

Sample Syllabus  
Insect Physiology 401/801  
Course Overview

**I. Course Information**

- Insect Physiology 401/801 – 3 credits
- Prerequisites: Chem 251; 12 Hrs Ento or Bios (Zoology).
- Textbook: Physiological Systems in Insects. 3<sup>rd</sup> edition Marc J. Klowden. Academic Press 2013.  
I will also be pulling resources from the following:
  - Insect Physiology and Biochemistry. James L. Nation. 2015
  - The Insect: Structure and Function. R. F. Chapman. 2013
  - Ecological and Environmental Physiology of Insects. Jon Harrison. 2012
  - Various websites, papers and physiology professors who have shared their information.

**II. Course Objectives**

Insect Physiology is the study of the properties, processes, and functions of insect systems. As a component of this course we will examine some major biochemical molecules and actions to study structures and functions within the physiological systems. A student in this course should be able to:

- Become familiar with the physiological systems in insects as outlined in the syllabus.
- Identify the influence that neural and hormonal controls have within each system.
- Write a synopsis of at least two research papers on a relevant physiology topic. (801 only)
- Develop a sense of how physiology can infuse in major research topics in entomology

**III. Grading**

The basic nature of this course is learning through process. Although “lectures” are a common practice in the learning process, I ascribe to the notion that discussions provide a much stronger means to mastering curricular objectives. Socratic questioning is a fundamental means for assimilating new information through cognitive associations and also allows for greater retention (seriously, I believe this). So as we progress through this semester I am hoping that instead of lecturing for large blocks of time, we can have meaningful and relevant discussions about the physiology and biochemistry of insects.

As an outcome for this course, you will be assessed on the following elements:

ELEMENT	POINTS
Unit quizzes (from Maple TA)	100
Midterm exam	200
Final exam	200
<i>Literature review (for 801 only)</i>	<i>100</i>
TOTAL	500 (for 401) 600 (for 801)

Your final submitted grade will be determined by the percentage of total points earned. The following chart outlines points earned, percentages and grades.

POINT RANGE (possible)	PERCENT RANGE	LETTER GRADE
558 to 600 points	93.0 to 100 %	A
540 to 557 points	90.0 to 92.9%	A-
522 to 539 points	87.0 to 89.9%	B+
498 to 521 points	83.0 to 86.9 %	B
480 to 497 points	80.0 to 82.9%	B-
462 to 479 points	77.0 to 79.9%	C+
438 to 461 points	73.0 to 76.9 %	C
420 to 437 points	70.0 to 72.9 %	C-

#### IV. Literature Review (800 level only)

A science research program commonly incorporates extensive literature reviews and assimilating that information into a collective understanding. Many reviews are written with just that notion in mind, expanding the current model in any research field. As with any course, there is a limitation to the scope and sequence which can be rationally offered. So a course becomes a survey of what is believed to be the most relevant information available. In order to expand from the confines of this course, each graduate student will be expected to read from physiology/biochemistry research reviews that relates to the current curriculum. A synopsis of selected research papers will be written during the course of this semester and submitted during dead week.

Details of the review synopsis will be worked out sometime during the semester as agreed upon by the class.

#### V. Syllabus

1. Endocrine system (Ch. 1)
  - Hormones & signal transduction system
    - G-coupled protein
    - Secondary messengers (cAMP, Ca<sup>2+</sup>, IP3, DG, nitric oxide)
  - Insect hormones- [name, synthesis origin, overview of function]
    - Prothoracicotropic hormone (PTTH)
    - Ecdysteroids (ecdysone & 20-hydroxyecdysone)
    - Juvenile hormone (JH)
    - Adipokinetic hormone (AKH)
    - Eclosion hormone (EH)
    - Pheromone-biosynthesis-activating neuropeptides (PBANs)
    - Others: Mas-ETH, egg-development neurohormone (EDNH)
2. Integumental system (Ch. 2)
  - Structure, function & formation
    - sclerotization
  - Growth & Molting
    - Metamorphic development
    - Molting process
    - Endocrinology of molting & metamorphosis
3. Digestive/Metabolic system (Ch. 6)

- Digestive system (alimentary tract)
  - Energy metabolism
    - Carbohydrate metabolism (glycolysis, Kreb's & oxidative phosphorylation)
      - ✘ Glucose, PGAL, pyruvate, acetyl CoA, CO<sub>2</sub>, trehalose
    - Other metabolites- lipids, proteins
    - Transport and regulation
  - Fat body (not from the book)
    - Structure
    - metabolism
4. Circulatory system (Ch. 7)
- System-
    - Hemolymph & Hemocytes
  - Immunity
  - Thermoregulation
5. Excretory system (Ch. 8)
- System
    - Malpighian tubules & hindgut
  - Osmoregulation
    - Water
    - Salts
6. Respiratory system (Ch. 9)
- Tracheal system
  - Physiology of gas exchange
7. Muscular system (Ch. 10)
- insect muscle tissue
    - types (tubular, close-packed, fibrillar)
  - muscle contraction
    - flight
    - synchronous vs. asynchronous
    - metabolism strategies
8. Nervous system (Ch. 11)
- Components of the nervous system
    - Nerve potentials
  - Sensing the environment
    - vision
9. Reproductive systems (Ch. 4)
- Female reproductive systems
  - Male reproductive systems
  - Reproduction
10. Developmental systems. (Ch. 3)
- Insect eggs & oogenesis
  - embryology
- Optional. Behavior (Ch. 5)