



**BRAWIJAYA UNIVERSITY**

**FACULTY OF AGRICULTURE**

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

**SEMESTER COURSE PLAN**

<b>COURSES</b>	<b>CODE</b>	<b>CLUSTERS OF COURSES</b>	<b>CREDIT (SKS)</b>	<b>SEMESTER</b>	<b>Date of Preparation</b>
Invasive Species Biology	PTH81243	Agricultural Entomology	2 SKS 2,34 ECTS	Odd	8 June 2021
<b>AUTHORIZATION</b>	<b>Course Developer Lecturer</b>		<b>Course Coordinator</b>		<b>Head of Study Program</b>
Department of Plant Pests and Diseases	Dr. Akhmad Rizali, SP., M.Si Dr. Agr.Sc. Hagus Tarno SP., MP. M. Akhid Syibli, SP., MP., Ph.D		Name  Signature		Dr. Akhmad Rizali, SP., M.Si.  Signature
<b>Learning Outcomes</b>	<b>ILO STUDY PROGRAM</b>				
	1	Able to work together and have social sensitivity and high concern for society and the environment.			
	2	Mastering concepts, theories and methods in the field of agricultural entomology			

	<b>Course Learning Outcome</b>	
	1	Students can develop, solve problems and manage research about invasive species in the world
	2	Students can develop, solve problems and manage research the adaptability of invasive species and their impacts
	3	Students can develop, solve problems and manage research about risk analysis of invasive species and invasive species control
<b>Brief Description of Course</b>	This course discusses invasive species in the world including adaptability and invasive nature, their effects on ecosystem balance, types of invasive species from plant, vertebrate, invertebrate and plant pathogen groups. In addition, prevention/ <i>biosecurity</i> efforts and risk analysis as well as detection, eradication, control principles and management of invasive species were also discussed.	
<b>Learning Material / Subject</b>	<ol style="list-style-type: none"> <li>1) Introduction (introduction to invasive species in the world)</li> <li>2) Invasive species: adaptability and invasive nature</li> <li>3) The influence of invasive species on ecosystem balance</li> <li>4) Invasive species of the plant group and their effects</li> <li>5) Invasive species of the vertebrate group</li> <li>6) Invasive species of the invertebrate group</li> <li>7) Invasive species of the microbial group (plant pathogens)</li> <li>8) <i>Biosecurity</i> and quarantine to prevent invasive species</li> <li>9) Invasive species risk analysis</li> <li>10) Early detection and warning of invasive species</li> <li>11) Eradication of invasive species</li> <li>12) Principles in the control of invasive species</li> <li>13) Biological control of invasive species</li> <li>14) Management of invasive species: public participation to international policy</li> </ol>	

<b>ILO and CLO Relationship</b>		A1	K1	K2	K3	S1	S2	S3
	CLO 1	0.5	0.5	0	0	0	0	0
	CLO 2	0	1	0	0	0	0	0
	CLO 3	0	1	0	0	0	0	0
<b>Book</b>	<b>Main</b>							
		<ol style="list-style-type: none"> <li>1. Pimentel. 2002. Biological invasions.</li> <li>2. Clout &amp; Williams. 2009. Invasive species management.</li> <li>3. Charles P. Wilcox and Randall B. Turpin. 2009. Invasive species : detection, impact, and control.</li> <li>4. Robinson AP, Walshe T, Burgman MA, Nunn M. 2017. Invasive Species: Risk Assessment and Management.</li> <li>5. Venette RC. 2015. Pest risk modelling and mapping for invasive alien species.</li> </ol>						
	<b>Supporting References</b>	<ol style="list-style-type: none"> <li>1) Jurnal Biological invasion: <a href="https://www.springer.com/journal/10530">https://www.springer.com/journal/10530</a></li> <li>2) Paini DR, Sheppard AW, Cook DC, Barro PJD, Worner SP, Thomas MB. 2016. Global threat to agriculture from invasive species. PNAS. 113:7575-7579</li> <li>3) Rizali A, Karindah S, Nugroho CT, Rahardjo BT. 2021. Similarity of ant communities increases with isolation from natural habitat and abundance of invasive ants in oil palm plantations of Central Borneo. Global Ecology and Conservation 28: e01690.</li> <li>4) Rizali A, Oktaviyani, Putri SDPS, Doananda M, Linggani A. 2021. Invasion of fall armyworm <i>Spodoptera frugiperda</i>, a new invasive pest, alters native herbivore attack intensity and natural enemy diversity. Biodiversitas 22: 3482-3488</li> </ol>						

	5) Rizali A, Hadi MS, Pudjianto P, Buchori D. 2019. A new trophic interaction between invasive weed, its biological control agent, and local insects: a case study of <i>Chromolaena odorata</i> . Biodiversitas 20: 1006-1011.	
<b>Learning Media</b>	<b>Software:</b>	<b>Hardware:</b>
		Computer, LCD
<b>Team Teaching</b>	Dr. Akhmad Rizali, SP., M.Si Dr. Agr.Sc. Hagus Tarno SP., MP.	
<b>Required Courses</b>	1) Tidak ada	

<b>Week</b>	<b>Sub-CLO (as expected final capability)</b>	<b>Indicator</b>	<b>Criteria &amp; Forms of Assessment</b>	<b>Learning Methods (Lectures / Assignments / other forms of learning)</b>	<b>Time (Duration)</b>	<b>Learning Materials / [References]</b>	<b>Proportion (%)</b>
1	Students have a comprehensive understanding of the world's invasive species	Ability to respond to learning materials, follow learning activities and skills to master theories about	Criteria:  Students' ability to develop thinking about	Method: Contextual Instruction	100 minutes  Task 1 (2x60 minutes)	Introduction (Summary/Overview )	5 %

		invasive species in the world	invasive species in the world  Form of Task: reviewing the number of invasive species in the world and their impacts	Lectures and discussions  Self-task			
2	Students are able to master theories about the adaptability and invasive nature of invasive species	Ability to respond to learning materials, participate in learning activities and carry out tasks	Criteria:  The ability of students to master the theory of adaptation and invasive nature of species  Form of assessment:	Lectures and discussions  Self-study  Method : Contextual Instruction	100 minutes  Self-study (2x60 minutes)	Adaptability  Characteristics and properties of invasive species	

			Task: Review scientific articles on adaptability and invasive properties				
3.	Students are able to master theories about the influence of invasive species on ecosystem balance	Ability to respond to learning materials, participate in learning activities and carry out tasks	<p>Criteria:</p> <p>The ability of students to master the influence of invasive species on ecosystem balance</p> <p>Form of assessment:</p> <p><i>Case Method</i></p> <p><i>Evaluation:</i></p> <p>Seeking case studies from scientific articles on the influence of invasive species</p>	<p>Lectures and discussions</p> <p>Self-study</p> <p>Method : Contextual Instruction</p>	<p>100 minutes</p> <p>Self-study (2x60 minutes)</p>	<p>Interaction of invasive species with <i>native biodiversity</i></p> <p>The influence of invasive species on ecosystem balance</p>	

4.	Students are able to master theories about invasive species from plant groups and their impacts	Ability to respond to learning materials, participate in learning activities and carry out tasks	<p>Criteria:</p> <p>The ability of students to master theories about invasive species from plant groups and their impacts</p> <p>Form of assessment:</p> <p><i>Case Method</i>  <i>Evaluation:</i> Seek case studies from scientific articles of invasive species of plant groups and their impacts</p>	<p>Lectures and discussions</p> <p>Self-study</p> <p>Method : Contextual Instruction</p>	<p>100 minutes</p> <p>Self-study (2x60 minutes)</p>	Invasive species of the plant group and their effects	
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5.	Students are able to master theories about invasive species of vertebrate groups	Ability to respond to learning materials, participate in learning activities and carry out tasks	<p>Criteria:</p> <p>The ability of students to master theories about invasive species from vertebrate groups</p> <p>Form of assessment:</p> <p><i>Case Method Evaluation:</i></p> <p>Seeking case studies from scientific articles of invasive species from vertebrate groups and impact</p>	<p>Lectures and discussions</p> <p>Self-study</p> <p>Method : Contextual Instruction</p>	<p>100 minutes</p> <p>Self-study (2x60 minutes)</p>	Invasive species of the vertebrate group and their impact	
6.	Students are able to master theories about	Ability to respond to learning materials, participate in	<p>Criteria:</p> <p>The ability of students to</p>	Lectures and discussions	100 minutes	Invasive species of the invertebrate group	



	invasive species from invertebrate groups	learning activities and carry out tasks	<p>master the theory of invasive species from vertebrate groups</p> <p>Form of assessment:</p> <p><i>Case Method</i></p> <p><i>Evaluation:</i></p> <p>Seeking case studies from scientific articles of invasive species from invertebrate groups and impact</p>	<p>Self-study</p> <p>Method : Contextual Instruction</p>	Self-study (2x60 minutes)		
7.	Students are able to master theories about invasive species from microbial groups (plant pathogens)	Ability to respond to learning materials, participate in learning activities and carry out tasks	<p>Criteria:</p> <p>The ability of students to master the theory of invasive species from</p>	<p>Review and discussion</p> <p>Self-study</p>	<p>100 minutes</p> <p>Self-study (2x60 minutes)</p>	Invasive species of the microbial group (plant pathogens)	

			<p>vertebrate groups</p> <p>Form of assessment:</p> <p><i>Case Method Evaluation:</i></p> <p>Seeking case studies from scientific articles of invasive species from microbial groups (plant pathogens) and impact</p>	<p>Method : Contextual Instruction</p>			
8.	Students are able to master the theory of Biosecurity and quarantine to prevent invasive species	Ability to respond to learning materials, participate in learning activities and carry out tasks	<p>Criteria:</p> <p>The ability of students to master the theory of Biosecurity and quarantine to prevent invasive species</p>	<p>Lectures and discussions</p> <p>Self-study</p> <p>Method : Contextual Instruction</p>	<p>100 minutes</p> <p>Self-study (2x60 minutes)</p>	Biosecurity and quarantine to prevent invasive species	

			<p>Form of assessment:</p> <p>Review scientific articles related to <i>Biosecurity</i> and quarantine to prevent invasive species</p>				
9.	Students are able to master theories about invasive species risk analysis	Ability to respond to learning materials, participate in learning activities and carry out tasks	<p>Criteria:</p> <p>Students' ability to master theories about invasive species risk analysis</p> <p>Form of assessment:</p> <p>Review scientific journal articles related to invasive species risk analysis</p>	<p>Lectures and discussions</p> <p>Self-study</p> <p>Method : Contextual Instruction</p>	<p>100 minutes</p> <p>Self-study (2x60 minutes)</p>	Invasive species risk analysis	

10.	Students are able to master theories about detection and early warning of invasive species	Ability to respond to learning materials, participate in learning activities and carry out tasks	<p>Criteria:</p> <p>The ability of students to master the theory of detection and early warning of invasive species</p> <p>Tugas shape:</p> <p>Review scientific journals related to detection and early warning of invasive species</p>	<p>Lectures and discussions</p> <p>Self-study</p> <p>Method : Contextual Instruction</p>	<p>100 minutes</p> <p>Self-study (2x60 minutes)</p>	Early detection and warning of invasive species	
11.	Students are able to master the theory of eradication of invasive species	Ability to respond to learning materials, participate in learning activities and carry out tasks	<p>Criteria:</p> <p>The ability of students to master the theory of eradication of invasive species</p>	<p>Lectures and discussions</p> <p>Self-study</p> <p>Method : Contextual Instruction</p>	<p>100 minutes</p> <p>Self-study (2x60 minutes)</p>	Eradication of invasive species	

			<p>Task Form:</p> <p>Review scientific journal articles related to eradication of invasive species</p>				
12.	Students are able to master theories about Principles in invasive species control	Ability to respond to learning materials, participate in learning activities and carry out tasks	<p>Criteria:</p> <p>The ability of students to master the theory of principles in controlling invasive species</p> <p>Assessment form: Task</p> <p>Review scientific articles on principles in invasive species control</p>	<p>Lectures and discussions</p> <p>Self-study</p> <p>Method : Contextual Instruction</p>	<p>100 minutes</p> <p>Self-study (2x60 minutes)</p>	Principles of controlling invasive species	

13.	Students are able to master theories about biological control of invasive species	Ability to respond to learning materials, participate in learning activities and carry out tasks	<p>Criteria:</p> <p>The ability of students to master the theory of biological control of invasive species</p> <p>Biological control of invasive species</p> <p>Task assessment form: Task: Review scientific articles on principles in invasive species control</p>	<p>Lectures and discussions</p> <p>Self-study</p> <p>Method : Contextual Instruction</p>	<p>100 minutes</p> <p>Self-study (2x60 minutes)</p>	Early detection and warning of invasive species	
14.	Students are able to master theories about invasive species management: public	Ability to respond to learning material, participate in	<p>Criteria:</p> <p>The ability of students to</p>	<p>Review and discussion</p> <p>Self-study</p>	100 minutes	Management of invasive species: public participation	

	participation to international policy	learning activities and perform tasks	<p>master theories about invasive species management: public participation to international policy</p> <p>Form of assessment: Review scientific articles on invasive species management: public participation to international policy</p>	Method : Contextual Instruction	Self-study (2x60 minutes)	to international policy	
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