Department of Plant Protection

College of Agricultural Engineering Sciences

University of Salahaddin

Subject: Advanced Insect Physiology

Course Book – (Master's Degree)

Lecturer's Name: Dr. Pshtiwan Abdullah Jalil

Academic Year: 2023-2024

Course Book

1. Course name	**Advanced Insect Physiology**
2. Lecturer in charge	**Pshtiwan Abdullah Jalil, PhD**
3. Department/ College	**Plant Protection Dept./Agricultural Engineering Sciences College.**
4. Contact	**e-mails: Pshtiwan.jalil@su.edu.krd** **Tel: 0750 4823304**
5. Time (in hours) per week	**Sunday, Theory (2) and Practically (2) hrs./week**
6. Office hours	**8:30 – 2:00 from Sunday to Thursday**
7. Course code	
8. Teacher's academic profile	**Personal information:** Date of Birth: 1-1-1982 Place of Birth: Kirkuk Nationality: Iraqi Marital Status: Married Sex: Male **Education and certifications:** **Pshtiwan Abdullah Jalil,** I Achieved a Doctor of Philosophy (Ph.D.) in Entomology/Molecular Insect Taxonomy, accomplished from Salahaddin University, Erbil, Kurdistan Region-Iraq, 2020. My dissertation title was "Taxonomic and molecular study of some flat-headed borers (Coleoptera: Buprestidae) occurring across Erbil Province, Kurdistan Region-Iraq". I got a Master of Science in Economic Insects on horticultural crops, entitled "Biological and Ecological Study of the small cabbage white butterfly, *Pieris rapae* L. (Lepidoptera: Pieridae) on the cabbage and cauliflower in Gradarasha Research Station, Erbil Province, Kurdistan Region-Iraq". In College of Agricultural Engineering Sciences, Salahaddin University, Erbil, 2011.
9. Keywords	Insect Physiology, Digestive System, Respiratory System, Circulatory System, Excretory System, Muscular System, Moulting Process.

10. Course overview:

This course guide clarifies what to expect from reading this material in advance. The study of Insect physiology is not only of theoretical importance, but it is the basis of your understanding and appreciation of the fundamentals that guide information dissemination to the students. Studying this subject is an important for showing the insect systems and structures clearly. This is because the adoption of organs and systems and their function involves mouthpart modification, diapause stage, and body wall. The course introduces students into knowledge about insect physiology and functional anatomy.

11. Course objective:

The main objective of this course is to provide students with understanding of the concepts, and applications of insect physiology in advanced. Students will learn about their functions, types, and roles in improving efficiency and productivity in insect structure. Temporary critical thinking and problem-solving skills: Another key objective of this course is to nurture students' critical thinking and problem-solving abilities. Through the lectures, discussions, and practical experiences, students will be encouraged to analyze and evaluate different communication principles and their relationship with physiology of insect systems, distinguished between Insect physiology and anatomy. Understand the principles of insect systems as it relates to insect anatomy, and recognize all the insect organs and structures. It is considering factors such as reproduction, feeding, and adaptation. The insect systems also explained and diapause, hibernation and Aestivation are key factors in this subject.

12. Student's obligation

The students should attend regularly for all lectures throughout the course. By being present and on time, students can be actively involved in the learning process, participate in lessons, and benefit from class activities, and writing notes. Additionally, students should come prepared for daily quizzes and actively contribute to class discussions to enhance their conception and critical thinking skills. Also, there are many important things such as taking part in practical parts in department labs and completing all tests, exams, assignments, and weekly reports.

13. Forms of teaching

The teaching method is important for providing students with an inclusive and interesting education. The following methods of teaching will be followed.

1- PowerPoint presentations: To give a summary of the lecture in the course, we will utilize data show presentations in the form of PowerPoint slides. Also, extra detailed information will be given through narration, while the slides will define the practice of each lecture.

2- Using a whiteboard: A whiteboard is also required for teaching and explaining different topics, and certain examples.

3- Practical dissection: For the observation of insect systems and organs practical dissecting will be performed in Entomology labs.

14. Assessment scheme

Students must pass mid-term exams, is worth 50 marks, and the final exam is worth 50 marks.

15. Student learning outcome:

Through the end of this course, students should be able to:

- Demonstrate an inclusive understanding of insect physiology basics and principles.

- The structure of each insect system.
- Utilize practical methods for dissection Successfully.
- Observation of all insect systems and organs.
- Understanding the mechanisms and function of each system and organ.

16. Course Reading List and References:

- The following textbooks and references are recommended for further reading:

CHAPMAN R. F. 2013. The Insects: Structure and Function, 5th Edition. Book.

FORTES, P., SALVADOR, G. & CÔNSOLI, F.L. 2011. Ovary development and maturation in *Nezara viridula* (L.) (Hemiptera: Pentatomidae). *Neotrop. Entomol*. 40(1):89-96.

HOMBERG, U. (1987). Structure and functions of the central complex in insects. In Arthropod Brain, ed. A.P. Gupta, pp. 347–67. New York: Wiley

MARC J. KLOWDEN 2007. Physiological Systems in Insects, 2nd Edition.

O'Donnell M. 2008. Insect Excretory Mechanisms. In: S.J. Simpson, Editor(s), Advances in Insect Physiology, Academic Press. Volume 35, Pages 1-122.

O'SHEA, M., ROWELL, C.H.F. AND WILLIAMS, J. L. D. (1974). The anatomy of a locust visual interneurons; the descending contralateral movement detector. Journal of Experimental Biology, 60, 1–12.

ÖZYURT, N., CANDAN, S. & SULUDERE, Z. 2014. The morphology and histology of the male reproductive system in *Apodiphus amygdali* (Germar,1817) (Heteroptera: Pentatomidae). Life: *The Excitement of Biology*, 2(1): 31-41.

WIGGLESWORTH 1972. Principles of Insect Physiology, 7th Edition, - V. B.

POSSEBOM, T., LUCINI, T., PANIZZI, A.R. 2020. Stink bugs nymph and adult biology and adult preference on cultivated crop plants in the southern Brazilian Neotropics. *Environ. Entomol.* 49(1):132-140.

TERRA W.R., FERREIRA C. 2009. Digestive System. In: Vincent H. Resh and Ring T. Carde, Editor(s), Encyclopedia of Insects (Second Edition), Academic Press, San Diego. Pages 273-281.

17. The Topics:	Lecturer's name
1. The Integument system • Structure, function, formation & Sclerotization **2. Digestive/Metabolic system** • Digestive system (alimentary tract) • Energy metabolism • Fat body (not from the book) **3. Circulatory system** • Hemolymph & Hemocytes • Immunity • Thermoregulation **4. Excretory system** • Malpighian tubules & hindgut • Osmoregulation • Water • Salts **5. Respiratory system** • Tracheal system • Physiology of gas exchange **6. Muscular system** • insect muscle tissue • types (tubular, close-packed, fibrillar) • muscle contraction • flight **7. Nervous system** • Components of the nervous system • Nerve potentials • Sensing the environment **8. Reproductive systems** • Female reproductive systems • Male reproductive systems • Reproduction **9. Endocrine system** • Molting process metamorphosis **10. Insect Hormone**	

18. Examinations:

1. **Definitions**, Define the following terms: Bucal cavity, Pyloric valve, Gizard, Ostia, Anal papillae.

2. **Explanations**, such as:

- What is the difference between an forgut, and midgut?

- Compare between
  - passive, and active ventilation.
  - Tracheae & Tracheoles
  - Parthenogenesis & Paedogenesis
  - Afferent cells & Efferent cells

- Write the main composition of the insect cuticle.
- Write the process of circulation in insects in detail.
- What is molting? and write its steps or phases in sequence.
- Write the physiological function for the following. (20) Marks
  - Malpighian tubules
  - Ejaculatory duct
  - Juvenile hormone
  - Spermatheca

19. Extra notes:

- When an exam postponed by a student, whatever be the reason, he/she has to do the exam within one week. It is the student's responsibility to contact the subject lecturer and the department presidency with the frame time to rearrange for an alternative exam. Failure to do so in a timely way may result in an uncounted grade for the missed exam.

20. Peer review پێداچوونەوەی هاوەڵ

I hereby approve that the course is comprehensive and covers all aspects of the course. The subject is arranged sequentially which enables the students to learn gradually step by step.

Name:

Degree:

Specialty:

Signed:

Date: