The University of Manitoba

Faculty of Agricultural and Food Sciences

COURSE TITLE

Insect Taxonomy

Department	Course Number	Academic Session	Credit Hours
Entomology	ENTM 7200	Fall 2021	3

Prerequisites and how they apply to this course

ENTM 2050 or consent of instructor. ENTM 2050 is an introductory entomology course that provides the necessary background in insect form, function, and identification that is necessary for an advanced level taxonomy course.

Classroom Location	Meeting Days and Class Hours
Animal Science / Entomology, Room: 219	MWF 9:30 – 10:20 am
Lab/Seminar Location	Lab/Seminar/Hours
Animal science building, Room: 220	W 2:30 – 5:25 pm
Department Office location	Phone Number
Animal Science Building 214	(204) 474-9257

Course Web Page (if applicable)

Instructor Information

Name & Title

Dr. Jason Gibbs (he/him/his)

Office Location	Office Phone Number
Animal Science Building 213A	(204) 474-7485

Office Hours

Set office hours are indicated below. I can also be reached by email and will respond within 48 hours.

Office hours: Monday 10:30-11:30 am or by appointment.

Email Address

jason.gibbs@umanitoba.ca

Teaching Assistant:	TA Office Hours and Location
N/A	/

TA Email:

Course Philosophy

Territorial Acknowledgment

The University of Manitoba campuses are located on original lands of Anishinaabeg, Cree, Oji-Cree, Dakota, and Dene peoples, and on the homeland of the Métis Nation.

COVID-19 policy

The instructor and students will be expected to follow all University and government policies related to the COVID-19 pandemic. At a minimum students will be expected to regularly hand-sanitize and clean after touching / handling common surfaces / items. Masks are expected to be worn during the lectures and labs. The instructor is fully vaccinated, and all students are strongly encouraged to be immunized prior to the commencement of class to ensure the safety of fellow students and their broader contacts (some of whom may be unable to be vaccinated). Lectures and labs will be in-person as long as that is allowable, but the course format and format of lab exams may change without prior notice if pandemic restrictions require it.

Students' Learning Responsibilities

Students are expected to practice personal and academic integrity and to take responsibility for one's own personal and academic commitments. Within the context of this class, regular attendance is critical to learn how to identify a wide diversity of insects. Students should respect others and contribute to cooperative learning by promoting a respectful atmosphere and striving to learn from differences in people, ideas, and opinions. Students are expected to be prepared for class and submit assignments on time. Students are highly encouraged to ask for help under any circumstances, but particularly if having difficulty with material or in completing assignments.

Why this course is useful?

This course teaches students the fundamentals of insect taxonomy and teaches students how to identify a diverse array of adult insects. Students will also be introduced to the International Code of Zoological Nomenclature and understand basic phylogenetic theory and how it impacts classification. Students will become proficient with diagnostic identification keys in a variety of formats. This course is useful for anyone considering a career in entomology, museum-based careers, and for any student interested in taxonomy, biodiversity, systematics, evolution, insect morphology, and applied aspects of insect identification.

Who should take this course?

Students in the Entomology Graduate Program and students interested in zoology, biodiversity, taxonomy, systematics, and/or evolution.

How this course fits into the curriculum

This course is important background for graduate students with an interest in insect biodiversity, taxonomy, and evolution.

Course Description

Modified Graduate Calendar Description

This course is designed for students interested in learning about the immense diversity of insects and related arthropods, and to gain an understanding of the natural history, classification, and evolution of insects. Students will learn to use diagnostic keys to identify insects to species and be able to differentiate among a diverse array of insect families from around the world. Students will learn valuable collection and preservation techniques and be able to distinguish key morphological characters in different insect lineages. This course will focus on diversity in adult forms and emphasize terrestrial habitats. Students are expected to collect and practice multiple collecting techniques and explore insects in their natural environment. Students will also be expected to curate a portion of their collected material and make an insect collection emphasizing diversity.

Instructional Methods

This course combines traditional lecture and interactive laboratories to achieve course and learning objectives. Traditional lectures are intended to introduce the major morphological features for different insect lineages and to explain the current understanding of insect evolution in a phylogenetic framework. During lab sessions students will sort, curate and identify their own collected material as well as insects provided by the instructor.

Course Objectives

This course will examine insect diversity through a phylogenetic lens and emphasize the morphological and biological features that identify multiple lineages of insects, other hexapods, and related arthropods. Course objectives include:

- Gain an appreciation of insect diversity around the world and the evolution of insects through time.
- Learn about the natural history of many groups of insects that are found in Manitoba and in other areas of the world.
- Understand how museums function and the role in science, teaching, and outreach.
- Understand key morphological characteristics that define taxonomic lineages to identify insects that have not been encountered previously.
- Learn principles of systematics and understand the role of phylogeny in classification.
- Understand the role of molecular data in identification and taxonomy.
- Develop skills to use relevant literature for insect identification and be able to synthesize information from multiple sources to understand the classification of a group of insects.
- Gain an appreciation for the biodiversity informatics and its many uses in biology.

Learning outcomes: By the end of the course students should be able to:

- Recognize most insect families found in Manitoba by sight.
- Use identification keys effectively to identify lower taxonomic levels.
- Collect adult insects in terrestrial habitats and properly curate specimens and database specimen metadata.
- Understand the role of modern phylogenetic methods in insect classification.

- Understand how to read a phylogenetic tree, what kinds of data are used to estimate trees, how those data are analyzed, and what it means to be monophyletic.
- Understand species concepts and methods for species delimitation.
- Solve taxonomic problems and describe how species and other taxa are named and described
- Name and briefly describe the latest developments in insect biodiversity research, ***e.g.***, , DNA barcoding.
- Synthesize information from multiple taxonomic sources (primary literature, internet) to understand the natural history of a group of insects.
- Learn to present taxonomic information to others in an effective manner.

Description of Examinations

The lab exams and final lab exam will assess student's ability to identify insects by knowing key morphological characteristics that define lineages of insects. Students will be expected to know specific identifying characteristics of organisms to allow them to identify multiple families of insects across all orders. Lab exams are traditionally 'bell-ringers' where material to be identified is passed from student to student with a limited time to identify the material.

Questions on the lecture midterm and final exams will come from lecture content (e.g. species concepts, basic phylogenetic theory, the history and practice of classification, new developments in cyber-taxonomy, as well as aspects of the International Code of Zoological Nomenclature) and won't include material covered in the labs.

Description of Assignments

Major Assignments (40% of final grade)

Students must choose to complete 2 of the following 4 assignments: student should refer to the assignment handout for details, instructions, and grading rubrics. Collections are strongly encouraged.

A. **Insect collection:** 75–100 curated and identified specimens (see instructions).
B. **New Species Record:** Write a publication quality report on a new locality record(s) for a given species.
C. **Curatorial Project:** Curate an entire group of insects in the J. B. Wallis-R.E. Roughley Museum of Entomology; including sorting and identifying pro-tem material
D. **Checklist:** database and summarize holdings of a taxon in the Museum

Assignment and Exam Due Dates

- Wednesday October 13^{h}, 2021; Lab Midterm 1
- Monday October 19^{8h}, 2021: Lecture Midterm
- Wednesday November 17th, 2021; Lab Midterm 2
- Friday December 3, 2021: Major Assignments Due
- Wednesday December 8, 2021: Lab Final

Grade Evaluation

Major Assignments: 40%

Lab midterms: 15% (two, 7.5% each)

Class midterm: 10%

Lab Final exam: 15%

Final exam: 20%

Important Dates (e.g., voluntary withdrawal date)

Nov 8–12: Fall term break.

November 22: Last day for Voluntary Withdrawal without academic penalty

Texts, Readings, Materials

Required Textbook(s):

Johnson, Norman F. & Charles A. Triplehorn. 2005. *Borror and DeLong's Introduction to the Study of Insects, 7th edition*. Brooks/Cole (Thompson). 864 pp. *ISBN*: 0030968356

Alternative texts: Arnett RH (2000) American Insects: A handbook of the insects of America north of Mexico. CRC Press.

Marshall, SA (2006) Insects: Their natural history and diversity. Firefly Books

Recommended Reading:

Will be assigned.

Course Policies

Inquiries to the Instructor:

Students are encouraged to discuss issues pertaining to assignments with the instructor well in advance of deadlines. While every effort will be made to return student inquiries via email as soon as possible, students should expect a minimum of 24 hours to receive a response. Students are encouraged to drop by the instructor's office for assistance (Room 213A animal Science Building), particularly during office hours.

Late Assignments

Late assignments will not be accepted. Student should hand in whatever they have completed by the due date. Late assignments may be received in exceptional circumstances and with excused absences.

Missed Assignments and Exams

To pass the course, all items for which a mark is allocated must be completed and submitted. Unexcused missed assignments or exams will be given a grade of zero. Where assignments are missed and excused through written notification such as a doctor's certification of illness, evidence of death in the family, or other circumstances that are beyond the control of the student, the student can establish a new due date with the instructor and complete the assignment without penalty when handed in by the new due date. The course cannot

be passed without submitting a collection and / or the major assignment. If the final exam has been missed for a valid, documented reason such as illness, or death in the family, another exam date will be set at the discretion of the instructor or through the university administration.

Academic Integrity

Plagiarism or any other form of cheating in examinations, term tests or academic work is subject to serious academic penalty. Cheating in examinations or tests may take the form of copying from another student or bringing unauthorized materials into the exam room. Exam cheating can also include exam impersonation. A student found guilty of contributing to cheating in examinations or assignments is also subject to serious academic penalty. Plagiarism involves an attempt to pass off the work and ideas of others as one's own and is considered cheating. Citing all sources for ideas, images, or otherwise is essential. Students must obtain written permission to use images in assignments but are encouraged to take their own photographs. Students should acquaint themselves with the University's policy on plagiarism, cheating, exam impersonation, and duplicate submission (see http://umanitoba.ca/student/resource/student_advocacy/cheating_plagiarism_fraud.html). Electronic detection tools may be used to screen assignments in cases of suspected plagiarism.

Class Schedule:

See below, topics to be covered may be subject to minor revision, however, deadlines and due dates will remain firm.

Marking scheme:

A+ (≥90), A (≥80), B+ (≥75), B (≥70), C+ (≥65), C (≥60), D (≥50), F (<50)

Class Schedule

Day	Date	Lecture	Lab	Due Dates
W	8-Sep-21	Introduction to Insect Taxonomy		
F	10-Sep-21	Insect morphology		
M	13-Sep-21	Insect morphology II		
W	15-Sep-21	**lab lecture: Hymenoptera**	Hymenoptera 1, 2	
F	17-Sep-21	Understanding phylogenies		
M	20-Sep-21	Origins of the insects		
W	22-Sep-21	**lab lecture: Hyms cont'd, Coleoptera**	Hymenoptera 3, Coleoptera 1	
F	24-Sep-21	The role of taxonomy		
M	27-Sep-21	History of insect classification		
W	29-Sep-21	**lab lecture: Coleos cont'd, minor orders 1**	Coleoptera 2, Strepsiptera, Neuropterida, Mecoptera, Siphonaptera	
F	1-Oct-21	Nomenclature I		
M	4-Oct-21	Nomenclature II		
W	6-Oct-21	**lab lecture: Diptera**	Diptera 1, 2	
F	8-Oct-21	Species concepts		
M	11-Oct-21	Speciation I		
W	13-Oct-21	**lab lecture: Dips cont'd, Lepidoptera**	**Lab Midterm 1**/ Diptera 3, Lepidoptera 1	LAB Midterm 1 (7.5%)
F	14-Oct-21	Speciation II		
M	18-Oct-21	**MIDTERM**		Midterm 1 (15%)
W	20-Oct-21	**lab lecture: Leps cont'd, Trichoptera**	Lepidoptera 2, Trichoptera	
F	22-Oct-21	Importance of museums		
M	25-Oct-21	Species descriptions		
W	27-Oct-21	**lab lecture: Hemiptera**	Hemiptera	
F	39-Oct-21	Databases & Bioinformatic tools		
M	1-Nov-21	Introduction to molecular data		
W	3-Nov-21	**lab lecture: minor orders II**	Thysanoptera, Psocodea, Zoraptera, Plecoptera, Dictyoptera, Dermaptera, Embioptera	
F	5-Nov-21	Generating molecular data		
M	8-Nov-21	DNA barcoding		
W	10-Nov-21	NO LECTURE		
F	12-Nov-21	NO LECTURE		
M	15-Nov-21	DNA barcoding controversies		
W	17-Nov-21	**lab lecture: Phasmatodea, Orthoptera**	**Lab Midterm 2**/ Phasmatodea, Orthoptera	Lab Midterm 2 (7.5%)
F	19-Nov-21	Analysing DNA barcode data		
M	22-Nov-21	Extending barcoding		
W	24-Nov-21	**lab lecture: Odonata, Ephemeroptera**	Odonata, Ephemeroptera	
F	26-Nov-21	Classification wars I		
M	29-Nov-21	Classification wars II		
W	1-Dec-21	**lab lecture: primitive orders**	Archaeognatha, Zygentoma, Entognatha	
F	3-Dec-21	Molecular phylogenetics approaches I		Major Assignments Due (40%)
M	6-Dec-21	Molecular phylogenetics approaches II		

W	8-Dec-21	Reconstructing ancestral states	Lab Final (Cumulative)	Lab Final (15%)
F	10-Dec-21	Fossils and phylogenies / Review		
	TBA		FINAL EXAM	FINAL (20%)