diagnostics, serological and molecular techniques for detection of plant pathogens, Basic local alignment search tool.	
	UNIT IV (5 hours) Evaluation of fungicides, bactericides etc., field experiments, data collection and preparation of references.	CO4

Reference Books:

1. Baudoin ABAM, Hooper G R, Mathre D E & Carroll R B. 1990. Laboratory Exercises in Plant Pathology: An Instructional Kit. Scientific Publ., Jodhpur.
2. Dhingra O D & Sinclair J B. 1986. Basic Plant Pathology Methods. CRC Press, London, Tokyo.
3. Fox R T V. 1993. Principles of Diagnostic Techniques in Plant Pathology. CABI Wallington.

Course Code	AGS664						
Course Title	Phytonematology						
Hours	30 L:1, T:0, P:1						
Credits	2						
Type	Interdepartmental elective Course						
Course Outcomes	<p>On the completion of the course, the student will gain the following knowledge and skills:</p> <p>CO1: Understand the general morphology and anatomy of plant parasitic nematodes</p> <p>CO2: Understand the classification of plant parasitic nematodes</p> <p>CO3: Understand the various types of diseases caused by plant parasitic nematodes</p> <p>CO4: Understand various methods used for management of plant parasitic nematodes</p>						
Examination Type	Theory+ Practical						
Assessment Tools	Written Quiz	Assignment/Project Work	MSE	MSP	ESE	ESP	ABL/PBL
Weightage	10%	0	0	20%	35%	30%	5%
Syllabus	UNIT I (6 hours) History, morphology and anatomy of body wall, digestive, reproductive, excretory and nervous system; body cavity						CO1
	UNIT II (5 hours) Taxonomic concepts, classification with emphasis on Phyto nematodes, nematological techniques						CO2
	UNIT III (4 hours) Nematodes as pests of crops, nematode ecology and disease compels; nematode biology and physiology;						CO3
	UNIT IV (3 hours) Different methods of nematode management.						CO4

	<p>Practical (12 hours)</p> <p>Sampling and extraction techniques for endo and ecto-parasitic nematodes; counting estimation of soil populations; killing; fixing and preserving, preparing mounts; staining nematode in plant tissues; pathogenicity techniques; morphology studies of different body systems, drawing measurement of nematodes; identification of phyto- parasitic nematodes upto genetic level; familiarity with important nematode diseases and their control.</p>	
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Reference Books:

1. Barrington EJW. 1967. Invertebrate Structure and Function. Nelson, Nairobi.
2. Blackwelder RE. 1967. Taxonomy - A Text and Reference Book. John Wiley & Sons, New York.
3. Chen ZX, Chen SY & Dickson DW. 2004. Nematology: Advances and Perspectives. Vol. I. Nematode Morphology, Physiology and Ecology. CABI, Wallingford.

Course Code	AGS665						
Course Title	Insect vectors of plant viruses and other pathogens						
Hours	30 L:1, T:0, P:1						
Credits	2						
Type	Interdepartmental elective Course						
Course Outcomes	<p>On the completion of the course, the student will gain the following knowledge and skills:</p> <p>CO1: Understand the role of insect vectors, their mouth parts and ecology in relation to disease transmission</p> <p>CO2: Understand the transmission of plant viruses and fungal growth</p> <p>CO3: Understand the transmission of mycoplasma and bacterial pathogens</p> <p>CO4: Understand the epidemiology and management of plant diseases through vector management</p>						
Examination Type	Theory+ Practical						
Assessment Tools	Written Quiz	Assignment/Project Work	MSE	MSP	ESE	ESP	ABL/PBL
Weightage	10%	0	0	20%	35%	30%	5%
Syllabus	<p>UNIT I (5 hours)</p> <p>History of developments in the area of insects as vectors of plant pathogens. Important insect vectors and their characteristics; mouth parts and feeding processes of important insect vectors. Efficiency of transmission</p>						CO1
	<p>UNIT II (5 hours)</p> <p>Transmission of plant viruses and fungal pathogens. Relation between viruses and their vectors. Transmission of plant viruses by aphids, whiteflies, mealy bugs and thrips.</p>						CO2

	UNIT III (4 hours) Transmission of mycoplasma and bacteria by leaf hoppers and plant hoppers. Transmission of plant viruses by psyllids, beetles and mites	CO3
	UNIT IV (4 hours) Epidemiology and management of insect transmitted diseases through vector management.	CO4
	Practical (12 hours) Identification of common vectors of plant pathogens- aphids, leafhoppers, whiteflies, thrips, beetles, nematodes; culturing and handling of vectors; demonstration of virus transmission through vectors- aphids, leafhoppers and whiteflies	

Reference Books:

1. Basu AN. 1995. *Bemisia tabaci* (Gennadius) - Crop Pest and Principal Whitefly Viruses. Oxford & IBH, New Delhi.
2. HarrisKF and Maramarosh K. (Eds.). 1980. Vectors of Plant Pathogens. Academic Press, London.
3. Maramorosch K & Harris KF. (Eds.). 1979. Leafhopper Vectors and Plant Disease Agents. Academic Press, London.
4. Youdeovei A & Service MW. 1983. Pest and Vector Management in the Tropics. English Language Books Series, Longman, London.

Course Code	AGS666						
Course Title	Chemicals in Plant Disease Management						
Hours	45 L:2, T:0, P:1						
Credits	3						
Type	Interdepartmental elective Course						
Course Outcomes	<p>On the completion of the course, the student will gain the following knowledge and skills:</p> <p>CO1: Understand the history of pesticide development and to understand their classification</p> <p>CO2: Understand the role of various chemicals, botanicals and their different formulations in plant disease management</p> <p>CO3: Understand the handling, storage and precautions while using fungicides</p> <p>CO4: Understand various plant protection appliances and the environmental concern related to use of chemical plant protectants</p>						
Examination Type	Theory+ Practical						
Assessment Tools	Written Quiz	Assignment/Project Work	MSE	MSP	ESE	ESP	ABL/PBL
Weightage	10%	0	25%	25%	35%	0	5%
Syllabus	<p>UNIT I (10 hours)</p> <p>History and development of chemicals; definition of pesticides and related terms; advantages and disadvantages of chemicals. Classification of chemicals used in plant disease control and their characteristics.</p>						CO1
	<p>UNIT II (5 hours)</p> <p>Chemicals in plant disease control, viz., fungicides, bactericides, nematocides, antiviral chemicals and botanicals. Formulations, mode of action and application of different fungicides; chemotherapy and phytotoxicity of fungicides.</p>						CO2

	UNIT III (10 hours) Handling, storage and precautions to be taken while using fungicides; compatibility with other agrochemicals, persistence, cost-benefit ratio, factor affecting fungicides.	CO3
	UNIT IV (5 hours) General account of plant protection appliances; environmental pollution, residues and health hazards, fungicidal resistance in plant pathogens and its management.	CO4
	Practical (15 hours) Acquaintance with formulation of different fungicides and plant protection appliances. Formulation of fungicides, bactericides and nematocides; <i>in vitro</i> evaluation techniques, preparation of different concentrations of chemicals including botanical pesticides based on active ingredients against pathogens; persistence, compatibility with other agro-chemicals; detection of naturally occurring fungicide resistant mutants of pathogen; methods of application of chemicals.	

Reference Books

1. Bindra OS & Singh H. 1977. Pesticides - An Application Equipment. Oxford & IBH, New Delhi.
2. Nene YL & Thapliyal PN. 1993. Fungicides in Plant Disease Control. 3rd Ed. Oxford & IBH, New Delhi.
3. Torgeson DC (Ed.). 1969. Fungicides. Vol. II. An Advanced Treatise. Academic Press, New York.
4. Vyas SC. 1993. Handbook of Systemic Fungicides. Vols. I-III. Tata McGrawHill, New Delhi.

Course Code	AGS667						
Course Title	Ecology of soil-borne pathogens						
Hours	45 L:2, T:0, P:1						
Credits	3						
Type	Interdepartmental elective Course						
Course Outcomes	<p>On the completion of the course, the student will gain the following knowledge and skills:</p> <p>CO1: Understand the importance of soil inhabiting plant pathogens and the importance of rhizosphere</p> <p>CO2: Understand the role of various biocontrol agents and their types</p> <p>CO3: Understand the role of inoculum density of the pathogen and various biocontrol mechanisms</p> <p>CO4: Understand the role of suppressive soils for the management of soil borne pathogens</p>						
Examination Type	Theory+ Practical						
Assessment Tools	Written Quiz	Assignment/Project Work	MSE	MSP	ESE	ESP	ABL/PBL
Weightage	10%	0	25%	25%	35%	0	5%
Syllabus	UNIT I (10 hours) Soil as an environment for plant pathogens, nature and importance of rhizosphere and rhizoplane, host exudates, soil and root inhabiting fungi.						CO1
	UNIT II (6 hours) Bio-control agents and their types.						CO2
	UNIT III (10 hours) Inoculum potential and density in relation to host and soil variables, competition, predation, antibiosis and fungistasis.						CO3
	UNIT IV (4 hours) Suppressive soils, biological control- concepts and potentialities for managing soil borne pathogens.						CO4

	<p>Practical (15 hours)</p> <p>Quantification of rhizosphere and rhizoplane microflora with special emphasis on pathogens; pathogenicity test by soil and root inoculation techniques, correlation between inoculum density of test pathogens and disease incidence, demonstration of fungistasis in natural soils; suppression of test soil-borne pathogens by antagonistic microorganisms. Isolation and identification of different biocontrol agents.</p>	
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Reference Books:

1. Baker KF & Snyder WC. 1965. Ecology of Soil-borne Plant Pathogens. John Wiley, New York.
2. Cook RJ & 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 & Waller JM. 1997. Soil-borne Diseases of Tropical Crops. CABI, Wallington.
5. Parker CA, Rovira AD, Moore KJ & Wong PTN. (Eds). 1983. Ecology and Management of Soil-borne Plant Pathogens. APS, St. Paul, Minnesota.

Course Code	AGS668						
Course Title	Disease resistance in plants						
Hours	30 L: 2, T:0, P: 0						
Credits	2						
Type	Interdepartmental elective Course						
Course Outcomes	<p>On the completion of the course, the student will gain the following knowledge and skills:</p> <p>CO1: Understand the process of infection and sources of resistance in germplasm</p> <p>CO2: Understand the type of resistance, physiological races of pathogens and selection pressure</p> <p>CO3: Understand the various types of structural and biochemical defense mechanisms in plants</p> <p>CO4: Understand the gene for gene concept and deployment of resistance genes for plant disease management</p>						
Examination Type	Theory						
Assessment Tools	Written Quiz	Assignment/Project Work	MSE	MSP	ESE	ESP	ABL/PBL
Weightage	10%	10%	25%	0	50%	0	5%
Syllabus	<p>UNIT I (10 hours)</p> <p>Introduction and historical development, dynamics of pathogenicity, process of infection, variability in plant pathogens, gene centers as sources of resistance, disease resistance terminology.</p>						CO1
	<p>UNIT II (5 hours)</p> <p>Disease escapes, disease tolerance, disease resistance, types of resistance, identification of physiological races of pathogens, disease progression in relation to resistance, stabilizing selection pressure in plant pathogens</p>						CO2

	UNIT III (5 hours) Host defense system, morphological and anatomical resistance, preformed chemicals in host defense, post infection chemicals in host defense, phytoalexins, hypersensitivity and its mechanisms.	CO3
	UNIT IV (10 hours) Gene-for-gene concept, protein-for-protein and immunization basis, management of resistance genes. Strategies for gene deployment.	CO4

Reference Books:

1. Deverall BJ. 1977. Defence Mechanisms in Plants. Cambridge Univ. Press, Cambridge, New York.
2. Mills Dallice et al. 1996. Molecular Aspects of Pathogenicity and Resistance: Requirement for Signal Transduction. APS, St Paul, Minnesota.
3. Parker J. 2008. Molecular Aspects of Plant Diseases Resistance. Blackwell Publ. 4. Robinson RA. 1976. Plant Pathosystems. Springer Verlag, New York.
5. Singh BD. 2005. Plant Breeding – Principles and Methods. 7th Ed. Kalyani Publ., Ludhiana
6. Van der Plank JE. 1975. Principles of Plant Infection. Academic Press, New York.
7. Van der Plank JE. 1978. Genetic and Molecular Basis of Plant Pathogenesis. Springer Verlag. New York.

Course Code	AGS669						
Course Title	Epidemiology and forecasting of plant diseases						
Hours	45 L:2, T:0, P:2						
Credits	3						
Type	Interdepartmental elective Course						
Course Outcomes	<p>On the completion of the course, the student will gain the following knowledge and skills:</p> <p>CO1: Understand the development of epidemics and their importance from historic perspective</p> <p>CO2: Understand the mathematical models in plant disease epidemiology</p> <p>CO3: To asses crop losses and understand the role of surveillance in minimizing the probability of epidemics</p> <p>CO4: Understand the importance of plant disease forecasting for minimizing epidemic spread</p>						
Examination Type	Theory+ Practical						
Assessment Tools	Written Quiz	Assignment/Project Work	MSE	MSP	ESE	ESP	ABL/PBL
Weightage	10%	0	25%	25%	35%	0	5%
Syllabus	UNIT I (10 hours) Epidemic concept and historical development, pathometry and crop growth stages, epidemic and analysis.						CO1
	UNIT II (5 hours) Common and natural logarithms, function fitting area under disease progress curve and correction factors, inoculum dynamics, population biology of pathogens, temporal spatial variability in plant pathogens.						CO2
	UNIT III (5 hours) Survey, surveillance and vigilance, crop loss assessment and models for prediction of crop losses.						CO3

	UNIT IV (10 hours) Principles and pre-requisites of forecasting, systems and factors affecting various components of forecastings, some early forecasting, and procedures based on weather and inoculum potential, modeling disease growth and disease prediction.	CO4
	Practical (10 hours) Measuring diseases, spore dispersal and trapping, weather recording, survey, multiplication of inoculum, computerized data analysis, function fitting, model preparation and validation.	

Reference Books:

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

Course Code	AGS670						
Course Title	Integrated disease management						
Hours	45 L:2, T:0, P:2						
Credits	3						
Type	Interdepartmental elective Course						
Course Outcomes	<p>On the completion of the course, the student will gain the following knowledge and skills:</p> <p>CO1: Understand the concepts and tools of plant disease management</p> <p>CO2: Understand the various components of integrated plant disease management</p> <p>CO3: Understand the development of IDM modules</p> <p>CO4: Understand the importance of IDM in management of diseases in different crops</p>						
Examination Type	Theory+ Practical						
Assessment Tools	Written Quiz	Assignment/Project Work	MSE	MSP	ESE	ESP	ABL/PBL
Weightage	10%	0	25%	25%	35%	0	5%
Syllabus	UNIT I (10 hours) Introduction, definition, concept and tools of disease management						CO1
	UNIT II (10 hours) Components of integrated disease management- their limitations and implications.						CO2
	UNIT III (6 hours) Development of IDM- basic principles, biological, chemical and cultural diseasemanagement.						CO3
	UNIT IV (4 hours) IDM in important crops- rice, wheat, cotton, sugarcane, chickpea, rapeseed mustard, pearl millet, <i>kharif</i> pulses, vegetable crops and fruit crops.						CO4

	Practical (15 hours) Application of biological, cultural, chemical and biocontrol agents, their compatibility and integration in IDM; demonstration of IDM in certain crops as project work.	
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Reference Books:

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

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Course Code	CSA559						
Course Title	Computer Fundamentals and Programming						
Hours	60 L:2, T:0, P:2						
Credits	3						
Type	Supporting Course						
Course Outcomes	<p>On the completion of the course, the student will gain the following knowledge and skills:</p> <p>CO1: Understand the computer fundamentals, representation of integers, character representation, ASCII and EBCDIC</p> <p>CO2: Understand the functional units of computer, I/O devices, primary and secondary memories. Programming fundamentals, Constants and variables; Arithmetic expressions, assignment statement, logical expression.</p> <p>CO3: Understand the Sequencing, alteration and iteration; Arrays, string processing. Sub-programs, recursion, pointers and files.</p> <p>CO4: Understand the program correctness; Debugging and testing of programs.</p>						
Examination Type	Theory + Practical						
Assessment Tools	Written Quiz	Assignment/Project Work	MSE	MSP	ESE	ESP	ABL/PBL
Weightage	10%	0	25%	0	35%	25%	5%
Examination Mode	Theory + Practical						
Syllabus	Unit 1: (8 hours) Computer Fundamentals - Number systems: decimal, octal, binary and hexadecimal; Representation of integers, fixed and floating-point numbers, character representation; ASCII, EBCDIC.						CO1
	Unit 2: (8 hours) Functional units of computer, I/O devices, primary and secondary memories. Programming Fundamentals with C - Algorithm, techniques of problem solving, flowcharting, stepwise refinement; Representation of integer, character, real, data types; Constants and variables; Arithmetic expressions, assignment statement, logical expression.						CO2
	Unit 3: (7 hours) Sequencing, alteration and iteration; Arrays, string processing. Sub-programs, recursion, pointers and files.						CO3

	Unit 4: (7 hours) Program correctness; Debugging and testing of programs.	CO4
	Practical (30 hours) Conversion of different number types; Creation of flow chart, conversion of algorithm/flowchart to program; Mathematical operators, operator precedence; Sequence, control and iteration; Arrays and string processing; Pointers and File processing.	

Suggested Readings

1. Goel, A. (2010). Computer fundamentals, Pearson publishers.
2. Wempen, F. (2015) Computing Fundamentals: Introduction to Computers. John Willey & Sons Inc