



BRAWIJAYA UNIVERSITY

FACULTY OF AGRICULTURE

DEPARTMENT OF PLANT PESTS AND DISEASES / MASTER OF AGRICULTURAL ENTOMOLOGY

SEMESTER COURSE PLAN

COURSES	CODE	CLUSTERS OF COURSES	CREDIT (SKS)	SEMESTER	Date of Preparation
Integrated Pest and Disease Management	PTH82218	Master of Agricultural Entomology	2 SKS 2.34 ECTS	Complete	June 8, 2021
AUTHORIZATION	Course Developer Lecturer		Course Coordinator	Head of Study Program	
Department of Plant Pests and Diseases	Dr. Ir. Gatot Mudjiono Dr. Moch. Syamsul Hadi		Dr. Ir. Gatot Mudjiono Signature	Akhmad Rizali, SP, M.Si, Ph.D Signature	
Learning Outcomes	ILO STUDY PROGRAM				
	S1	Able to work together and have social sensitivity and high concern for the community 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 continuous agriculture			

	P3	Mastering the theory of biotechnology of plant pest control and plant resistance management
	U1	Have the skills to manage research in the field of inter/multidisciplinary agricultural entomology
	K1	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	After taking this course, students will master knowledge of the meaning of agroecosystems, their structure and function, changes in ecosystems into agroecosystems and their ecological consequences based on agroecological principles, agroecosystem management, and mitigation programs in the context of integrated pest management towards sustainable agriculture.
	2	Students will master and develop knowledge about IPM technology, IPM Ecology, IPM Biointensive, as well as the basics of agroecology and IPM
	3	Students will master and develop knowledge about the failure of IPM implementation in the world, obstacles and challenges of the IPM Implementation Program as well as key concepts in the preparation of IPM programs and IPM development concepts
	4	Students will master and develop knowledge about management procedures based on OPT type, ecological engineering, and IPM implementation in Indonesia (for example on rice plants)
Brief Description of Course	This course studies the structure, function, and change of ecosystems into agroecosystems and mitigation programs in the context of integrated pest disease management (IPM), especially in Indonesia towards sustainable agriculture.	

Learning Material / Subject	<ol style="list-style-type: none"> 1) Introduction 2) IPM Technology 3) IPM Ecology 4) Biointensive IPM 5) Basic Agroecology and IPM (I) 6) Basic Agroecology and IPM (II) 7) IPM Implementation before Altieri's Criticism 8) Ten Steps to IPM Implementation 9) The failure of IPM implementation in the world 10) Key Concepts in IPM Program Preparation 11) IPM Development Concept 12) Management Procedures Based on OPT Type 13) Obstacles and Challenges of IPM Implementation Program 14) IPM implementation in Indonesia, for example in rice plants 15) IPM and Ecological Engineering 																																															
	<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <thead> <tr style="background-color: #e0f2f1;"> <th></th> <th>S1</th> <th>P1</th> <th>P2</th> <th>P3</th> <th>U1</th> <th>U2</th> <th>K1</th> </tr> </thead> <tbody> <tr> <td style="background-color: #e0f2f1;">CLO1</td> <td>0.5</td> <td>0.5</td> <td>0.0</td> <td>0.0</td> <td>0.0</td> <td>0.0</td> <td>0.0</td> </tr> <tr> <td style="background-color: #e0f2f1;">CLO2</td> <td>0.0</td> <td>0.5</td> <td>0.25</td> <td>0.25</td> <td>0.0</td> <td>0.0</td> <td>0.0</td> </tr> <tr> <td style="background-color: #e0f2f1;">CLO3</td> <td>0.0</td> <td>0.0</td> <td>0.0</td> <td>0.25</td> <td>0.0</td> <td>0.25</td> <td>0.5</td> </tr> <tr> <td style="background-color: #e0f2f1;">CLO4</td> <td>0.0</td> <td>0.0</td> <td>0.25</td> <td>0.25</td> <td>0.0</td> <td>0.25</td> <td>0.25</td> </tr> </tbody> </table>									S1	P1	P2	P3	U1	U2	K1	CLO1	0.5	0.5	0.0	0.0	0.0	0.0	0.0	CLO2	0.0	0.5	0.25	0.25	0.0	0.0	0.0	CLO3	0.0	0.0	0.0	0.25	0.0	0.25	0.5	CLO4	0.0	0.0	0.25	0.25	0.0	0.25	0.25
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CLO4	0.0	0.0	0.25	0.25	0.0	0.25	0.25																																									
Book	<p>Main</p> <ol style="list-style-type: none"> 1. Mudjiono G. 2014. Integrated pest management. UB. Press 2. Gurr GM, Wratten SD, Altieri MA. 2004. Ecological Engineering for Pest Management Advances in Habitat Manipulation for Arthropods. CSIRO PUBLISHING 																																															

	<p>3. Abrol DP. 2014. Integrated Pest Management: Current Concepts and Ecological Perspectives. Elsevier</p> <p>4. Rosset PM, Altieri MA. 2017. Agroecology: Science and Politics. Fernwood Publishing.</p>	
	Supporter	
	<p>1) Sama'Iradat T, Gatot M, Abadi AL, Toto H. 2020. Demographic Analysis Armoured Scale (Diaspididae Family) on Apple Plant in Junggo, Tulungrejo Village, Bumiaji District, Batu City. Proceedings of the 13th International Interdisciplinary Studies Seminar, IISS 2019, 30-31 October 2019, Malang, Indonesia (p. 306). European Alliance for Innovation.</p> <p>2) Sila S, Abadi AL, Mudjiono G, Astono TH. 2020. Banana Bunchy Top Virus (BBTV) on wild banana species in Kutai Kartanegara Regency. EurAsian Journal of Biosciences 14(2).</p> <p>3) Wibowo D, Rahardjo BT, Karindah S, Muhammad FN. 2023. The diversity and abundance of weeds in sugarcane (<i>Saccharum officinarum</i>) plantations and its relationships with Hymenoptera parasitoids diversity. Biodiversity Journal of Biological Diversity 24(4).</p> <p>4) Rahmawasih R, Abadi AL., Mudjiono G, Rizali A. 2022. The effect of integrated pest management on <i>Scirpophaga innotata</i> population and natural enemies on rice field in South Sulawesi, Indonesia. Biodiversity Journal of Biological Diversity 23(9).</p>	
Learning Media	Software:	Hardware:
		Computer, LCD
Team Teaching	<p>Dr. Ir. Gatot Mudjiono</p> <p>Dr. Moch. Syamsul Hadi</p>	
Required Courses	<p>1) None</p>	

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 the knowledge of IPM History and IPM concepts	Ability to explain the history and concepts of IPM and carry out tasks	Criteria: Students' ability to explain the history and concepts of IPM Form of Assessment: reviewing journals on Ecology-Based Management problems that occur in Indonesia	Lectures and discussions Self-task	100 minutes Quiz and Task 1 (2x60 minutes):	Introduction which includes the History of IPM and the Concept of IPM Book: Alston, D. G. 2011. The Integrated Pest Management (IPM) Concept. Published by Utah State University Extension and Utah Plant Pest Diagnostic Laboratory IPM-014-11 July 201. Downloaded August 25, 2011	5%

[fromhttp://extension.usu.edu/files/publications/publication/ipm-concept'96.pdf](http://extension.usu.edu/files/publications/publication/ipm-concept'96.pdf)

Dent, D. R. 1995. Principles of integrated pest management. p. 8 – 46. D.R. Dent (ed.). *In* Integrated Pest Management. Chapman & Hall. London.

Gray, M. E.; S.T. Ratcliffe, and M. E. Riche. 2009. The HDI paradigm: concepts, strategies and tactics p. 1 – 13. *In* Integrated Pest Management. Concepts, Tactics, Strategies and Case Studies. Cambridge

						<p>e University Press. 529 pp.</p> <p>Bajwa, W. I. and Marcos Kogan. 2002. Compendium of IPM Definitions (CID). What is IPM and how is it defined in the Worldwide Literature. Integrated Plant Protection Center (IPPC) Oregon State University, Corvallis Publication Number 998, 200.</p>	
2	Students are able to master knowledge of economic thresholds as a basis for pesticide application as well as the advantages and limitations of IPM Technology	Ability/skills to identify pests and set economic thresholds as a basis for pesticide application	<p>Criteria:</p> <p>The ability of students to explain the economic threshold as the basis for pesticide application</p>	<p>Lectures and discussions</p> <p>Self-task</p>	<p>100 minutes</p> <p>Self-study (2x60 minutes)</p>	<p>IPM Technology</p> <ol style="list-style-type: none"> 1. Economic thresholds as a basis for pesticide application 2. Advantages and limitations of IPM Technology 	5%

			<p>and the advantages and limitations of IPM Technology</p> <p>Assessment form: Quizzes and assignments</p>			<p>Book: Dent, D. R. 1995a. Principles of integrated pest management. p. 8 – 46. D.R. Dent (ed.). <i>In</i> Integrated Pest Management. Chapman & Hall. London.</p>	
3	<p>Students are able to conduct agroecosystem analysis studies as a basis for making control decisions as well as the advantages and limitations of Ecological IPM</p>	<p>Ability to analyze agroecosystems as a basis for control decision making as well as the advantages and limitations of Ecological IPM</p>	<p>Criteria: Students are able to study agroecosystem analysis and what are the advantages and limitations of ecological IPM</p> <p>Form of assessment:</p>	<p>Lectures and discussions</p> <p>Self-task</p>	<p>100 minutes</p> <p>Self-study (2x60 minutes):</p>	<p>IPM Ecology</p> <ol style="list-style-type: none"> 1. Agroecosystem analysis as a basis for control decision making 2. Advantages and limitations of Ecological IPM <p>Book: Committee on Pest and Pathogen Control through Management of Biological Control</p>	5%

			Quizzes and assignments			agents and Enhanced Natural Cycles and Process. 1996. Ecological Based Pest Management. National Academy, Washington. 144 p.	
4	Students are capable. mastering knowledge of Conventional vs Biointensive IPM, Background to Biointensive IPM, Biointensive IPM Components, and Integrated Weed Management	Ability to explain current issues on biointensive IPM	Criteria: Able to explain the difference between conventional IPM and biointensive IPM, master background knowledge and components of biointensive IPM, and be able to explain how to manage weeds in an	Lectures and discussions Self-task	100 minutes Self-study (2x60 minutes):	<p>Biointensive IPM:</p> <ol style="list-style-type: none"> 1. Conventional vs Biointensive IPM 2. Background to Biointensive IPM 3. Biointensive IPM Components 4. Integrated Weed Management <p>Book: Dufour, R. 2001. Biointensive Integrated Pest Management (IPM). Fundamentals of Sustainable Agriculture. ATTRA</p>	5%

			<p>integrated manner</p> <p>Form of assessment:</p> <p>quiz</p> <p>ability to respond and argue in discussions</p>			<p>Sustainable Agriculture.</p> <p>Dufour, Rex. 2000. Farmskaping to Enhance Biological Control. The NCAT Sustainable Agriculture Project. © NCAT. 40 pages. Downloaded, September 13, 2011 dari https://attra.ncat.org/attra-pub/summaries/summary.php?pub=145</p>	
5	<p>Students are able to master knowledge about</p> <ol style="list-style-type: none"> 1. Agroecology and IPM rationale 2. mastering knowledge of Agroecosystem Vulnerability to OPT 3. Decreasing Landscape and On Farm Diversity 	<p>Ability to explain the rationale of Agroecology and IPM, the vulnerability of Agroecosystems to OPT, as well as the decline in landscape diversity and on farm</p>	<p>Able to explain the rationale of Agroecology and IPM, the vulnerability of Agroecosystems to OPT, as well as the decline in landscape</p>	Lectures and discussions	<p>100 minutes</p> <p>Self-study (2x60 minutes)</p>	<p>Basic Agroecology and IPM (I)</p> <ol style="list-style-type: none"> 1. Agroecology and IPM Rationale 2. mastering knowledge of Agroecosystem Vulnerability to OPT 3. Decreasing Landscape and 	5%

			<p>diversity and on farm</p> <p>Form of assessment:</p> <p>ability to respond and play an active role in discussions</p>			<p>On Farm Diversity</p> <p>Book:</p> <p>Altieri, M. A. and Clara I. Nicholls. 2005. Agroecology and the Search for a Truly Sustainable Agriculture. 1st edition . United Nations Environment Programme Environmental Training Network for Latin America and the Caribbean Boulevard de los Virreyes 155, Colonia Lomas de Virreyes 11000, Mexico D.F.©, Mexico</p> <p>Altieri, M. A.. 1999. The ecological role of biodiversity in agroecosystems. Agriculture, Ecosystems and Environment 74 (1999) 19–31. Downloaded, September 8, 2011</p>	
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						<p>http://www.geography.siu.edu/courses/429/AgroEco/AgroEcoC.pdf</p> <p>Gliessman, S. R. 2000. Agroecology. Ecological Process in Sustainable Agricultural. CRC Press LLC. 357 p</p>	
6	Students are able to develop the idea that pesticides, fertilizers, weather, plant breeding, GMO crops can induce an explosion in pest insect populations, as well as master the knowledge that habitat manipulation can restore soil health and also plant diversity	The ability to deepen or expand science regarding the induction of pest insect explosions caused by various factors	Able to explain about the induction of insect explosion pests caused by: pesticides, fertilizers, weather, plant breeding, GMO crops. As well as the benefits of habitat manipulation to restore soil health and also plant diversity	Lectures and discussions	100 minutes Self-study (2x60 minutes)	<p>Basic Agroecology and IPM (II)</p> <ol style="list-style-type: none"> 1. Pesticides induce an explosion of insect pests 2. Fertilizer induces pest explosion 3. Weather induces Insect Pest Explosion 4. Changes Induced by Plant Breeding 5. GMO Crops and the Explosion of Insect Pests. 6. Habitat manipulation restores soil 	5%

			<p>Form of assessment:</p> <p>Presentation</p> <p>the ability to respond, think critically and play an active role in discussions</p>			<p>health and plant diversity</p> <p>Book:</p> <p>Altieri, M. A. and Clara I. Nicholls. 2005. Agroecology and the Search for a Truly Sustainable Agriculture. 1st edition . United Nations Environment Programme Environmental Training Network for Latin America and the Caribbean Boulevard de los Virreyes 155, Colonia Lomas de Virreyes 11000, Mexico D.F.©, Mexico</p> <p>Altieri, M. A.. 1999. The ecological role of biodiversity in agroecosystems. Agriculture, Ecosystems and Environment 74 (1999) 19–31. Downloaded, September 8, 2011</p>	
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						<p>http://www.geography.siu.edu/courses/429/AgroEco/AgroEcoC.pdf</p> <p>Gliessman, S. R. 2000. Agroecology. Ecological Process in Sustainable Agricultural. CRC Press LLC. 357 p</p>	
7	Students are able to master knowledge about the Ten Steps in IPM Implementation	Ability to develop thinking about IPM Implementation and critical thinking	<p>Able to review and explain how IPM Implementation before Altieri's criticism and ten steps of IPM Implementation</p> <p>Form of assessment:</p>	<p>Lectures and discussions</p> <p>Self-task</p>	<p>100 minutes</p> <p>Self-study (2x60 minutes)</p>	<p>IPM Implementation (before Altieri's criticism) & Ten Steps to IPM Implementation</p> <p>Library:Dent, D.R. 1995c. Implementation of an IPM system. p. 208 – 221. D.R. Dent (ed.). In Integrated Pest Management. Chapman & Hall. London.</p>	5%

			<p>Forum Group Discussion</p> <p>the ability to respond, think critically and play an active role in discussions</p>			<p>Pimentel, D., John Krummel, David Gallahan, Judy Hough, Alfred Merrill, Ilse Schreiner, Pat Vittum, Fred Koziol, Ephraim Back, Doreen Yen, and Sandy Fiance. 1981. A cost-benefit analysis of pesticide use in U.S Food Production. p. 27 – 54. D. Pimentel (ed.). In CRC Handbook of Pest Management in Agriculture Vol. II. CRC Press.</p>	
8	Mid-term exam/UTS						
9	Students master knowledge about criticism of IPM development in the world, and also the strategic non-	Ability to think critically and analytically about the causes of failure of IPM	Able to write critical studies about the failure of IPM	Lectures and discussions Self-task	100 minutes	Failure of IPM implementation in the world:	5%

	technological application of IPM	implementation in the world.	implementation in the world Form of assessment: Logic and ideas in writing a critical study about the failure of IPM application in the world		Self-study (2x60 minutes)	<ol style="list-style-type: none"> 1. Criticism of IPM development in the world 2. Strategic non-technological application of IPM <p>Book:</p> <p>Altieri, M. A, and Clara Ines Nicholls. 2000. Applying Agroecological Concepts to Development of Ecologically Based Pest Management Strategies. Professional Societies and Ecologically Based Pest Management: Proceedings of a Workshop (2000). Downloaded, 2011 dari http://www.nap.edu/openbook.php?record_id=9888&page=14</p>	
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						Anonymous. 2009. Key Concept or Tools for Thinking About IPM. Crop Health: Key concept or Tools for thinking about IPM Cereal Knowledge Bank. IRRI (International Rice Research Institute). © 2008 IRRI & CIMMYT Attribution-NonCommercial-ShareAlike 3.0 Unported. Downloaded on August 25, 2011 dari http://www.knowledgebank.irri.org/default.htm	
10	Students are able to master knowledge about Key Concepts in the Preparation of IPM Programs	Ability to respond to learning materials, participate in learning activities and carry out tasks regarding key	Able to explain key concepts in the preparation of IPM programs	Lectures and discussions Self-task	100 minutes Self-study (2x60 minutes)	Key Concepts in IPM Program Preparation Book: Altieri, M. A. and Clara I. Nicholls.	5%

		concepts in the preparation of IPM programs	Form of assessment: Quizzes and assignments			<p>2005. Agroecology and the Search for a Truly Sustainable Agriculture. 1st edition . United Nations Environment Programme Environmental Training Network for Latin America and the Caribbean Boulevard de los Virreyes 155, Colonia Lomas de Virreyes 11000, Mexico D.F.©, Mexico</p> <p>Anonymous. 2009. Key Concept or Tools for Thinking About IPM. Crop Health: Key concept or Tools for thinking about IPM Cereal Knowledge Bank. IRRI (International</p>	
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						Rice Research Institute). © 2008 IRRI & CIMMYT Attribution-NonCommercial-ShareAlike 3.0 Unported. Downloaded on August 25, 2011 dari http://www.knowledgebank.irri.org/default.htm	
11	Students are able to think critically and analytically about the main reasons why IPM projects fail, IPM is a natural risk, Economic Concepts and economic thresholds, Mutual relations of OPT - Damage	Ability to develop thoughts on the concept of IPM development	Able to think critically and analytically, and able to explain the concept of IPM development which includes: The reasons for IPM projects fail, IPM is a natural risk, Economic Concepts and economic thresholds,	Lectures and discussions Self-task	100 minutes Self-study (2x60 minutes)	IPM development concept 1. Main reasons why IPM projects fail 2. IPM is a natural risk 3. Economic Concept and economic threshold 4. OPT-Damage reciprocal relationship Book:	5%

			<p>Mutual relations of OPT - Damage</p> <p>Form of assessment:</p> <p>Quizzes and assignments</p>			<p>Altieri, M. A. and Clara I. Nicholls. 2005. Agroecology and the Search for a Truly Sustainable Agriculture. <i>1st edition</i> . United Nations Environment Programme Environmental Training Network for Latin America and the Caribbean Boulevard de los Virreyes 155, Colonia Lomas de Virreyes 11000, Mexico D.F.©, Mexico</p>	
12	Students are able to master the knowledge of explaining OPT with r and K strategies and migrant OPT	Ability to think analytically about differences in pest breeding strategies and management procedures	Able to explain the OPT Management Procedure Based on its development strategy systematically	<p>Lectures and discussions</p> <p>Self-task</p>	<p>100 minutes</p> <p>Self-study (2x60 minutes)</p>	<p>Management Procedures Based on OPT Type (Strategy r and K, OPT Migrant)</p> <p>Book: Altieri, M. A. and Clara I. Nicholls. 2005. Agroecology</p>	5%

			Form of assessment: Task - Presentation			and the Search for a Truly Sustainable Agriculture. <i>1st edition</i> . United Nations Environment Programme Environmental Training Network for Latin America and the Caribbean Boulevard de los Virreyes 155, Colonia Lomas de Virreyes 11000, Mexico D.F.©, Mexico	
13	Students are able to master knowledge about the problem of farmer adoption of IPM, Field School as a means of socializing IPM	Critical and analytical thinking skills regarding the Obstacles and Challenges of IPM Implementation Program	Able to describe Obstacles and Challenges in IPM Implementation Programs such as Problems of farmer	Lectures and discussions Self-task Method : group discussion forum	100 minutes Self-study (2x60 minutes)	Obstacles and Challenges of IPM Implementation Program: 1. The problem of farmer adoption of IPM	5%

			<p>adoption of IPM</p> <p>Form of assessment: assignment</p>			<p>2. Field School as a means of socializing IPM</p> <p>Book: Anonymous. 2009. Key Concept or Tools for Thinking About IPM. Crop Health: Key concept or Tools for thinking about IPM Cereal Knowledge Bank. IRRI (International Rice Research Institute). © 2008 IRRI & CIMMYT Attribution-NonCommercial-ShareAlike 3.0 Unported. Downloaded on August 25, 2011 dari http://www.knowledgebank.irri.org/default.htm</p> <p>Anonymous. 2011c.</p>	
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						<p>Introduction to Integrated Pest control. The Asia Pacific Regional Technology Centre (APRTC). Downloaded on September 5, 2011 dari http://www.sdearn.net/aprtc/intro_ipm/sup2_02.asp?ID=0&OFR=0&CID=3&FNC=0</p> <p>Anonymous. 2011a. Overview of HDI. Texas IPM Program. Providing science-based solutions to pest problems using methods that minimize health, environmental, and economics risks. Downloaded, September 9, 2011 dari http://ipm.tamu.edu/overview/</p>	
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14	Students are able to master knowledge about the failure of IPM Technology, interruption of self-reliance and food (PTT) programs, wide-scale IPM as a solution, emphasizing the search for cultivation in strengthening preemptive actions	Analytical and critical thinking skills regarding the failure of IPM Technology, Interruption of food self-sufficiency programs (PTT), Wide-scale IPM as a solution, Emphasizing cultivation tracing in strengthening preemptive actions	Able to explain the implementation of IPM in rice plants in Indonesia systematically Form of assessment: Quizzes and assignments	Lectures and discussions Self-task Method : case study	100 minutes Self-study (2x60 minutes)	IPM implementation in Indonesia (example on rice plants) Book: Anonymous. 2009. Key Concept or Tools for Thinking About IPM. Crop Health: Key concept or Tools for thinking about IPM Cereal Knowledge Bank. IRRI (International Rice Research Institute). © 2008 IRRI & CIMMYT Attribution-NonCommercial-ShareAlike 3.0 Unported. Downloaded on August 25, 2011 dari http://www.knowledgebank.irri.org/default.htm	5%
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					<p>Anonymous. 2011c. Introduction to Integrated Pest control. The Asia Pacific Regional Technology Centre (APRTC). Downloaded on September 5, 2011 dari http://www.sdlearn.net/aprtc/intro_ipm/sup2_02.asp?ID=0&OFR=0&CID=3&FNC=0</p> <p>Anonymous. 2011a. Overview of HDI. Texas IPM Program. Providing science-based solutions to pest problems using methods that minimize health, environmental, and economics risks. Downloaded September 9,</p>	
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						<p>2011 dari http://ipm.tamu.edu/overview/</p> <p>Mudjiono, G. 2014. Integrated Pest Management, UB. Press. Malang</p>	
15	<p>Students are able to master knowledge about ecological engineering, habitat manipulation, and IPM, Basic ecological engineering ecology for IPM, Habitat manipulation in Rice IPM</p>	<p>Ability to develop ecological engineering and habitat manipulation thinking and skills.</p>	<p>Able to explain IPM and ecological engineering systematically and analytically.</p> <p>Form of assessment: assignment (presentation)</p>	<p>Lectures and discussions</p> <p>Self-task</p>	<p>100 minutes</p> <p>Self-study (2x60 minutes)</p>	<p>IPM and Ecological Engineering:</p> <ol style="list-style-type: none"> 1. Ecological engineering, habitat manipulation, and IPM 2. Ecological basis of ecological engineering for IPM 3. Habitat manipulation in Rice IPM <p>Book: Kangas, P.C. 2004. Ecological Engineering, Principles and</p>	5%

						<p>Practice Lewis Publishers. A CRC Press Company, London</p> <p>Odum, H.T. and B. Odum.2003. Concepts and methods of ecological engineering. Ecological Engineering 20 : 339–361</p> <p>Gurr. G. M. and S. D. Wratten. 2004. Ecological Engineering for Pest Management Advances in Habitat Manipulation for Arthropods. CSIRO PUBLISHING</p>	
16	Final Exam/UAS						15%