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
Insect Physiology	PTH81139	Agricultural Entomology	2 SKS 2,34 ECTS	Odd	30 June 2021

AUTHORIZATION	Course Developer Lecturer	Course Coordinator	Head of Study Program
Department of Plant Pests and Diseases	Prof. Dr. I. Bambang Tri Rahardjo, SU. Prof. Dr.Ir. Retno Dyah Puspitarini, MS.	Name Signature	Akhmad Rizali, SP, M.Si, Ph.D Signature

Learning Outcomes	ILO STUDY PROGRAM	
	A1	Able to work together and have social sensitivity and high concern for society and the environment.

	K1	Mastering concepts, theories and methods in the field of agricultural entomology
	COURSE LEARNING OUTCOME	
	1	Students can develop ideas about the definition and Insect physiological coverage in general also concerns the integument of insects
	2	Students are able to develop a basic understanding of the digestive system (absorption and utilization of food, symbionts in digestion), the circulatory system, and the respiratory system
	3	Students can develop knowledge about the function of blood cells, metabolism of carbohydrates, proteins and fats
	4	Students can develop knowledge about the nervous and sensory systems
	5	Students can develop knowledge about the hormonal system, muscles and movement
	6	Students can develop knowledge about the reproductive system and defense of insects
Brief Description of Course	This subject discusses insect physiology which includes in accordance with the subject matter of integument, digestive system, circulatory system, nervous system, sensory system, muscle and movement system, hormone system, production reprodction system and insect defense.	
Learning Material / Subject	1) Introduction 2) Integument 3) Digestive system: absorption and utilization of food, symbionts in digestion 4) Circulatory System 5) Function of blood cells 6) Respiratory system 7) Carbohydrate, protein and fat metabolism 8) Nervous system: Nervous organs, how nerves work 9) Nervous system: the target of action of insecticides	

10) Sensory system / Insect senses: sense organs and how they work
11) Hormonal system: endocrine and exocrine
12) Muscular system and movement: morphology and function of muscle movement
13) Reproductive system of insects: anatomy of the internal organs of reproduction, spermatozoa and embryology
14) Insect defense system: symbionts, encapsulation, resistance and exocrine glands

Relationship of CLO and ILO

	A1	K1	K2	K3	S1	S2	S3
CLO 1	0.5	0.5	0	0	0	0	0
CLO 2	0.5	0.5	0	0	0	0	0
CLO 3	0.5	0.5	0	0	0	0	0
CLO 4	0.5	0.5	0	0	0	0	0
CLO 5	0.5	0.5	0	0	0	0	0
CLO 6	0.5	0.5	0	0	0	0	0

Book

Main

1. Chapman RF. 2012. The Insects: Structure and Function 5th Edition.
2. Klowden MJ. 2021. Physiological Systems In Insects.
3. Wigglesworth VB. 1982. The Principles of Insect Physiology 7th Edition

	Supporting References	
	1) Rahayu SE, Leksono AS, Gama ZP, Tarno, H. 2023. The Effect of Papaya Leaf Extract (Carica papaya L.) on the Mortality Rate of Spodoptera litura Fabricius Larvae and the Level of Damage to Soybean Leaves in Malang, Indonesia: A Greenhouse Simulation. AGRIVITA, Journal of Agricultural Science 45(1): 20-30. 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) Firdaus AS, Lin YW, You KA, Negi A, Kurniawan N, Wicaksono KP, Tarno H, Yeh SD. 2022. Geographical restriction and body size variation in two sibling species of flower-breeding Drosophila. Research Square.	
Learning Media	**Software : PPt**	**Hard Hardware : LCD**
	Online and Offline	Computer, LCD
Team Teaching	Prof.Dr.Ir. Bambang Tri Rahardjo, SU Dr.Ir. Retno Dyah Puspitarini, MS.	
Required Courses	1) Fundamentals of Entomology	

Week	Sub-CLO	Indicator	Criteria & Forms of Assessment	Learning Methods	Time (Duration)	Learning Materials / [References]	Proportion (%)

	(as expected final capability)			(Lectures / Assignments / other forms of learning)			
1	Students are able to develop thoughts about the definition and scope of course material which includes insect physiology in general according to the subject matter	The ability to respond to learning material, follow learning activities about insect physiology in general.	Criterion: The ability of students to master the understanding of digestion, blood circulation, nervous system, muscle system in general.	Lectures / Discussion	100 minutes Self-study (2x60 minutes)	Includes discussion of digestion, blood circulation, nervous system, muscle system in general.	5 %
2	Students are able to develop thoughts about the definition and scope of lecture material which includes insect integument	Ability to respond to learning material, follow insect integument learning activities	Criterion: The ability of students to master knowledge about the constituents	Lectures/ Discussion	100 minutes Self-study (2x60 minutes)	Constituents and functions of the integument	5 %

			and functions of integument Form of assessment: discussion				
3	Students are able to gain knowledge about the digestive system	Ability to respond to learning material, follow learning activities Digesting system	Criterion: The ability of students to master knowledge about the digestive system, the process of digestion and absorption, symbionts in digestion Form of assessment: Quizzes and assignments	Lectures/ Discussion	100 minutes Self-study (2x60 minutes)	Learn about the digestive system, the process of digestion and absorption. Studying the needs and balance of nutrients and the effects of nutrients on growth and development, symbionts on digestion	5 %

4	Students are able to gain knowledge about the circulatory system	Ability to respond to learning material,follow circulatory system learning activities	The ability of students to master knowledge about the circulatory system and blood cells Form of assessment: Quizzes and assignments	Lectures/ Discussion	100 minutes Self-study (2x60 minutes)	Learn about the circulatory system and blood cells	5 %
5	Students are able to gain knowledge about blood cell function	Ability to respond to learning material, follow learning activities about blood cell function	The ability of students to master knowledge about the function of blood cells and temporary storage of important compounds Form of assessment:	Lectures Presentation	100 minutes Self-study (2x60 minutes)	Study the function of blood cells and storehouse while storage of important compounds.	5 %

			Group tasks				
6	Students are able to gain knowledge about the insect respiratory system	Ability to respond to learning material, follow learning activities about the insect respiratory system	The ability of students to master knowledge about the respiratory system, gas exchange in aquatic insects and endoparasitic insects Form of assessment: Kuis and tasks	Lectures / Discussion	100 minutes Self-study (2x60 minutes)	Organization and structure of the trachea system, Gas movement in the trachea system, Gas exchange in aquatic insects, Gas exchange in endoparasitic insects	5 %
7	Mid-term Exam						15 %
8	Students are able to gain knowledge about carbohydrate, protein and fat metabolism	Ability to respond to learning material, follow learning activities	The ability of students to master knowledge about	Lectures / Discussion	100 minutes	Study the cycles associated with carbohydrate,	5 %

		about carbohydrate, protein and fat metabolism	cycles related to carbohydrate, protein and fat metabolism Form of assessment: Quizzes and assignments		Self-study (2x60 minutes)	protein and fat metabolism	
9	Students are able to gain knowledge about the nervous system I	Ability to respond to learning material, follow learning activities about the nervous system I	Able to master knowledge about the basic components and functions of the nervous function system. Form of assessment: Quizzes and assignments	Lectures / Diskusi	100 minutes Self-study (2x60 minutes)	Learn about the basic components and functions of the nervous system.	5 %
10	Students are able to gain knowledge about the nervous system II	Ability to respond to learning material, follow learning activities	Able to master knowledge about	Discussion	100 minutes	Learn about insecticide work targets	5 %

		about the nervous system II	insecticide work targets Form of assessment: Quizzes and assignments		Self-study (2x60 minutes)		
11	Students are able to gain knowledge about the sensory system or insect senses	The ability to respond to learning material, follow learning activities about the sensory system or insect senses	Able to master knowledge about sensory organs and how they work, visual senses, mechanical and chemical senses. Form of assessment: Quizzes	Discussion	100 minutes Self-study (2x60 minutes)	Learn about sense organs and how they work, visual senses, mechanical and chemical senses.	5 %

12	Students are able to gain knowledge about the hormonal system	The ability to respond to learning material, follow learning activities about the insect hormone system	Able to master knowledge about the endocrine system and exocrine Form of assessment: Quizzes and assignments	Discussion	100 minutes Self-study (2x60 minutes)	Learn about the endocrine system and exocrine	5 %
13	Students are able to gain knowledge about the muscular system and movement	Ability to respond to learning material, follow learning activities about the muscular system and movement	Able to master knowledge of muscle structure and contraction Form of assessment: Group tasks	Lectures Presentation	100 minutes Self-study (2x60 minutes)	Study the morphology, structure and contraction of muscles, and the function of muscle movement	5 %

14	Students are able to gain knowledge about the reproductive system of male and female insects	Ability to respond to learning materials and participate in learning activities about male and female insect reproduction	Able to master knowledge about anatomy, internal reproductive organ systems of males and females, sperm transfer to females, ovulation and fertilization. Form of assessment: Quizzes and assignments	Discussion	100 minutes Self-study (2x60 minutes)	Learn about the anatomy of male and female internal reproductive organ systems, sperm to female transfer, ovulation and fertilization.	5 %
15	Students are able togain knowledge about insect defense systems		Able to master knowledge of symbionts, encapsulation, resistance, and exocrine glands Form of assessment:	Lectures/ Discussion	100 minutes Self-study (2x60 minutes)	Learn about symbionts, encapsulation, resistance, and exocrine glands	5 %

			Quizzes and assignments				
16.	Final Exam						15 %