

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	CREDIT (SKS)	SEMESTER	Date of Preparation
Plant Resistance to Pests	PTH81208	Agricultural Entomology	2 SKS 2.34 ECTS	Odd	Jul 26, 2021
AUTHORIZATION	Course Developer Lecturer	Course Coordinator		Head of Study Program	
Department of Plant Pests and Diseases	Prof. Dr. Ir. Bambang Tri Rahardjo, SU. Prof. Dr. Ir. Ludji Pantja Astuti, MS.	Name Signature		Dr. Akhmad Rizali, SP., M.Si. Signature	
Learning Outcomes	ILO STUDY PROGRAM				

S1	Able to work together and have social sensitivity and high concern for society and the environment
P1	Mastering concepts, theories and methods in the field of agricultural entomology
P2	Mastering the concept of integrated pest management in the context of sustainable agriculture
P3	Mastering the theory of biotechnology in controlling plant pests and managing plant resistance
COURSE LEARNING OUTCOME	
1.	Students are expected to be able to develop ideas about the meaning of pest-resistant plants, mechanisms of plant resistance and the role of resistant plants in Integrated Pest Management (IPM)
2.	Students are expected to be able to develop ideas about the types and classification of plant resistance to pests, mechanisms of plant resistance, and heritable genetic traits of resistant plants and biotic changes of resistant plants (co-evolution in resistant plants)
3.	Students are expected to be able to develop ideas about plant morphology and biochemical factors as the basis for plant resistance to pests and the factors that affect the expression of plant resistance to pests
4.	Students are expected to be able to develop ideas about techniques for measuring the level of plant resistance to pests and techniques for obtaining pest-resistant plants
5.	Students are expected to be able to develop ideas about the compatibility of resistant plants by farming/technical culture, biological control, biotechnology, and pesticides
6.	Students are able to solve problems regarding obstacles to obtaining multi/interdisciplinary resistant varieties in case studies of cereal crops, cotton, corn, and carrots

Brief Description of Course	<p>This course will discuss plant resistance, type and classification, resistance mechanism, measurement techniques, techniques for obtaining resistant plants, factors that affect plant resistance, compatibility with other control methods in Integrated Pest Management (IPM).</p>
Learning Material / Subject	<ol style="list-style-type: none"> 1) Introduction (definition, history of utilization and role of resistant plants in pest protection) 2) Types and Classification of Plant Resistance to Pests 3) Plant resistance mechanisms (Antixenosis, Antibiosis, and Tolerant) 4) Plant morphological and biochemical factors as the basis of plant resistance to pests 5) Technique of measuring the level of plant resistance to pests 6) Techniques for obtaining pest-resistant plants 7) Factors affecting the expression of plant resistance to pests 8) UTS 9) Genetic traits of heritable resistant plants and biotic changes of resistant plants (co-evolution in resistant plants) 10) Compatibility of resistant plants by means of farming / technical culture 11) Compatibility of resistant plants with biological control 12) Compatibility of resistant plants with biotechnology 13) Compatibility of resistant plants with pesticides 14) Case studies on cereal crops, cotton, corn, and carrots 15) General conclusions on the role of resilient crops in the future era of agricultural development 16) UAS

Relationship between CLO and ILO		S1	P1	P2	P3	U1	U2	K1
	CLO1	0.25	0.5	0.25	0.00	0.0	0.0	0.0
	CLO2	0.25	0.50	0.00	0.25	0.0	0.0	0.0
	CLO3	0.00	0.5	0.5	0.00	0.0	0.0	0.0
	CLO4	0.00	0.5	0.5	0.00	0.0	0.0	0.0
	CLO5	0.00	0.25	0.25	0.5	0.0	0.0	0.0
	CLO6	0.25	0.25	0.25	0.25	0.0	0.0	0.0

Book	Main	
-------------	-------------	--

1. Smith CM. 2005. Plant Resistance to Arthropods: Molecular and Coventional Approaches. Springer
2. Schaller A. 2008. Induced Plant Resistance to Herbivory. Springer.
3. Chakravarthy AK, Selvanarayanan V. 2019. Experimental Techniques in Host-Plant Resistance. Springer

	Supporting References	
	<ol style="list-style-type: none"> 1. Heinrichs, E. A. 1986. Perspectives and Directions for the continued development of insect-resistant rice varieties. <i>Agric. Ecosyst. Environ.</i> 18: 9–36. 2. Rahardjo, B. T., Achadian, E. M., Taufiqurrahman, A. F., Hidayat M. R. 2021. Silica Fertilizer (Si) Enhances Sugarcane Resistance to The Sugarcane Top Borer <i>Scirpophaga excerptalis</i> Walker. <i>Agrivita</i> 43(1): 37-42. 3. Astuti, L. P., Rizali, A., Firnanda, A., Widjayanti, T. 2020. Physical and chemical properties of flour product affect the development of <i>Tribolium castaneum</i>. <i>Journal of Stored Product Research</i> 86: 101555. 4. Astuti, L. P., Prabowo, P. P., Rizali, A., Mutala'liah, M. 2019. Collonization and Oviposition Preference of Six Weevil Species on Various Colors of Storage Container. <i>Indonesian Journal of Plant Protection</i> 23(2). 5. Astuti, L. P., Ramadhani, F. S., Sitanggang, H. A., Rizali, A., Setiawan, Y., Mutala'liah. 2021. Development of <i>Corcyra cephalonica</i> (Stainton) on six varieties of brown and milled rice. <i>Journal of Entomological Research</i> 45(3): 385-392. 6. Astuti, L. P., Rizali, A., Tanzilia, S. 2018. Seed coat and variety of peanut inhibits host preference and development of <i>Oryzaephilus mercator</i>. <i>Journal of Stored Product Research</i> 78: 98-104. 	
Learning Media	Software:	Hardware:
	Microsoft Windows and Microsoft Office, Video Conferencing Software	Computer, LCD, PC
Team Teaching	Prof. Dr. Ir. Bambang Tri Rahardjo, SU. Prof. Dr. Ir. Ludji Pantja Astuti, MS.	
Required Courses	-	

Week	Sub-CLO	Indicators	Assessment Criteria & Forms	Learning Methods	Duration (minutes)	Learning Materials [References]	Proportion (%)
-------------	----------------	-------------------	--	-------------------------	---------------------------	--	---------------------------

1	Students are able to develop thinking About Resistant Plants, History of Utilization and Role of Resistant Plants in Plant Protection	Ability to develop thinking Resistant plants, their history of use and role in pest control and play an active role in discussions.	<p>Criterion: The accuracy of students in explaining the understanding and history of the use of resistant plants and their roles</p> <p>Form of Assessment: Ability to respond and answer in discussions</p>	Lectures and discussions and independent assignments	<p>100 minutes</p> <p>Task 1 (2x60 minutes): summarize and develop lecture material by referring to the library</p>	Introduction: Definition, history of utilization and role of resistant plants in plant protection.	5 %
---	---	---	---	--	---	---	-----

2	Students are able to identify the type and classification of plant resistance to pests	Skills in correctly identifying the type and classification of plant resistance to pests.	<p>Criteria: The ability of students to identify the type and classification of plant resistance to pests appropriately</p> <p>Form of assessment: Accuracy in identifying the type and classification of plant resistance to pests</p>	Lectures and discussions and self-study	<p>100 minutes</p> <p>Self-study (2x60 minutes): Types and classification of plant resistance to pests</p>	Types and classification of plant resistance to pests: Classification of the level of resistance, functional resistance, genetic resistance.	5 %
---	--	---	---	---	--	---	-----

3	<p>Students are able to develop thinking The mechanism of plant resistance to pests</p>	<p>Ability to develop thinking mechanisms of plant resistance to pests and carrying out tasks</p>	<p>Criteria: Students are able to explain precisely the mechanism of plant resistance to pests</p> <p>Form of assessment: Presentation on the mechanism of resilience</p>	<p>Lectures, presentations, and discussions</p>	<p>100 minutes</p> <p>Self-study (2x60 minutes): The mechanism of plant resistance to pests</p>	<p>Describe the mechanisms of plant resistance of antixenosis, antibiosis, and tolerance.</p>	
---	---	---	---	---	---	---	--

4	Students are able to analyze plant morphological and biochemical factors as the basis for plant resistance to pests	Ability and accuracy in analyzing the factors causing the formation of plant resistance to pests	<p>Criteria: Students are able to explain accurately and analyze the role of plant physical and biochemical factors in plant resistance to pests</p> <p>Form of assessment: Assignment</p>	Lectures and discussions and self-study	<p>100 minutes</p> <p>Self-study (2x60 minutes): Physical and biochemical factors of plants as the basis of plant resistance to pests</p>	The role of plant physical and biochemical factors in plant resistance to pests	5 %
---	---	--	--	---	---	---	-----

5	Students are skilled in measuring the level of plant resistance to pests	Ability and skill to measure the level of plant resistance to pests	<p>Able to determine measurement techniques and measure the level of plant resistance to pests</p> <p>Form of assessment: assignment</p>	Lectures and discussions as well as Self-study	<p>100 minutes</p> <p>Self-study (2x60 minutes): Evaluation of the level of plant resistance to pests</p>	Techniques for measuring the level of plant resistance to pests with antixenosis, antibiotic and tolerant resistance mechanisms	5 %
---	--	---	--	--	---	---	-----

6	Students are able to develop and apply techniques to obtain plants resistant to pests	Ability to develop and apply techniques to obtain plants resistant to pests	Form of assessment: Assignment Able to plan and carry out stages to get plants resistant to pests	Lectures and discussions and self-study	100 minutes Self-study (2x60 minutes): Techniques for obtaining resistant plants	Components to obtain plants resistant to pests Include: personnel, insect biology, insect populations, genetic sources, breeding sources and techniques, error level testing, cross resistance priority, biotype, and key factors	5 %
---	---	---	---	---	--	---	-----

7	Students are able to analyze factors that affect the expression of plant resistance to pests	Ability to analyze factors affecting the expression of plant resistance to pests	Form of assessment: Presentation of factors affecting the systematic expression of plant resistance to pests.	Lectures, presentations and discussions as well as self-study	100 minutes Self-study (2x60 minutes): Factors affecting the expression of plant resistance to pests	Factors affecting the expression of plant resistance to pests (Plants, insects and the environment)	5 %
8	Mid-term exam						15%

9	Students are able to analyze and develop knowledge about biotic changes that cause pests in resistant plants (co-evolution)	ability to analyze and develop knowledge about biotic changes that cause pests in resistant plants (co-evolution)	<p>Criteria:</p> <p>ability to analyze and develop knowledge about biotic changes that cause pests in resistant plants (co-evolution)</p> <p>Form of assessment: Assignment</p>	Face-to-face, and discussion	<p>100 minutes</p> <p>Self-study (2x60 minutes)</p>	Biotic changes that cause pests in resistant plants (co-evolution)	5 %
---	---	---	---	------------------------------	---	--	-----

10	Students are able to design and develop compatibility in the use of resistant plants by means of planting / technical culture	Ability to construct compatibility of the use of resistant plants through farming / technical culture	<p>Criteria: The design results of compatibility in the use of resistant plants through farming / technical culture the right one</p> <p>Form of assessment: Assignment</p>	Discussion	<p>100 minutes</p> <p>Self-study (2x60 minutes): constructing compatibility of the use of resistant plants through farming / technical culture</p>	Compatibility of Utilization of Resistant Plants by Farming / Technical Culture	5 %
----	---	---	---	------------	--	---	-----

11	Students are able to design and develop resistant plant compatibility with biological control	ability to plan and design resistant plant compatibility with biological control	<p>Criteria: Design results of resistant plant compatibility with biological control the right one</p> <p>Form of assessment: Assignment</p>	Discussion	<p>100 minutes</p> <p>Self-study (2x60 minutes): planning and designing the compatibility of resistant plants with biological control</p>	Compatibility of resistant plants with biological control	5 %
----	---	--	--	------------	---	---	-----

12	Students are able to design and develop resistant plant compatibility with biotechnology	ability to plan and design compatibility of resistant plants with biotechnology	<p>Criteria: Able to convey ideas effectively and systematically about the results of planning the compatibility of resistant plants with biotechnology</p> <p>Form of assessment: presentation</p>	Discussions and presentations	<p>100 minutes</p> <p>Self-study (2x60 minutes): Prepare presentation materials</p>	Compatibility of resistant plants with biotechnology	5 %
----	--	---	---	-------------------------------	---	--	-----

13	Students are able to design and develop resistant plant compatibility with pesticide applications	ability to develop and design resistant plant compatibility with aesthetic applications	<p>Criteria: Able to convey ideas effectively and systematically about the results of planning the compatibility of resistant plants with aesthetic applications</p> <p>Form of assessment: Mperfection Planning Report Compatibility of Resistant Plants with Aesthetic Applications</p>	Discussion	<p>100 minutes</p> <p>Self-study (2x60 minutes): Create a planning report on the compatibility of pesticide-resistant crops</p>	Compatibility of resistant plants with pesticides	5 %
----	---	---	---	------------	---	---	-----

14	Students are able to analyze various case studies of crop resistance in cereal crops, cotton, corn, and carrots	Ability to conduct studies Case studies on crop resistance in cereal crops, cotton, corn, and carrots	Criteria: The depth of analysis and critical thinking contained in the case study report on crop resilience in cereal crops, cotton, corn, and carrots Form of assessment: Perfection of Case Study Report	Discussion	100 minutes Self-study (2x60 minutes): Create a case study report on crop resistance in cereal crops, cotton, corn, and carrots	Case studies of crop resistance in cereal crops, cotton, corn, and carrots	5 %
----	---	--	---	------------	---	--	-----

15	Students are able to develop general knowledge about the role of pest-resistant plants to support the realization of sustainable agriculture	Ability to write studies About the role of pest-resistant plants to support the realization of continued agriculture	Criteria: The depth of analysis and critical thinking contained in the ability to write studies on the role of pest-resistant plants to support the realization of sustainable agriculture Form of assessment: perfection in writing short articles	Discussion	100 minutes Self-study (2x60 minutes): reviewing journals on the latest issues of pest-resistant crops to support the realization of sustainable agriculture	General conclusions on the role of resistant crops in the future era of agricultural development	5 %
16	Final exam						15%