BRAWIJAYA UNIVERSITY

FACULTY OF AGRICULTURE

DEPARTMENT OF PLANT PESTS AND DISEASES / MASTER OF AGRICULTURAL ENTOMOLOGY STUDY PROGRAM

SEMESTER COURSE PLAN

COURSES	CODE	CLUSTERS OF COURSES	CREDITS	SEMESTER	Date of Preparation
Insect Pathology	PTH86217	Agricultural Entomology	2 4.15 ECTS	Even	JULY 29, 2021

AUTHORIZATION	Course Developer Lecturer	Course Coordinator	Head of Study Program
Department of Plant Pests and Diseases	Dr. Ir. Aminudin Afandhi, MS Dr. Ir. Sri Karindah, MS	Name Signature	Akhmad Rizali, SP, M.Si, Ph.D Signature

Learning Outcomes	ILO STUDY PROGRAM	
	1	Able to work together and have social sensitivity and high concern for society and the environment. Knowledge
	2	Mastering concepts, theories and methods in the field of agricultural entomology

	3	Mastering the concept of integrated pest management in the context of sustainable agriculture
	Course Learning Outcome	
	1	Students are able to develop knowledge about insect pathology
	2.	Students are able to manage research on insect pathology
Brief Description of Course	1. The Insect Pathology course includes biological disciplines and entomology sub-disciplines that explore and develop disease science in insects and mites. The material studied includes: potentials, constraints, and solutions for the utilization of various insect pathogen species in IPM in agroecosystems.	
Learning Material / Subject	1. Introduction 2. Basic elements of insect pathology I 3. Basic Elements of Insect Pathology II 4. Microbial control principles and Bacterial Epizootiology 5. Principles of microbial control and Epizootiology of Nematodes 6. Microbial control principles and Fungal Epizootiology 7. Principles of microbial control and Epizootiology of Viruses and Protozoa 8. UTS 9. Bacteria as Insect Pathogens 10. Fungi as Insect Pathogens 11. Viruses and Protozoa as Insect Pathogens 12. Nematodes as Insect Pathogens 13. Mechanism and Management of insect resistance to insect pathogens 14. Regulation of legality of utilization of biological control agents 15. Prospects for insect pathogens in Integrated Pest Management	

Relationship Beetween ILO and CLO

	ILO1	**ILO2**	**ILO3**	ILO4	ILO5	ILO6	ILO7
CLO1	0.25	0.5	0.25	0	0	0	0
CLO2	0.5	0	0.5	0	0	0	0

References

Main

1. Ehlers RU. 2011. Regulation of Biological Control Agents. Springer
2. Roy HE, Vega FE, Chandler D, Goettel MS, Pell J, Wajnberg E. 2010. The Ecology of Fungal Entomopathogens. Springer
3. Abdel-Raheem M. 2021. Entomopathgenic Fungi and Their Mode of Action. LAP LAMBERT Academic Publishing.
4. Gaugler R. 2002. Entomopathogenic Nematology. CABI
5. Morales-Ramos JA. 2022. Mass Production of Beneficial Organisms: Invertebrates and Entomopathogens. 2ndEdition. Academic Press

Supporting References

1) Afandhi A, Choliq FA, Fernando I, Marpaung YMAN, Setiawan Y. 2022. Occurrence of soil-inhabiting entomopathogenic fungi within a conventional and organic farm and their virulence against Spodoptera litura. Biodiversity: Journal of Biological Diversity, 23(2).
2) Hadi MS, Taufiqurrahman AF, Choliq FA, Istiqomah I, Karindah S. 2020. Pathogenicity of Entomophatogenic Fungi Lecanicillium lecanii Against Predator Insect Menochilus Sexmaculatus. TROPICAL PLANTA: Journal of Agrosciences 8(2): 63-68.

Learning Media	**Software:**	**Hardware:**
		Computer, LCD

Team Teaching	Dr. Ir. Aminudin Afandhi, MS. Dr. Ir. Sri Karindah, MS.
Required Courses	-

Week	Sub-CLO (as expected final capability)	Indicators	Criteria & Forms of Assessment	Learning Methods (Lectures / Assignments / other forms of learning)	Time (Duration)	Learning Materials / [References]	Proportion (%)
1	Students are able to master knowledge about the scope of	Accuracy in responding to learning material, following learning	Criteria: The accuracy of students in	Lectures and discussion	100 minutes	Introduction: (History, Definition, Scope,	5%

	material in insect pathology	activities and re-explaining insect pathology in general d	explaining systematically about the history, understanding, scope, and benefits of insect pathology Form of assessment: active participation in class, accuracy in responding and opinion in discussions		Self-Study (2x60 minutes)	and Benefits of Insect Pathology) Book: Steinhaus E. 1956. Microbial control—the emergence of an idea. A brief history of insect pathology through the nineteenth century. Hilgardia 26(2):107-160. Steinhaus E. 1963. indicated that the basic elements of insect pathology embrace. Tarasco E, Luca F. 2021. Biological Control and Insect Pathology Vega, Fernando & Rich, Harry. (2012). Insect	

						Pathology, Second Edition.	
2	Students are able to master knowledge about understanding the basic elements of insect pathology	Accuracy in responding to learning materials, following learning activities and describing the basic elements of insect pathology related to insect pathology agents, host insect range, epizootics and enzootics and carrying out tasks	Criteria: The accuracy of students explaining systematically about insect pathology agents, the range of host insects, epizootics and enzootics Form of assessment: Accuracy of response and opinion in discussions	Lectures and discussion	100 minutes Self-study (2x60 minutes)	Basic elements of insect pathology I: (Insect pathology agents, host insect range, epizootic and enzootic) Book: Steinhaus E. 1956. Microbial control—the emergence of an idea. A brief history of insect pathology through the nineteenth century. Hilgardia 26(2):107-160. Steinhaus E. 1963. indicated that the basic elements of insect pathology embrace.	5%

						Tarasco E, Luca F. 2021. Biological Control and Insect Pathology Vega, Fernando & Rich, Harry. (2012). Insect Pathology, Second Edition.	
3	Students are able to master knowledge about the blood element of insect pathology	Accuracy in responding to learning material, following learning activities and describing the basic elements of insect pathology such as virulence, pathogenicity, pathogenesis, symptomatology and carrying out tasks	Criteria: Students are able to explain systematically about Virulence, Pathogenicity, Pathogenesis, and Symptomatology of insect pathogens Form of assessment: Assignment	Discussion	100 minutes Self-study (2x60 minutes)	Basic elements of insect pathology II: (Virulence, Pathogenicity, Pathogenesis, Symptomatology) Book: Steinhaus E. 1956. Microbial control—the emergence of an idea. A brief history of insect pathology through the nineteenth	5%

						century. Hilgardia 26(2):107-160. Steinhaus E. 1963. indicated that the basic elements of insect pathology embrace. Tarasco E, Luca F. 2021. Biological Control and Insect Pathology Vega, Fernando & Rich, Harry. (2012). Insect Pathology, Second Edition.	
4	Students are able to master knowledge about the principles of microbial control and Bacterial Epizootiology	Accuracy in responding to learning materials, following learning activities and describing the principles of microbial control	Criteria: The accuracy of students explaining systematically about the principles of microbial control and	Discussion	100 minutes Self-study (2x60 minutes)	Microbial control principles and Bacterial Epizootiology Book: Steinhaus E. 1956. Microbial control—	5%

		and bacterial epizootiology, as well as carrying out tasks	Bacterial Epizootiology against insects Form of assessment: Quizzes and assignments			the emergence of an idea. A brief history of insect pathology through the nineteenth century. Hilgardia 26(2):107-160. Steinhaus E. 1963. indicated that the basic elements of insect pathology embrace. Tarasco E, Luca F. 2021. Biological Control and Insect Pathology Vega, Fernando & Rich, Harry. (2012). Insect Pathology, Second Edition.	
5	Students are able to master knowledge about the principles of microbial control	Accuracy in responding to learning materials,	Criteria: The accuracy of students explains	Lectures and discussion	100 minutes	Principles of microbial control and Epizootiology of Nematodes	5%

	and Nematode Epizootiology	following learning activities and describing the principles of microbial control and Nematode Epizootiology and carrying out tasks	systematically about the principles of microbial control and Epizootiology of Nematodes against insects Form of assessment: tasks		Self-study (2x60 minutes)	Book: Steinhaus E. 1956. Microbial control—the emergence of an idea. A brief history of insect pathology through the nineteenth century. Hilgardia 26(2):107-160. Steinhaus E. 1963. indicated that the basic elements of insect pathology embrace. Tarasco E, Luca F. 2021. Biological Control and Insect Pathology Vega, Fernando & Rich, Harry. (2012). Insect Pathology, Second Edition.	

6	Students are able to master knowledge about the principles of microbial control and Fungal Epizootiology	Accuracy in responding to learning materials, following learning activities and describing the principles of microbial control and Fungal Epizootiology and carrying out tasks	Students are able to explain the principles of microbial control and fungal epizootiology against insects Form of assessment: assignment	Discussion	100 minutes Self-study (2x60 minutes)	Microbial control principles and Fungal Epizootiology Book: Steinhaus E. 1956. Microbial control—the emergence of an idea. A brief history of insect pathology through the nineteenth century. Hilgardia 26(2):107-160. Steinhaus E. 1963. indicated that the basic elements of insect pathology embrace. Tarasco E, Luca F. 2021. Biological Control and Insect Pathology Vega, Fernando & Rich, Harry.	5%

						(2012). Insect Pathology, Second Edition.	
7	Students are able to master knowledge about the principles of microbial control and Epizootiology of Viruses and Protozoa	Accuracy in responding to learning materials, following learning activities, and describing the principles of microbial control and Epizootiology of Viruses and Protozoa	Criterion: The accuracy of students explaining the principles of microbial control and Epizootiology of Viruses and Protozoa against insects Assessment form: Quizzes and assignments	Discussion	100 minutes Self-study (2x60 minutes)	Principles of microbial control and Epizootiology of Viruses and Protozoa Book: Steinhaus E. 1956. Microbial control—the emergence of an idea. A brief history of insect pathology through the nineteenth century. Hilgardia 26(2):107-160. Steinhaus E. 1963. indicated that the basic elements of insect pathology embrace. Tarasco E, Luca F. 2021. Biological	5%

						Control and Insect Pathology Vega, Fernando & Rich, Harry. (2012). Insect Pathology, Second Edition.	
8	Midterm Exam						
9	Students are able to master knowledge about bacteria as insect pathogens	Accuracy in responding to learning materials, participating in learning activities and examining the use of bacteria as insect pathogens and carrying out tasks	Criterion: The accuracy of students explaining examples of insect pathogenic bacterial species and insect pathogenic bacteria propagation techniques	Discussion	100 minutes Self-study (2x60 minutes)	Bacteria as Insect Pathogens: (examples of insect pathogenic bacterial species and propagation techniques) Book: Steinhaus E. 1956. Microbial control—the emergence of an idea. A brief history of insect pathology through the nineteenth century. Hilgardia 26(2):107-160.	

			Form of assessment: assignment			Steinhaus E. 1963. indicated that the basic elements of insect pathology embrace. Tarasco E, Luca F. 2021. Biological Control and Insect Pathology Vega, Fernando & Rich, Harry. (2012). Insect Pathology, Second Edition.	
10	Students are able to master knowledge about understanding fungi as insect pathogens	Accuracy in responding to learning materials, following learning activities and understanding of fungi as insect pathogens and carrying out tasks	Criterion: The accuracy of students explaining examples of insect pathogenic fungal species and insect pathogenic fungus	Discussion	100 minutes Self-study (2x60 minutes)	Fungi as Insect Pathogens: (examples of insect pathogenic fungal species and propagation techniques) Book: Steinhaus E. 1956. Microbial control—	5%

			propagation techniques Form of assessment: assignment			the emergence of an idea. A brief history of insect pathology through the nineteenth century. Hilgardia 26(2):107-160. Steinhaus E. 1963. indicated that the basic elements of insect pathology embrace. Tarasco E, Luca F. 2021. Biological Control and Insect Pathology Vega, Fernando & Rich, Harry. (2012). Insect Pathology, Second Edition.	
11	Students are able to master knowledge about viruses and	Accuracy in responding to learning materials,	Criteria: The accuracy of students explaining	Discussion	100 minutes	Viruses and Protozoa as Insect Pathogens:	5%

	protozoa as insect pathogens	following learning activities and re-explaining viruses and protozoa as insect pathogens and	examples of virus species and insect pathogenic protozoa and propagation techniques for viruses and insect pathogenic protozoa Form of assessment: assignment		Self-study (2x60 minutes)	(examples of viral species and insect pathogenic protozoa and propagation techniques) Book: Steinhaus E. 1956. Microbial control—the emergence of an idea. A brief history of insect pathology through the nineteenth century. Hilgardia 26(2):107-160. Steinhaus E. 1963. indicated that the basic elements of insect pathology embrace. Tarasco E, Luca F. 2021. Biological Control and Insect Pathology	

						Vega, Fernando & Rich, Harry. (2012). Insect Pathology, Second Edition.	
12	Students are able to master knowledge about nematodes as insect pathogens	Accuracy in responding to learning materials, following learning activities and skills to explain nematodes as insect pathogens and carrying out tasks	Criteria: The accuracy of students explaining examples of insect pathogenic nematode species and insect pathogenic nematode propagation techniques Form of assessment: assignment	Discussion, Practicum	100 minutes Self-study (2x60 minutes)	Nematodes as Insect Pathogens: (examples of insect pathogenic Nematode species and propagation techniques) Book: Steinhaus E. 1956. Microbial control—the emergence of an idea. A brief history of insect pathology through the nineteenth century. Hilgardia 26(2):107-160. Steinhaus E. 1963. indicated that the basic elements of	5%

						insect pathology embrace. Tarasco E, Luca F. 2021. Biological Control and Insect Pathology Vega, Fernando & Rich, Harry. (2012). Insect Pathology, Second Edition.	
13	Students are able to master knowledge of the mechanism and management of insect resistance to Insect Pathogens	Accuracy in responding to learning materials, following learning activities and skills explaining the mechanism and management of insect resistance to insect pathogens	Criterion: The accuracy of students explaining the mechanism and management of insect resistance to insect pathogens Form of assessment:	Discussion	100 minutes Self-study (2x60 minutes)	Mechanism and Management of insect resistance to insect pathogens Book: Steinhaus E. 1956. Microbial control—the emergence of an idea. A brief history of insect pathology through the nineteenth century. Hilgardia 26(2):107-160.	5%

			Task, Accuracy of response, and opinion in discussions			Steinhaus E. 1963. indicated that the basic elements of insect pathology embrace. Tarasco E, Luca F. 2021. Biological Control and Insect Pathology Vega, Fernando & Rich, Harry. (2012). Insect Pathology, Second Edition.	
14	Students are able to master and apply regulations on the legality of the use of biological control agents	Accuracy in responding to learning materials, participating in learning activities, mastering, and implementing regulations on the legality of the	Criteria: The accuracy of students applying regulations on the legality of the use of biological control agents	Discussion	100 minutes Self-study (2x60 minutes)	Regulation of Biological Control Agents. Ralf-Udo Ehlers. Editor 2011. Springer.	5%

		use of biological control agents	Form of assessment: assignment				
15	Students are able to master knowledge about the prospects of insect pathogens in integrated pest management	Accuracy in responding to learning materials, participating in learning activities and visionary thinking about the prospects of insect pathogens in IPM.	Criterion: The accuracy of students explains how the prospects for conventional research, biotechnology research, and local insect pathogen industries in Integrated Pest Management Form of assessment: Assignment	Lectures and Discussion	100 minutes Self-study (2x60 minutes)	Prospects for insect pathogens in Integrated Pest Management: (Conventional research, biotechnology research, and local insect pathogen industry) Book: Steinhaus E. 1956. Microbial control—the emergence of an idea. A brief history of insect pathology through the nineteenth century. Hilgardia 26(2):107-160.	5%

						Steinhaus E. 1963. indicated that the basic elements of insect pathology embrace. Tarasco E, Luca F. 2021. Biological Control and Insect Pathology Vega, Fernando & Rich, Harry. (2012). Insect Pathology, Second Edition.	
16	Final Exam						