



# **Department of Environmental Science and Health**

**College of Science**

**University of Salahaddin**

**Subject: Insect Ecology – theory**

**Course Book (2<sup>nd</sup> Year)**

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**Academic Year: 2022- 2023**



The Insects are the most diverse and important group of animals on land. Insects are members of a larger group called arthropods (which also includes arachnids, myriapods, and crustaceans). Despite their small size, the numbers or biomass of insects means that they have a significant impact on the environment and therefore upon our lives. Insects are everywhere. They are, by far, the most common animals on our planet. More than 1.5 million species of insects have been named. This is three times the number of all other animals combined. Even so, some say that the insects that have been given names are only a small fraction of the insects in nature. Many are yet to be discovered. We can find insects in almost every conceivable habitat. Their size, shape, color, biology, and life history are so diverse that it makes the study of insects absolutely fascinating. Without insects, our lives would be vastly different. Insects pollinate many of our fruits, flowers, and vegetables. We would not have much of the produce that we enjoy and rely on without the pollinating services of insects, not to mention honey, beeswax, silk, and other useful products that insects provide. Insects feed on a seemingly endless array of foods. Many insects are omnivorous, meaning that they can eat a variety of foods including plants, fungi, dead animals, decaying organic matter, and nearly anything they encounter in their environment. Still others are specialists in their diet, which means they may rely only on one particular plant or even one specific part of one particular plant to survive. Many insects are predatory or parasitic, either on plants or on other insects or animals. Such insects are important in nature to help keep pest populations (insects or weeds) at a tolerable level. We call this the balance of nature. Predatory and parasitic insects are very valuable when they attack other animals or plants that we consider to be pests. Insects are very important as primary or secondary decomposers. Without insects to help break down and dispose of wastes, dead animals and plants would accumulate in our environment and it would be messy indeed.

**11. Course objective:**

The aim of this course is to introduce students to basic insect biology, including basic taxonomy. Insects as a group make up more than 70% of all the known species of living organisms and insects impact all aspects of our daily lives. We primarily think of insects in the context of their negative impacts: pests of agriculture crops and livestock, disease vectors, pests of our homes, etc. However, insects are also beneficial to human society in many ways. For example, insects are essential pollinators of our crop and ornamental plants, are a valuable food item for many economically and culturally important animals, can be used to control invasive plants and insects, and constitute excellent models for scientific research (e.g. *Drosophila melanogaster*).

By the end of this course students should develop a basic understanding of insect biology and be able to identify different insects to the level of Order.

To understand basic insect biology, as well as natural history and evolutionary relationships of insect orders and families. To have a deeper understanding of several aspects of the biology of insects. To appreciate the impact that insects have (both positive and negative) on human society, including human health, agriculture, and the environment. Be able to identify the potential impact of different insect species on

agriculture, human health, and society in general; to be knowledgeable about potential control strategies. Demonstrate phylogenetic "tree thinking" and be able to categorize insects based on basic ecological, behavioral, morphological, physiological, or developmental attributes.

some of the main objectives in this course should be as follow, the 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- Understand taxonomic characters of insects.
- 4- Understand the advantage and disadvantage of insects to man and their role in the environment.

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

The role of students and their obligations throughout the academic year include:

The student is obliged to attend to the class room. Student also enforced to make:

- A. Daily activity and quizzes
- B. Reports and seminar
- C. Insect collecting (practical).

## **13. Forms of teaching**

Different forms of teaching will be used to reach the objectives of the course:

- A. Data show and power point
- B. White board
- C. Paper of lectures

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. 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 handouts. 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:	Marks
1. Reports, Attendance and Participation	3 %
2. Home works and quizzes	2 %
3. Theory Exam mean	10 %
4. Total Scores	15 %
✓ Final theory exam:	50 marks

By the end of this course, students will be able to:

- 1) Explain influences of an insect's biotic and abiotic environment on evolution of life histories;
- 2) Describe causes and effects of patterns of insect species abundance and distribution within ecosystems;
- 3) Describe fundamental ecological principles underlying the development and application of insect pest management and insect conservation;
- 4) Evaluate and critique ecological primary literature for content and scientific quality;
- 5) Translate scientific ecological literature into lay public-accessible presentations.

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

##### Key references:

1. McInnes, K. H. (2014). The insects: an outline of entomology / P.J. Gullan and P.S. Cranston; with illustrations by. – 5th edition. John Wiley & Sons, Ltd. 987 pp.
2. David, B. V. and Ananthakrishnan, T. N. (2004). General and Applied Entomology. 2nd ed. Tata McGraw-hill Publishing Co. Ltd. New Delhi. India. 1184 pp.
3. Elzinga, Richard J. (1997). Fundamentals of Entomology. 4th ed. New Jersey, Prentice-Hall, Inc. 475 pp.
4. Chown, S. L. and Nicolson, S. W. (2004). Insect Physiological Ecology Mechanisms and Patterns. Oxford University Press. 254pp.
5. Gorb, S. (2002). Attachment Devices of Insect Cuticle. New York, Boston, Dordrecht, London, Moscow. 322pp.
6. Resh, V. H. and Cardé, R. T. (2003). Encyclopedia of Insects. USA. Academic Press, Elsevier Science, 1266 pp.
7. Chapman, R. F. (2013). The Insects Structure and Function, fifth edition Cambridge University Press 961pp.

## 17. Topics

<b>Subjects</b>	<b>Weeks</b>
<b>Phylum Arthropoda / class Insecta</b> <b>What is Entomology?</b>	<b>1</b>
<b>Insects and its related animal phylum Arthropoda</b> <b>Characters contributing to the success of insect.</b> <b>Advantage and disadvantage of insects</b>	<b>2</b>
<b>Introduction to insect ecology</b> <b>Insect and climate</b>	<b>3</b>
<b>Introduction to herbivory</b> <b>Plant – Herbivore Interactions</b>	<b>4</b>
<b>Plant defenses and insect counter defenses</b> <b>Predator – Prey interactions</b>	<b>5</b>
<b>Natural enemy behavioral ecology</b> <b>Predator-prey and host-parasite interactions</b>	<b>6</b>
<b>Insect defenses against enemies</b> <b>Mutualisms</b>	<b>7</b>
<b>Behavioural ecology: Social insects</b>	<b>8</b>
<b>Exam</b>	<b>9</b>
<b>Plant Chemistry and Insects</b> <b>Chemical Signaling</b>	<b>10</b>
<b>Plants and Insect Nutrition</b> <b>Pollination</b>	<b>11</b>
<b>Class Presentation</b>	<b>12</b>
<b>Final Exam</b>	<b>13</b>

Ministry of Higher Education and Scientific research

