

Insect Biodiversity and Evolution

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Instructors

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Time / Location

We meet every Tuesday and Thursday, from 12:05–1:20p in Tyson Bldg, Room 108 for lecture and from 1:35–3:20p in Headhouse III, Room 102 (Frost Entomological Museum) for lab.

Course Goals, Objectives, and Outcomes

This course is designed to teach students about insect taxonomy, evolutionary relationships, collection and preservation techniques, morphology, and natural history. We'll focus mostly on adult forms and emphasize insects found in Pennsylvania. In the lab, students will learn how to handle specimens, use diagnostic tools, and identify insects by sight. Collection techniques will be honed during [field trips](#).

Upon completion of this course students should be able to:

- Label a generalized hexapod diagram with external anatomy terms
- Name and sight-identify all local hexapod orders and several common local families

- Solve taxonomic problems and describe how species and other taxa are named and described, i.e., understand the fundamentals of taxonomic practice
- Draw a phylogenetic tree of relationships between hexapod orders
- Teach others how to read a phylogenetic tree and know what kinds of data are used to estimate trees, how those data are analyzed, and what it means to be monophyletic
- Describe key innovations and life history strategies of major hexapod lineages and when they evolved
- Teach others how to collect, preserve, and transport hexapod specimens and describe why this process is important
- Teach others about the natural history of insects more generally

Course Expectations and Content

To realize the educational outcomes listed above, students are expected to:

- Attend every lecture and lab
- Participate in discussions
- Ask questions

See [Policies and resources](#) page for information regarding academic honesty, non-discrimination, psychological services, and disability access.

The course content is organized roughly into 13 units (see below), each of which has its own (more or less) structured curriculum, including lecture/discussion components and lab exercises. Dispersed across these units are topics (“phenomena”) that transcend taxa—i.e., they will be discussed at multiple points during the semester, as appropriate. Examples include leaf mining and other herbivory strategies, galls, mimicry/aposematism, sound production, weapons, and parasitism.

1. Natural history collections - history, relevance, and ethics ([collections slides](#) ↓
(https://psu.instructure.com/courses/2125267/files/126473018/download?download_frd=1) ; [Insect Collectors Code](#) ↓ (https://psu.instructure.com/courses/2125267/files/124839881/download?download_frd=1))
2. Basic arthropod morphology ([morphology slides](#) ↓
(https://psu.instructure.com/courses/2125267/files/126472996/download?download_frd=1) ; [morphology lab](#) ↓ (https://psu.instructure.com/courses/2125267/files/126507206/download?download_frd=1) ; [morphology cheat sheet](#) ↓
(https://psu.instructure.com/courses/2125267/files/126507252/download?download_frd=1))
3. Early arthropods, fossils, terrestrialization ([fossils and terrestrialization slides](#) ↓
(https://psu.instructure.com/courses/2125267/files/127088352/download?download_frd=1) ; [fossil lab](#) ↓
(https://psu.instructure.com/courses/2125267/files/127088503/download?download_frd=1))
4. Fundamentals of systematics ([systematics slides](#) ↓
(https://psu.instructure.com/courses/2125267/files/127088457/download?download_frd=1) ;

- [systematics lab](https://psu.instructure.com/courses/2125267/files/126507170/download?download_frd=1) ↓ (https://psu.instructure.com/courses/2125267/files/126507170/download?download_frd=1)
5. Non-hexapod arthropods ([arthropod slides](https://psu.instructure.com/courses/2125267/files/127088212/download?download_frd=1) ↓ (https://psu.instructure.com/courses/2125267/files/127088212/download?download_frd=1) ; [non-hexapod arthropod lab](https://psu.instructure.com/courses/2125267/files/127088718/download?download_frd=1) ↓ (https://psu.instructure.com/courses/2125267/files/127088718/download?download_frd=1))
6. Non-pterygote Hexapoda ([non-pterygote slides](https://psu.instructure.com/courses/2125267/files/127403881/download?download_frd=1) ↓ (https://psu.instructure.com/courses/2125267/files/127403881/download?download_frd=1) ; [non-pterygote lab](https://psu.instructure.com/courses/2125267/files/127088652/download?download_frd=1) ↓ (https://psu.instructure.com/courses/2125267/files/127088652/download?download_frd=1))
7. Paleoptera, origin of wings ([Paleoptera slides](https://psu.instructure.com/courses/2125267/files/127403770/download?download_frd=1) ↓ (https://psu.instructure.com/courses/2125267/files/127403770/download?download_frd=1) ; [Paleoptera lab](https://psu.instructure.com/courses/2125267/files/127225277/download?download_frd=1) ↓ (https://psu.instructure.com/courses/2125267/files/127225277/download?download_frd=1))
8. Polyneoptera ([Polyneoptera 1 slides](https://psu.instructure.com/courses/2125267/files/127740210/download?download_frd=1) ↓ (https://psu.instructure.com/courses/2125267/files/127740210/download?download_frd=1) , [Polyneoptera 2 slides](https://psu.instructure.com/courses/2125267/files/127740280/download?download_frd=1) ↓ (https://psu.instructure.com/courses/2125267/files/127740280/download?download_frd=1) ; [Polyneoptera lab](https://psu.instructure.com/courses/2125267/files/127740403/download?download_frd=1) ↓ (https://psu.instructure.com/courses/2125267/files/127740403/download?download_frd=1))
9. Acercaria ([Acercaria 1 slides](https://psu.instructure.com/courses/2125267/files/127842386/download?download_frd=1) ↓ (https://psu.instructure.com/courses/2125267/files/127842386/download?download_frd=1) , [Acercaria 2 slides](https://psu.instructure.com/courses/2125267/files/128041412/download?download_frd=1) ↓ (https://psu.instructure.com/courses/2125267/files/128041412/download?download_frd=1) ; [Acercaria lab](https://psu.instructure.com/courses/2125267/files/127740392/download?download_frd=1) ↓ (https://psu.instructure.com/courses/2125267/files/127740392/download?download_frd=1)) *midterm material ends here*
10. Holometabolous development, Hymenoptera ([Holometabola slides](https://psu.instructure.com/courses/2125267/files/129399228/download?download_frd=1) ↓ (https://psu.instructure.com/courses/2125267/files/129399228/download?download_frd=1) ; [Hymenoptera sides 1](https://psu.instructure.com/courses/2125267/files/129399232/download?download_frd=1) ↓ (https://psu.instructure.com/courses/2125267/files/129399232/download?download_frd=1) ; [Hymenoptera slides 2](https://psu.instructure.com/courses/2125267/files/129399236/download?download_frd=1) ↓ (https://psu.instructure.com/courses/2125267/files/129399236/download?download_frd=1) ; [Hymenoptera slides 3](https://psu.instructure.com/courses/2125267/files/129399239/download?download_frd=1) ↓ (https://psu.instructure.com/courses/2125267/files/129399239/download?download_frd=1) ; [Hymenoptera lab](https://psu.instructure.com/courses/2125267/files/128679403/download?download_frd=1) ↓ (https://psu.instructure.com/courses/2125267/files/128679403/download?download_frd=1))
11. Neuropterida ([Neuropterida slides](https://psu.instructure.com/courses/2125267/files/129399255/download?download_frd=1) ↓ (https://psu.instructure.com/courses/2125267/files/129399255/download?download_frd=1) ; [Neuropterida lab](https://psu.instructure.com/courses/2125267/files/128679413/download?download_frd=1) ↓ (https://psu.instructure.com/courses/2125267/files/128679413/download?download_frd=1))
12. Coleoptera and Strepsiptera ([Coleoptera 1 slides](https://psu.instructure.com/courses/2125267/files/129399332/download?download_frd=1) ↓ (https://psu.instructure.com/courses/2125267/files/129399332/download?download_frd=1) ; [Coleoptera 2 slides](https://psu.instructure.com/courses/2125267/files/129399336/download?download_frd=1) ↓ (https://psu.instructure.com/courses/2125267/files/129399336/download?download_frd=1) ; [Coleoptera 3 and Strepsiptera slides](https://psu.instructure.com/courses/2125267/files/129399338/download?download_frd=1) ↓ (https://psu.instructure.com/courses/2125267/files/129399338/download?download_frd=1) ; [Coleoptera](https://psu.instructure.com/courses/2125267/files/129399338/download?download_frd=1)

[and Strepsiptera lab](https://psu.instructure.com/courses/2125267/files/128679354/download?download_frd=1) ↓ (https://psu.instructure.com/courses/2125267/files/128679354/download?download_frd=1))

13. Antliophora ([Diptera 1 slides](https://psu.instructure.com/courses/2125267/files/129399398/download?download_frd=1) ↓ (https://psu.instructure.com/courses/2125267/files/129399398/download?download_frd=1) ; [Diptera 2 slides](https://psu.instructure.com/courses/2125267/files/129399412/download?download_frd=1) ↓ (https://psu.instructure.com/courses/2125267/files/129399412/download?download_frd=1) ; [Mecoptera and Siphonaptera slides](https://psu.instructure.com/courses/2125267/files/129399414/download?download_frd=1) ↓ (https://psu.instructure.com/courses/2125267/files/129399414/download?download_frd=1) ; [Antliophora lab](https://psu.instructure.com/courses/2125267/files/129265410/download?download_frd=1) ↓ (https://psu.instructure.com/courses/2125267/files/129265410/download?download_frd=1))
14. Amphiesmentoptera ([Lepidoptera 1 slides](https://psu.instructure.com/courses/2125267/files/129847925/download?download_frd=1) ↓ (https://psu.instructure.com/courses/2125267/files/129847925/download?download_frd=1) ; [Lepidoptera 2 slides](https://psu.instructure.com/courses/2125267/files/129847922/download?download_frd=1) ↓ (https://psu.instructure.com/courses/2125267/files/129847922/download?download_frd=1) ; [Trichoptera slides](https://psu.instructure.com/courses/2125267/files/130368502/download?download_frd=1) ↓ (https://psu.instructure.com/courses/2125267/files/130368502/download?download_frd=1) ; [Amphiesmenoptera lab](https://psu.instructure.com/courses/2125267/files/129848114/download?download_frd=1) ↓ (https://psu.instructure.com/courses/2125267/files/129848114/download?download_frd=1))
15. **NEW!** Insect declines ([insect decline slides](https://psu.instructure.com/courses/2125267/files/130368531/download?download_frd=1) ↓ (https://psu.instructure.com/courses/2125267/files/130368531/download?download_frd=1))

Required Course Materials

Textbook: There is no required textbook. Instructors will discuss and make available resources that facilitate specimen diagnosis and learning about the evolution of these organisms. Should you desire to have your own books we recommend:

- [Daly and Doyen's Introduction to Insect Biology](https://global.oup.com/academic/product/daly-and-doyens-introduction-to-insect-biology-9780190853167?cc=us&lang=en&) (https://global.oup.com/academic/product/daly-and-doyens-introduction-to-insect-biology-9780190853167?cc=us&lang=en&)
- *Borror and DeLong's Introduction to the Study of Insects* (a bit dated now but still useful)

Attitude: Most students in this course are earning graduate degrees in Entomology. We assume you're here because you love insects and their relatives and want to understand more fully their diversity and evolution. Students should keep an open mind, be communicative about conflicts and problems, and always strive for excellence.

Grades








Grading scheme: Letter grades follow the usual scale: 94–100% = A; <94 to 90% = A-; <90 to 87% = B+; <87 to 84% = B; <84 to 80% = B-; <80 to 77% = C+; <77 to 70% = C; <70 to 60% = D; <60% = F.

Graded products:

midterm (October 12)	100
final exam (finals week)	100

lab practicals (n=4; dates posted by September 1)	120
collection check	30
collection	150
database	100
total =	600

Course Summary:

Date	Details	Due
Thu Sep 30, 2021	 Collection and database check (https://psu.instructure.com/courses/2125267/assignments/13111907)	due by 11:59pm
Tue Oct 12, 2021	 Midterm (https://psu.instructure.com/courses/2125267/assignments/13405827)	due by 11:59pm
Thu Oct 21, 2021	 lab practical 2 (https://psu.instructure.com/courses/2125267/assignments/13437036)	due by 11:59pm
Tue Dec 7, 2021	 lab practical 4 (https://psu.instructure.com/courses/2125267/assignments/13521649)	due by 11:59pm
Thu Dec 9, 2021	 Collection (https://psu.instructure.com/courses/2125267/assignments/13112424)	due by 11:59pm
	 Collection database (https://psu.instructure.com/courses/2125267/assignments/13112229)	due by 11:59pm
Tue Dec 14, 2021	 Final Exam (https://psu.instructure.com/courses/2125267/assignments/13530805)	due by 11:59pm
	 Lab practical 1 (https://psu.instructure.com/courses/2125267/assignments/13389770)	
	 lab practical 3 (https://psu.instructure.com/courses/2125267/assignments/13450409)	