

Ministry of Higher Education and Scientific research



**Department of Environmental Science and Health**

**College of Science**

**University of Salahaddin**

**Subject: Insect ecology- Practical**

**Course Book (2nd Year)**

**Lecturer's name MSc. Nihal Suhail Hanna**

**Academic Year: 2022-2023**

**Course Book**

<b>1. Course name</b>	Insect ecology (Practical)
<b>2. Lecturer in charge</b>	Nihal S. Hanna
<b>3. Department/ College</b>	Environmental Science and health/Science
<b>4. Contact</b>	e-mail: nihal.hanna@su.edu.krd Tel: (optional)
<b>5. Time (in hours) per week</b>	Practical: 2 hours per week
<b>6. Office hours</b>	6 hours per week
<b>7. Course code</b>	
<b>8. Teacher's academic profile</b>	<ul style="list-style-type: none"> <li>• I graduate from Salahaddin University in 2012 (Ranked 1<sup>st</sup> in Environmental sciences department and 3<sup>rd</sup> in all college). In 2015 I finished M.Sc degree in water quality and pollution (aquatic insect as bioindicator). Finally, I became lecturer assistant in 2016.</li> <li>• I published 7 papers in international scientific journal. I teach undergraduate students like entomology, water quality, water pollution, engineering drawing, principles of environmental sciences, computer science, ecostatistic, indices, and academic debate.</li> <li>• I worked as a member of the examination committee for college of science in (2015-2016), (2017-2018) and (2020-2021).</li> <li>• I become lecturer in 12/9/2019.</li> <li>• Now I am a Ph.D. student in Ecotoxicity at Salahaddin University -Sciences college-Environmental health and science department.</li> </ul>
<b>9. Keywords</b>	Insect, head, thorax, abdominal, and metamorphosis
<b>10. Course overview:</b>	<p><b>Insect ecology</b> is one of the most important lectures in <b>Environmental Sciences Department</b> because insects are a vital part of forest <b>biodiversity</b> and as they are particularly <b>sensitive to changes in the climate</b> and the patterns and seasons of regional flora cover, <b>insects provide evidence for general forest health as well changes in the cover</b>. The arrival of a new pest or the sudden decline of a well-established native species can indicate many things, such as the effects of deforestation, or a change in the types of arboreal cover, CO<sub>2</sub> concentration, and persistent ecological issues such as drought or flooding. They can tell us much about the types of trees, shrubs, and flowers (especially pollinating insects such as butterflies).</p> <p>The practical course will provide a general introduction to insects. Topics include morphological adaptations; laboratory and field activities include sampling and</p>

specimen preparation. In this course acquires knowledge and critical understanding of the principles of external structure of insect, metamorphosis. This course will cover aspects of insect's mouth part because most of injuries occurred to human being, animal and plants are due to mouth part of insects, that's why we will study this subject in detail. These structures are variously modified indifferent insect groups and are often used in classification and identification. The types of mouthparts an insect has determines how it feeds and what sort of damage it does, it is important, therefore, that the student have some knowledge of the structure of insect mouth parts. The course seeks to create learning insects and recognize common insects that occur in our surroundings and understand their biology and unique adaptations.

### **11. Course objective:**

A general knowledge of insects is important for many reasons. **Insects are the most diverse organisms on the planet and they are essential for the function of most terrestrial ecosystems.** Consequently, insects have played decisive roles in the evolution of many groups of organisms, such as the flowering plants. Much of our economic productivity depends upon insects but they are also cause immense damage to agriculture and transmit some of the most common and lethal diseases in the world. In addition, insects provide important model systems to address a variety of scientific questions from evolutionary development of complex body designs to how organisms communicate with one another.

The course will cover the basic view about insects including learning the basic external morphology of insects and how it is used in classification, describe the life cycles of important insect groups and understand how insects affect humans medically, economically and socially.

#### **Through the course sequence in Insect ecology, students will be able to:**

1. Get training in collection and preservation of insects.
2. Understand morphology of the insects and observe external features of insects.
3. Study the mouthparts, digestive system and reproductive system of insects by dissection and observation
4. Understand taxonomic characters of insects
5. Relate the various insect body structures to their functions.
6. Identify the developmental stages of insects.
7. Identification of different insects of some important families
8. Understand the advantage and disadvantage of insects to man and their role in the environment.

### **12. Student's obligation**

A typical class will be to start with a brief quiz. Every student must have two examinations, the attendance, sample drawing note book, classroom activities and insect collecting box.

### **13. Forms of teaching**

Different forms of teaching will be used to reach the objectives of the course: power point presentations for the head titles and definitions and summary of conclusions, classification of materials and any other illustrations, besides worksheet will be designed to let the chance for practicing on several aspects of the course in the classroom, furthermore students will be asked to prepare research papers on selective topics and summarize articles contents published in English into either Kurdish or Arabic language, those articles need to be from printed media or internet articles. There will be classroom discussions and the lecture will give enough background to translate, solve, analyze, and evaluate problems sets, and different issues discussed throughout the course.

To get the best of the course, it is suggested that you attend classes as much as possible, read the required lectures, teacher's notes regularly as all of them are foundations for the course. Lecture's notes are for supporting and not for submitting the reading material including the hand outs. Try as much as possible to participate in classroom discussions, preparing the assignments given the course given in the course.

### **14. Assessment scheme**

Your final grade will be derived as follows:

- ✓ Mean of two practical examinations:20%
- ✓ Daily quizzes 5%
- ✓ Note book 5%
- ✓ Insect collecting box: 5%

### **15. Student learning outcome:**

Students pursuing a degree in insect ecology are offered flexibility in a curriculum that develops an excellent knowledge base and an understanding of the concepts and fundamental practices of insect ecology. Knowledge is gained through laboratory experimentation. Special focus will be information on insect identification, morphology, behaviour, physiology and ecology.

At the end of the course students should be able to:-

- Identify common Insects and classify them into their respective taxa (orders).
- Describe the external morphology and internal Anatomy of a typical Insect.
- Relate the various insect body structures to their functions.
- Identify the developmental stages of insects.
- Differentiate the different types of development stages exhibited by various insect groups.

### **16. Course Reading List and References:**

1. Borror, J. D. and DeLong, M. D. (1964). An Introduction to the Study of Insects. 2<sup>nd</sup> edition. Holt, Rinehart, and Winston, New York, xii + 819 p.
2. Imms, A. D. (1970)A general Textbook of Entomology. 9<sup>th</sup> edition, London: Methuen & Co LTD.886P.

	<p>3. Richards, O. W. and Davies R. G. (1977). Imms' General Textbook of Entomology. 10th Edition. Volume 2: Classification and Biology. Chapman and Hall, London. 1354 p.</p> <p>4. Richard E. J. (1997). Fundamentals of Entomology. 4<sup>th</sup> edition. New Jersey, Prentice-Hall, Inc. 475 p.</p> <p>5. Gillott, C. (2005). Entomology. 3<sup>rd</sup> edition. Dordrecht, Springer, 834 p.</p> <p>6. David, B. V. and Ananthkrishnan, T. N. (2004). General and Applied Entomology. 2<sup>nd</sup> edition. Tata McGraw-hill Publishing Co. Ltd. New Delhi. India. 1184 p.</p>
<b>17. week</b>	<b>Topic</b>
1	What is an arthropod? Insects and their relatives
2	Techniques of Collecting, Pinning and Preservation of Insects
3	The insect head
4	The antennae
5	<p>Insect mouth part</p> <p>Mouth part of mature stage</p> <p>1- Chewing (biting) mouth part</p> <p>2- Sponging (lapping mouth part)</p> <p>3- Chewing - sponging mouth part</p> <p>4- Piercing - sucking</p> <p>A- Plant tissue</p> <p>B- Animal tissue</p> <p>5- Cutting-Lapping mouth part</p> <p>6- Cutting-sucking mouth part</p> <p>7- Siphoning-Sucking mouth part</p>
6	<p>Mouth part of immature stage</p> <p>1- Predaceous – biting mouth part</p> <p>2- Predaceous - suctorial mouth part</p> <p>3- Mouth part of Lepidoptera</p>
7&8	Insect thorax: Thoracic appendages (The legs and its modification)
9	Wings

10	The Abdomen
11	Metamorphosis
12	Insect identification (using identification key)

**18. Practical Topics (If there is any)**

**19. Examinations:**

**Questions:**

**Q1/ Fill in the following blanks:**

1. The Orientation of mouthparts in insects can be \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_.
2. Maxillae in chewing (biting) mouth part is divided into several parts are \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_.
3. The abdominal segments in insect body may be considered to form three groups: \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_.
4. Ametabolous development occurs in the apterygote orders such as \_\_\_\_\_ and \_\_\_\_\_.
5. The non-reproductive appendages of abdomen in adult stage of insect include \_\_\_\_\_, \_\_\_\_\_ and \_\_\_\_\_.

**Q2/ A. Identify the sample; what is the antennae type?**



**B. What is the type and function of hind wings in this sample?**



**C. Identify the slide?**



**Q3/** What are the types of mouth parts in bee and butterfly? What is the main different between them?

**Typical answers:**

**Q1/ Fill in the following blanks:**

1. The Orientation of mouthparts in insects can be **Hypognathous, Prognathous** and **Opisthognathous**.
2. Maxillae in chewing (biting) mouth part is divided into several parts are **cardo, stipe, galea, lacinia and palps**.
3. The abdominal segments in insect body may be considered to form three groups: **pregenital segments, genital segments and post genital segments**.
4. Ametabolous development occurs in the apterygote orders such as **Protura, Collembola and Diplura**.
5. The non-reproductive appendages of abdomen in adult stage of insect include **Anal cerci, Styli and Caudal filament**.

**Q2/ A.** Identify the sample; what is the antennae type?



**Scarabaeid beetle (Coleoptera), lamellate antennae.**

**B.** What is the type and function of hind wings in this sample?

**Halters:** are sense organs concerned with the maintenance of stability in flight.



**C.** Identify the slide?



**Serrate antennae**

**Q3/** What are the types of mouthparts in bees and butterflies? What is the main difference between them?

- **Honey Bee: Chewing-lapping mouthparts.**
- **Butterfly: Siphoning type**
- **The adult butterflies and moths (Lepidoptera) are adapted for feeding on nectar like the bees, but in their mouthparts, the maxillae form the main proboscis and not the labium.**

**20. Extra notes:**

**21. Peer review**

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