



BRAWIJAYA UNIVERSITY

FACULTY OF AGRICULTURE

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

SEMESTER LESSON PLAN

| COURSES | CODE | CLUSTERS OF COURSES | CREDIT | SEMESTER | Date of Preparation |
|--|--|--|----------------------|------------------------------|----------------------------|
| Pesticide Ecotoxicology | PTH82122 | Plant Pathology and Agricultural Entomology | 2 (1-1) 2,34 ECTS | EVEN | 8 June 2021 |
| AUTHORIZATION | Developer Lecturer | Course Coordinator | | Head of Study Program | |
| Department of Plant Pests and Diseases | Dr. Ir. Mintarto Martosudiro, MS Dr. Silvi Ikawati, SP., MP., M.Sc. | Name Signature | | Signature | |
| Learning Outcomes | ILO STUDY PROGRAM | | | | |

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|--------------------------------|--|
| A. Attitudes and Values | |
| ILO1 | Able to work together and have social sensitivity and high concern for society and the environment |
| B Knowledge | |
| ILO2 | Mastering concepts, theories and methods in the field of agricultural entomology |
| ILO3 | Mastering the concept of integrated pest management in the context of sustainable agriculture |
| C General Skills | |
| ILO6 | Have skills in contributing to solving problems in society through research design in the field of agricultural entomology |
| D Special Skills | |
| ILO7 | Having skills in developing innovations and proven applications for solving problems in society in the field of agricultural entomology in an inter/multidisciplinary manner within the framework of sustainable agriculture |
| CLO | |
| 1 | Able to develop knowledge about pesticide ecotoxicology |
| 2 | Able to develop knowledge about prudent management of pesticides |

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|------------------------------------|---|---|
| | 3 | Able to develop knowledge about the grouping of pesticides |
| | 4 | Able to develop knowledge about the kinship of pesticides with one another based on the chemistry of the active ingredients |
| | 5 | Be able to analyze the properties of persistent and broad-spectrum pesticides that have the potential to poison the environment |
| | 6 | Be able to develop pesticide management strategies based on ecological principles in order to realize sustainable agriculture |
| Brief Description of Course | This course discusses the history of insecticide use, physicochemical parameters, insecticide targets, resistance, resilience, pesticide residues in the environment, pesticide residues in food, negative impacts of pesticide residues, pesticide movement in nature, bioaccumulation/biomagnification of pesticide residues, hazards of risks in pesticide-related work, vegetable pesticides and natural ingredients, new natural products, IGR, pheromones, attractants and repellents, loss of pesticides in nature, and efforts to reduce the negative impact of pesticides. | |
| Learning Material / Subject | <ol style="list-style-type: none"> 1) Introduction: Introduction to lecture material 2) Pesticide Classification 3) Characteristics of persistent and wide-spectrum pesticides 4) Mode of action and toxicity of the insecticide 5) Mode of action and toxicity of the fungicide 6) Mode of action and toxicity of the bactericidal 7) Mode of action and toxicity of the herbicide 8) Measurement of residues and phases of pesticide poisoning of biotic components of ecosystems 9) Mechanisms of pest resistance to pesticides | |

| | <p>10) Impact of bubonic plague on natural enemies and non-target organisms 11) Risk dan Hazard 12) Ecosystem components that have potential as pesticide remediation agents 13) Mechanisms of pesticide biomagnification and their implications for health 14) Pesticide management in agriculture continues</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|--|---|------|------|------|------|------|---|--|------|------|------|------|------|------|------|------|------|-----|------|-----|-----|-----|-----|------|------|------|-----|-----|-----|-----|-----|------|-----|-----|-----|-----|-----|-----|-----|------|-----|------|------|-----|-----|-----|-----|------|-----|-----|------|-----|-----|-----|------|------|-----|-----|------|-----|-----|------|-----|
| <p>Relationship between CLO and ILO</p> | <table border="1"> <thead> <tr> <th></th> <th>ILO1</th> <th>ILO2</th> <th>ILO3</th> <th>ILO4</th> <th>ILO5</th> <th>ILO6</th> <th>ILO7</th> </tr> </thead> <tbody> <tr> <td>CLO1</td> <td>0.25</td> <td>0.5</td> <td>0.25</td> <td>0.0</td> <td>0.0</td> <td>0.0</td> <td>0.0</td> </tr> <tr> <td>CLO2</td> <td>0.25</td> <td>0.25</td> <td>0.5</td> <td>0.0</td> <td>0.0</td> <td>0.0</td> <td>0.0</td> </tr> <tr> <td>CLO3</td> <td>0.0</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> </tr> <tr> <td>CLO4</td> <td>0.0</td> <td>0.25</td> <td>0.25</td> <td>0.0</td> <td>0.0</td> <td>0.5</td> <td>0.0</td> </tr> <tr> <td>CLO5</td> <td>0.0</td> <td>0.0</td> <td>0.25</td> <td>0.0</td> <td>0.0</td> <td>0.5</td> <td>0.25</td> </tr> <tr> <td>CLO6</td> <td>0.0</td> <td>0.0</td> <td>0.25</td> <td>0.0</td> <td>0.0</td> <td>0.25</td> <td>0.5</td> </tr> </tbody> </table> | | | | | | | | ILO1 | ILO2 | ILO3 | ILO4 | ILO5 | ILO6 | ILO7 | CLO1 | 0.25 | 0.5 | 0.25 | 0.0 | 0.0 | 0.0 | 0.0 | CLO2 | 0.25 | 0.25 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | CLO3 | 0.0 | 0.5 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | CLO4 | 0.0 | 0.25 | 0.25 | 0.0 | 0.0 | 0.5 | 0.0 | CLO5 | 0.0 | 0.0 | 0.25 | 0.0 | 0.0 | 0.5 | 0.25 | CLO6 | 0.0 | 0.0 | 0.25 | 0.0 | 0.0 | 0.25 | 0.5 |
| | ILO1 | ILO2 | ILO3 | ILO4 | ILO5 | ILO6 | ILO7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CLO1 | 0.25 | 0.5 | 0.25 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CLO2 | 0.25 | 0.25 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CLO3 | 0.0 | 0.5 | 0.5 | 0.0 | 0.0 | 0.0 | 0.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CLO4 | 0.0 | 0.25 | 0.25 | 0.0 | 0.0 | 0.5 | 0.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CLO5 | 0.0 | 0.0 | 0.25 | 0.0 | 0.0 | 0.5 | 0.25 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| CLO6 | 0.0 | 0.0 | 0.25 | 0.0 | 0.0 | 0.25 | 0.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| <p>Reference</p> | <p>Main</p> | | | | | | <p>1) Hodgson E. 2004. A textbook of modern toxicology. 2) Mueller DS, Wise KA, Dufault NS, Bradley CA, Chilvers MI. 2017. Fungicide for field crops. 4) Matsumura F. 2012. Toxicology of insecticides.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

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| | Supporter | |
| | <p>1) Duffus JH, Worth HG. 2006. Fundamental toxicology.</p> <p>2) Simon JY. 2014. The toxicology and biochemistry of insecticides.</p> <p>3) Yang C, Hamel C, Vujanovic C, Gan Y. 2011. Fungicide: Mode of actions possible impact on non-target microorganisms</p> <p>4) Hoffman DJ, Rattner BA, Burton Jr GA, Cairns Jr J. 2002. Handbook of ecotoxicology.</p> <p>5) Buchori D, Rizali A, Priawandiputra, W, Sartiami, D, Johannis, M. 2020. Population Growth and Insecticide Residues of Honey Bees in Tropical Agricultural Landscapes. Diversity 12(1):1</p> <p>6) Ikawati S, Himawan T, Latief A, Tarno H. 2021. Characterization of Clove Oil Nanoparticles and Their Insecticidal Activity against <i>Cryptolestes ferrugineus</i> (Stephens) (Coleoptera: Laemophloeidae). Agrivita 43(1): 43-55.</p> | |
| Learning Media | Software: | Hardware: |
| | | Computer, LCD |
| Team Teaching | Dr.Ir. Mintarto Martosudiro, MS and Dr. Silvi Ikawati, SP., MP., MSc. | |
| Required Courses | - | |

| Week | Sub-CLO | Indicator | Assessment Criteria & Forms | Learning Methods | Duration (minutes) | Learning Materials / Study Materials [References] | Proportion (%) |
|------|--|--|---|---|--------------------|--|----------------|
| 1 | Students are able to develop an understanding of pesticide ecotoxicology in the framework of wise pesticide management | Ability to develop an understanding of pesticide ecotoxicology in the framework of wise pesticide management | <p>Criterion:</p> <p>Accuracy of students in developing an understanding of pesticide ecotoxicology and wise pesticide management</p> <p>Other PeniForms:</p> <p>Assignment</p> | <p>Method:</p> <p>Contextual Instruction</p> <p>Lectures and discussions</p> <p>Self-task</p> | 100 minutes | <p>Understanding pesticide ecotoxicology</p> <p>Prudent pesticide management</p> | 5 % |

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| | | | | | | | |
| 2 | Students are able to group pesticides and pesticide kinship with each other based on the chemistry of active ingredients | The ability to group pesticides and the kinship of pesticides with each other based on the chemistry of active ingredients | <p>Criterion:</p> <p>The accuracy of students in grouping pesticides and the kinship of pesticides with each other based on the chemistry of active ingredients</p> <p>Assessment form: Quizzes and assignments</p> | <p>Lectures and discussions</p> <p>Self-study</p> <p>Method : Contextual Instruction</p> | 100 minutes | Grouping of pesticides based on the chemistry of active ingredients | 10 % |
| 3 | Students are able to analyze the properties of persistent and | Ability to analyze the properties of persistent and | <p>Criterion:</p> <p>The accuracy of students in</p> | Lectures and discussions | 100 minutes | The properties of broad-spectrum persistent pesticides | |

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| | broad-spectrum pesticides that have the potential to poison the environment | broad-spectrum pesticides that have the potential to poison the environment | analyzing the properties of broad-spectrum persistent pesticides that have the potential to poison the environment Form of assessment: Quizzes and assignments | Self-study | | that are potentially toxic to the environment | |
| 4 | Students are able to analyze the mode of and toxicity of insecticides | Ability to analyze the mode of and toxicity of insecticides | Criterion: Accuracy of students in analyzing the mode of and toxicity of insecticides Form of Assessment: | Lectures and discussions | 100 minutes | Mode of action dan toksisitas insektisida | |

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| | | | Quizzes and assignments | | | | |
| 5 | Students are able to analyze the mode of and toxicity of fungicides | Ability to analyze the mode of and toxicity of fungicides | <p>Criterion:</p> <p>Student accuracy in analyzing the mode of and toxicity of fungicides</p> <p>Form of Assessment:</p> <p>Quizzes and assignments</p> | Lectures and discussions | 100 minutes | Mode of action dan toksisitas Fungisida | |
| 6 | Students are able to analyze the mode of and bactericidal toxicity | Ability to analyze mode of and bactericidal toxicity | <p>Criterion:</p> <p>Accuracy of students in analyzing the mode of and toxicity of bactericides</p> | Lectures and discussions | 100 minutes | Mode of action dan toksisitas bakterisida | |

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| | | | <p>Form of Assessment:</p> <p>Quizzes and assignments</p> | | | | |
| 7 | Students are able to analyze the mode of and toxicity of herbicides | Ability to analyze modes of and toxicity of herbicides | <p>Criterion:</p> <p>Accuracy of students in analyzing the mode of and toxicity of herbicides</p> <p>Form of Assessment:</p> <p>Quizzes and assignments</p> | Lectures and discussions | 100 minutes | Mode of action dan toksisitas Herbisida | |
| 8 | Mid-term Exam | | | | | | 30% |

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| 9 | Students are able to analyze the phases of pesticide pollution in the ecosystem | Ability to measure residues and analyze the phases of pesticide pollution in the ecosystem | <p>Criterion:</p> <p>Student skills in measuring residues and analyzing the phases of pesticide pollution in the ecosystem</p> <p>Form of assessment:</p> <p>Quizzes and assignments</p> | Lectures and discussions | 100 minutes | The phases of pesticide pollution in the ecosystem include: exposure phase, (2) kinetic phase, (3) dynamic phase | |
| 10 | Students are able to analyze and develop research on the mechanism of pesticide stention receipts in target organisms | Ability to analyze and develop research on the mechanism of pesticide resistance in organisms | <p>Criterion:</p> <p>The accuracy of students in analyzing and developing research on the mechanism of pesticide resistance</p> | Discussions and Presentations | 100 minutes | Mechanisms of pesticide resistance in target organisms | |

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| | | | Form of assessment: Presentations and tasks | | | | |
| 11 | Students are able to analyze and develop research on the phenomenon of pesticide poisoning in natural enemies and non-target organisms. | Ability to analyze and develop research on the phenomenon of pesticide poisoning in natural enemies and non-target organisms. | Criterion: The accuracy of students in analyzing and developing research on the phenomenon of pesticide poisoning in natural enemies and non-target organisms. Form of assessment: Quizzes and assignments | Lectures and discussions | 100 minutes | Impact of pesticide use on natural enemies and non-target organisms | 10% |
| 12 | Students are able to measure and analyze the negative impact of | Ability to measure and analyze the negative impact of | Criterion: Student accuracy in measuring and | Discussions and presentations | 100 minutes | The negative impact of pesticides on human health and | 10% |

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| | pesticides on human health | pesticides on human health | analyzing the negative impact of pesticides on human health Form of assessment: Presentations and tasks | | | how to analyze residues | |
| 13 | Students are able to analyze ecosystem components that have the potential to be pesticide remediation agents | Ability to analyze ecosystem components that have the potential as pesticide remediation agents | Criterion: The accuracy of students in analyzing ecosystem components that have the potential to be pesticide remediation agents Form of assessment: Quizzes and assignments | Lectures and discussions | 100 minutes | Potential components as remediation agents | 10% |

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| 14 | Students are able to analyze the mechanism of pesticide biomagnification and its implications for health | Ability to analyze the mechanism of pesticide biomagnification and its implications on health | <p>Criterion:</p> <p>The accuracy of students in analyzing pesticide biomagnification mechanism and its implications for health</p> <p>Form of assessment:</p> <p>Quizzes and assignments</p> | Lectures and discussions | 100 minutes | Mechanisms of pesticide biomagnification and their implications for health | |
| 15 | Students are able to develop research on pesticide management in agriculture. | Ability to develop research on pesticide management in agriculture. | <p>Criterion:</p> <p>The accuracy of students in developing research on pesticide management in agriculture.</p> | Discussions and presentations | 100 minutes | Pesticide management in agriculture continues | |

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| | | | Case studies and presentations | | | | |
| 16 | Final Exam | | | | | | 30% |