BRAWIJAYA UNIVERSITY

FACULTY OF AGRICULTURE

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

SEMESTER COURSE PLAN

COURSES	CODE	CLUSTERS OF COURSES	CREDITS	SEMESTER	Date of Preparation
Agricultural Acarology	PTH82243	Agricultural Entomology	2 2,98 ECTS	Even	8 July 2021

AUTHORIZATION	Course Developer Lecturer	Course Coordinator	Head of Study Program
Department of Plant Pests and Diseases	Prof. Dr. Ir. Retno Dyah Puspitarini, MS. Prof. Dr. Ir. Aminudin Afandhi, MS.	Name Signature	Dr. Akhmad Rizali, SP., M.Si. Signature

Learning Outcomes	ILO STUDY PROGRAM	
	1	Mastering concepts, theories and methods in the field of agricultural entomology
	2	Have skills in developing the concept of development in agriculture, especially continuous plant pest control.
	3	Have skills in developing innovations and applications that are tested for problem solving in the community in the field of agricultural entomology in an inter/multidisciplinary manner within the framework of sustainable agriculture.
	COURSE LEARNING OUTCOME	
	1	Students are expected to be able to develop ideas about Acarology in general and the importance of Acarology in agriculture
	2	Students are expected to be able to understand the morphology and biology of mites
	3	Students are expected to be able to analyze the bioecology of important phytophagous mites and their natural enemies
	4	Students are expected to be able to apply and evaluate various integrated mite management
Brief Description of Course	This course discusses the scope of acarology; the history of the development of acarology, the importance of acarology in agriculture, the systematics of acarology, morphology and function of physiology and anatomy, reproduction, bioecology of important phytophage mites, natural enemies of pest mites, history of IPM and biological control, the role of plant quarantine, control of	

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<tr><td></td><td>technical culture, and genetic control, chemical control, acaricidal resistance, IPM of food crop mites, horticulture, plantations and in greenhouses/interiors.</td></tr>
<tr><td>Learning Material / Subject</td><td>1) Introduction (history of the development of acarology, significance of acarology in agriculture, acarology systematics)
2) Morphology and function (outer and inner body of the mite)
3) Reproduction and embryogenesis (reproduction, embryogenesis,oviposition, life cycle, behavior and habitat)
4) Bioecology of important phytophage mites (Family Tetranichydae, Eriophyidae, and Tarsonemidae)
5) Bioecology of important phytophage mites (Family Tarsonemidae, Tenuipalpidae, and Acaridae)
6) Bioecology of mites-t,phytophage of important phytophages (mites in greenhouses and sheds) and soil mites
7) Natural enemies of pest mites (Bioecology of predatory mites, predatory insects and entomo-acaripathogens)
8) History of IPM and Biological Control: Classical, Augmentative and Conservation (Case Study of Mites)
9) The Role of Plant Quarantine, Technical Culture Control, and Genetic Control
10) Chemical Control: Classification of acaricides, Insecticides as Acaricides, Types of acaricides
11) Acaricidal resistance: Definition and mechanism, and resistance management
12) IPM of food and plantation plant mites
13) IPM mite horticultural plants: vegetables, fruits and flowers
14) IPM mites in greenhouses and interior spaces (indoor plants)</td></tr>
<tr><td>Relationship of CLO and ILO</td><td>
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<tr><td rowspan="4">Book</td><td>Main</td></tr>
<tr><td>1) Krantz GW, Walter DE. 2009. A Manual of Acarology 3rd Edition.
2) Hoy MA. 2016. Agricultural Acarology. Introduction to Integrated Mite Management.
3) Dhooria MS. 2016. Fundamentals of Applied Acarology.
4) Gerson U, Smiley RL, Ochoa R. 2003. Mites (Acari) for Pest Control.
5) Zhang ZQ. 2003. Mites of Greenhouses: Identification, Biology and Control.
6) Lindquist EE. 2011. Eriophyoid Mites: Their Biology, Natural Enemies and Control.
7) Vacante V. 2016. Handbook of Mites of Economic Plants: Identification, Bio-ecology and Control.</td></tr>
<tr><td>Supporting references</td></tr>
<tr><td>1) Puspitarini RD, Fernando I, Rachmawati R, Hadi MS. 2021. Host plant variability affects the development and reproduction of Tetranychus urticae. International Journal of Acarology 47(5): 381-386.
2) Puspitarini RD, Fernando I, Widjayanti T, Purwanti RA, Munthe SS, Wildaniyah U. 2021. Development and reproduction of Rhizoglyphus robini Claparéde (Astigmata: Acaridae), an emerging pest in Indonesia, on six host plants. International Journal of Acarology 47(8): 695-700.
3) Puspitarini RD, Fernando I, Sianturi YPPA, Rachmawati R. Compatibility of Jatropha curcas seed extract and entomopathogenic fungus Akanthomyces lecanii against the citrus red mite Panonychus citri. Biocontrol Science and Technology 32(3): 299-313.
4) Ihsan M, Puspitarini RD, Afandhi A, Fernando I. 2021. Abundance and diversity of edaphic mites (Arachnida, Acari) under different forest management systems in Indonesia. Biodiversitas 22(9): 3685-3692</td></tr>
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Learning Media	**Software:**	**Hardware:**
		Computer, LCD
Team Teaching	Dr. Ir. Retno Dyah Puspitarini, MS. Dr. Ir. Aminudin Afandhi, MS.	
Required Courses	1) NA	

Week to -	**Sub-CLO (as expected final capability)**	**Indicator**	**Criteria & Forms of Assessment**	**Learning Methods (Lectures / Assignments / other forms of learning)**	**Time (Duration)**	**Learning Materials / [References]**	**Proportion (%)**
1	Students are able to develop thinking: ● Scope of Acarology ● The history of the development of Acarology	Ability to respond to learning material, follow learning activities about the scope of acarology and the history of acarology.	Criteria: Form of Assessment: discussion	Method: Lectures and discussions	100 minutes	The scope of acarology in general; the history of the development of acarology; the importance of acarology in agriculture;	5 %

	● The significance of Acarology in agriculture ● Acarological Systematics					acarological systematics.	
2	Students are able to develop morphological thinking and body functions	Ability to respond to learning material,follow learning activities about morphology and body functions	Criterion: Form of assessment: discussion	Lectures and discussions Self-study	100 minutes Self-study (2x60 minutes)	Morphology and function of the outer and inner body of the mite	5%
3	Students are able to develop thoughts about reproduction and embryogenesis	Ability to develop thinking about reproduction and embryogenesis	Criterion: Form of assessment:	Lectures and discussions Self-study	100 minutes Self-study (2x60 minutes):	Reproduction, embryogenesis, oviposition, life cycle, behavior and habitat.	5%

			Quizzes and assignments				
4	Students are able to develop thoughts about important phytophage mites (I)	The ability to respond to learning materials about phytophage mites is important (I)	Criterion: Form of assessment: Quizzes and assignments	Lectures and discussions Self-study	100 minutes Self-study (2x60 minutes):	Family Tetranichydae, Eriophyidae, and Tarsonemidae.	5%
5	Students are able to develop bioecological thinking of important phytophage mites (II)	The ability to respond to bioecological learning materials of phytophage mites is important (II)	Form of assessment: Quizzes and assignments	Lectures and discussions Self-study	100 minutes Self-study (2x60 minutes):	Family Tarsonemidae, Tenuipalpidae, and Acaridae.	5%
6	Students are able to develop bioecological	The ability to respond to learning materials, and	Form of assessment:	Discussion	100 minutes	mites in greenhouses and sheds	5%

	thinking of important phytophage mites (III)	participate in bioecological learning activities of phytophage mites is important (III)	Quizzes and assignments		Self-study (2x60 minutes):		
7	Students develop thoughts about the natural enemies of pest mites.	Ability to respond to learning materials, and participate in learning activities about the natural enemies of pest mites	Form of assessment: Quizzes and assignments	Discussion	100 minutes Self-study (2x60 minutes):	Bioecology of predatory mites, predatory insects, and entomo-acaripathogens.	5%
8	Mid-term exam						15%
9	Students are able to develop thoughts about the history of IPM and biological control	Ability to respond to learning materials, participate in IPM history learning activities and biological control	Form of assessment: Quizzes and assignments	Discussion	100 minutes Self-study (2x60 minutes):	Biological Control: Classical, Augmentative and Conservation	5%

10	Students are able to develop thoughts about quarantine, technical culture control, genetic control	Ability to respond to learning materials, participate in learning activitiesabout quarantine, technical culture control, genetic control	Form of assessment: Quizzes and assignments	Discussion	100 minutes Self-study (2x60 minutes):	Quarantine, technical culture control, genetic control.	5%
11	Students are able to develop Chemical Control thinking	Ability to respond to learning materials, follow learning activities about Chemical Control	Form of assessment: Quizzes and assignments	Discussion	100 minutes Self-study (2x60 minutes):	Chemical Control: Classification of acaricides, Insecticides as Acaricides, Types of Acaricides.	5%
12	Students are able to develop thoughts	Ability to respond to learning	Form of assessment:	Discussion	100 minutes	Acaricidal resistance:	5%

	about Acaricidal Resistance	material, follow learning activities about Acaricidal resistance	Quizzes and assignments		Self-study (2x60 minutes):	Definition and mechanism, resistance management, resistance evaluation.	
13	Students are able to develop thoughts about IPM mites of food crops and plantations	Ability to respond to learning materials, participate in learning activities about IPM food and plantation plant mites	Form of assessment: Quizzes and assignments	discussion	100 minutes Self-study (2x60 minutes):	IPM of food and plantation plant mites	5%
14	Students are able to develop thoughts about IPM mites of horticultural plants: vegetables, fruits, and flowers	Ability to respond to learning materials, follow learning activities about IPM horticultural plant mites: vegetables, fruits, and flowers	Form of assessment: Quizzes and assignments	Discussion	100 minutes Self-study (2x60 minutes):	IPM mite horticultural plants: vegetables, fruits and flowers	5%

15	Students are able to develop thoughts about IPM mites in greenhouses and interior spaces (indoor plants)	Ability to respond to learning materials, follow learning activities about IPM mites in greenhouses and interior spaces (indoor plants)	Form of assessment: Quizzes and assignments	Discussion	100 minutes Self-study (2x60 minutes):	IPM mites in greenhouses and interior spaces (indoor plants)	5%
16	Final Exam						15 %