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| For Academic Affairs and Research Use Only |
| Proposal Number | SM20 |
| CIP Code:  |  |
| Degree Code: |  |

**New or Modified Course Proposal Form**

**[X] Undergraduate Curriculum Council**

**[ ] Graduate Council**

|  |
| --- |
| **[X]New Course, [ ]Experimental Course (1-time offering), or [ ]Modified Course (Check one box)** |

Signed paper copies of proposals submitted for consideration are no longer required. Please type approver name and enter date of approval.

|  |  |
| --- | --- |
| Virginie Rolland 8/4/2022**Department Curriculum Committee Chair** | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…**COPE Chair (if applicable)** |
| Stephen J. Mullin 8/5/2022**Department Chair** | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…**Head of Unit (if applicable)**   |
| John Hershberger 8/22/2022 Enter date…**College Curriculum Committee Chair** | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…**Undergraduate Curriculum Council Chair** |
| Mary Elizabeth Spence 8/22/2022**Office of Assessment (new courses only)** | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…**Graduate Curriculum Committee Chair** |
| Lynn Boyd 8/24/2022**College Dean** | Alan Utter 9/12/2022**Vice Chancellor for Academic Affairs** |
| \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…**General Education Committee Chair (if applicable)**   |  |

1. **Contact Person (Name, Email Address, Phone Number)**

Andrew Sweet, asweet@astate.edu, 870-680-8480

1. **Proposed starting term and Bulletin year for new course or modification to take effect**

Fall 2023, AY 2023-2024.

**Instructions:**

*Please complete all sections unless otherwise noted. For course modifications, sections with a “Modification requested?” prompt need not be completed if the answer is “No.”*

|  |  |  |
| --- | --- | --- |
|  | **Current (Course Modifications Only)** | **Proposed (New or Modified)** *(Indicate “N/A” if no modification)* |
| **Prefix** |  | **BIO** |
| **Number\*** |  | **4114** |
| **Title** |  | **Phylogenetics and Systematics** |
| **Description\*\*** |  | **Theory, history, and application of phylogenetic methods, especially in the context of understanding evolution, taxonomy, biodiversity, and genetics. Lecture three hours and lab three hours per week. Prerequisites, BIO 3011, BIO 3013, and BIO 4083. Fall, odd.** |

 ***\**** (Confirm with the Registrar’s Office that number chosen has not been used before and is available for use. For variable credit courses, indicate variable range. *Proposed number for experimental course is 9*. )

\*\*Forty words or fewer as it should appear in the Bulletin.

1. **Proposed prerequisites and major restrictions** **[Modification requested?]**

(Indicate all prerequisites. If this course is restricted to a specific major, which major. If a student does not have the prerequisites or does not have the appropriate major, the student will not be allowed to register).

1. **Yes** Are there any prerequisites?
	1. If yes, which ones?

**BIO 3013/3011 (Genetics and Lab); BIO 4083 (Evolution)**

* 1. Why or why not?

T**he proposed new course is an advanced evolution course that requires a foundational understanding of evolutionary theory. Many of the topics covered in the proposed course also rely on students to have a firm understanding of genetics. Therefore, students must have Genetics and Evolution courses as prerequisites. Students in relevant disciplines other than the biological sciences (e.g., computer science) will be able to take the course at the discretion of the instructor.**

1. **No** Is this course restricted to a specific major?
	1. If yes, which major? Enter text...
2. **Proposed course frequency [Modification requested?]**

(e.g. Fall, Spring, Summer; if irregularly offered, please indicate, “irregular.”) *Not applicable to Graduate courses.*

**Fall, odd years**

1. **Proposed course type [Modification requested?]**

Will this course be lecture only, lab only, lecture and lab, activity (e.g., physical education), dissertation/thesis, capstone, independent study, internship/practicum, seminar, special topics, or studio? Please choose one.

**Lecture and lab**

1. **Proposed grade type [Modification requested?]**

What is the grade type (i.e. standard letter, credit/no credit, pass/fail, no grade, developmental, or other [please elaborate])

**Standard letter**

1. **Yes** Is this course dual-listed (undergraduate/graduate)?
2. **No** Is this course cross-listed?

*(If it is, all course entries must be identical including course descriptions. Submit appropriate documentation for requested changes. It is important to check the course description of an existing course when adding a new cross-listed course.)*

**a.** – If yes, please list the prefix and course number of the cross-listed course.

 Enter text...

 **b.** – **Yes / No** Can the cross-listed course be used to satisfy the prerequisite or degree requirements this course satisfies?

 Enter text...

1. **No** Is this course in support of a new program?

a. If yes, what program?

 Enter text...

1. **No** Will this course be a one-to-one equivalent to a deleted course or previous version of this course (please check with the Registrar if unsure)?

a. If yes, which course?

Enter text...

**Course Details**

1. **Proposed outline** **[Modification requested?]**

(The course outline should be topical by weeks and should be sufficient in detail to allow for judgment of the content of the course.)

**Week 1: Introduction; Nomenclature**

**Week 2: Classification**

**Week 3: Characters, states, and polarity**

**Week 4: Maximum parsimony**

**Week 5: Types of data**

**Week 6: Sequence alignment; Exam 1**

**Week 7: Maximum likelihood; models**

**Week 8: Distance methods**

**Week 9: Bayesian inference**

**Week 10: Phylogenomics**

**Week 11: Gene tree discordance; Supertrees and networks**

**Week 12: Assessing support and discordance; Exam 2**

**Week 13: Divergence time; Biogeography**

**Week 14: Comparative methods; Trait evolution**

**Week 15: Cophylogenetics; Phylodynamics; Community phylogenetics**

**Final, cumulative exam**

1. **Proposed special features** **[Modification requested?]**

(e.g. labs, exhibits, site visitations, etc.)

**One 2hr 50min lab period per week**

1. **Department staffing and classroom/lab resources**

**Lecture room and a computer lab (e.g., LSE 205) for labs**

1. Will this require additional faculty, supplies, etc.?

**No**

1. **No** Does this course require course fees?

 *If yes: please attach the New Program Tuition and Fees form, which is available from the UCC website.*

**Justification**

**Modification Justification (Course Modifications Only)**

1. Justification for Modification(s)

**New Course Justification (New Courses Only)**

1. Justification for course. Must include:

 a. Academic rationale and goals for the course (skills or level of knowledge students can be expected to attain)

 **Phylogenetics (reconstructing the evolutionary history among different organisms) is a major component of biology, particularly for undergraduate students seeking an advanced understanding of evolutionary theory. Ecology, evolution, biotechnology, medicine, and many other fields rely on phylogenetic methods to better understand the world around us. However, phylogenetic theory and application is often very technical, requiring specific training for students to grasp the concepts and apply it to research questions or an advanced understanding of biology. The proposed course will fill this training gap by providing students with A) a thorough overview of the theory and application of phylogenetic methods and B) a hands-on computer lab that allows students to apply concepts they learn in class to real datasets and problems. Students will also complete an independent project to further apply their skills to a relevant question in their field(s) of interest. Students will need to give an oral presentation of their project to the class. By completing this course, students will obtain A) a thorough understanding of phylogenetics theory, B) an understanding of how phylogenetics links to taxonomic classification, B) experience applying theoretical knowledge of phylogenetics to real-world problems in biology, C) gaining proficiency in computational and bioinformatic techniques, including writing computer code and analyzing large data sets.**

b. How does the course fit with the mission of the department? If course is mandated by an accrediting or certifying agency, include the directive.

**The Biology program at A-State offers an environment that:**

**1. Offers a curriculum in biological sciences emphasizing acquisition of knowledge through integration of theory with practical laboratory and field studies**

**2. Provides opportunities to develop critical scientific reasoning, communication skills and the appropriate use of technology**

**3. Extends our skills and facilities in service to the public as well as to the scientific community.**

**This course will help students obtain these goals by providing specific training in bioinformatics, analytical methods, and advanced evolutionary theory. These skills are broadly applicable for students pursuing careers in health, education, research, and government.**

c. Student population served.

**Undergraduate students in the BS Biology pre-professional; BSE Evolution Ecology and Organismal Biology; BSE Biology; BS Wildlife, Fisheries, and Conservation; and BS Biotechnology degree programs**

d. Rationale for the level of the course (lower, upper, or graduate).

**The proposed course will be an advanced evolution course. The content will be most appropriate for advanced undergraduate students. The course will count as upper-level elective.**

**Assessment**

**Assessment Plan Modifications (Course Modifications Only)**

1. Do the proposed modifications result in a change to the assessment plan?

 *If yes, please complete the Assessment section of the proposal*

**Relationship with Current Program-Level Assessment Process (Course modifications skip this section unless the answer to #18 is “Yes”)**

1. What is/are the intended program-level learning outcome/s for students enrolled in this course? Where will this course fit into an already existing program assessment process?
2. **Students will be able to identify diversity as result of evolutionary and adaptive mechanisms while recognizing the underlying genetic principles and mechanisms of these processes.**
3. **Students will be able to distinguish biological mechanisms (for example cellular respiration; photosynthesis; DNA replication; etc.) and relate these mechanisms to overall biological systems (for example energy production and flow; circulatory systems in plants and animals; ecological systems) and how they work.**
4. **Students will be able to construct hypothesis; design studies to test those hypotheses.**

**This course will address all three of these outcomes by focusing on advanced theory in evolutionary biology, specifically related to phylogenetic theory and application. The course fills a need for undergraduate students in the various biology-focused graduate programs, who currently do not have many options for advanced courses in evolution or bioinformatics.**

1. Considering the indicated program-level learning outcome/s (from question #19), please fill out the following table to show how and where this course fits into the program’s continuous improvement assessment process.

*For further assistance, please see the ‘Expanded Instructions’ document available on the UCC - Forms website for guidance, or contact the Office of Assessment at 870-972-2989.*

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| **Program-Level Outcome 1 (from question #19)** | Capstone Exam |
| Assessment Measure | The capstone exam is administered at the end of the course BIO 4021 Biological Seminar that students must take in their graduating semester |
| Assessment Timetable | Every Fall and Spring semester |
| Who is responsible for assessing and reporting on the results? | Instructors of Record for the BIO 4021 Biological Seminar course. |

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| **Program-Level Outcome 2 (from question #19)** |   |
| Assessment Measure |  |
| Assessment Timetable |   |
| Who is responsible for assessing and reporting on the results? |   |

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| **Program-Level Outcome 3 (from question #19)** |   |
| Assessment Measure |   |
| Assessment Timetable |   |
| Who is responsible for assessing and reporting on the results? | Instructors |

*(Repeat if this new course will support additional program-level outcomes)*

 **Course-Level Outcomes**

1. What are the course-level outcomes for students enrolled in this course and the associated assessment measures?

|  |  |
| --- | --- |
| **Outcome 1** | Students will be able to interpret phylogenetic trees. |
| Which learning activities are responsible for this outcome? | Lecture, paper discussions, labs |
| Assessment Measure  | Exams, paper reflections, lab assignments, project and paper |

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| **Outcome 2** | Students will be able to identify the different schools of classification.  |
| Which learning activities are responsible for this outcome? | Lecture, labs |
| Assessment Measure  | Exams, lab assignments |

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| **Outcome 3** | Students will be able to evaluate different methods for estimating phylogenetic trees.  |
| Which learning activities are responsible for this outcome? | Lecture, paper discussions, labs |
| Assessment Measure  | Exams, paper reflections, lab assignments, project and paper |

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| **Outcome 4** | Students will be able to apply computation approaches for estimating and analyzing phylogenetic trees.  |
| Which learning activities are responsible for this outcome? | Labs |
| Assessment Measure  | Lab assignments, project and paper |

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| **Outcome 5** | Students will be able to explain evolutionary and genetic processes that can lead to discordant phylogenies. |
| Which learning activities are responsible for this outcome? | Lecture, paper discussions, labs |
| Assessment Measure  | Exams, paper reflections, lab assignments, project and paper |

*(Repeat if needed for additional outcomes)*

**Bulletin Changes**

|  |
| --- |
| **Instructions**  |
| **Please visit** [**http://www.astate.edu/a/registrar/students/bulletins/index.dot**](http://www.astate.edu/a/registrar/students/bulletins/index.dot) **and select the most recent version of the bulletin. Copy and paste all bulletin pages this proposal affects below. Please include a before (with changed areas highlighted) and after of all affected sections.** **\*Please note: Courses are often listed in multiple sections of the bulletin. To ensure that all affected sections have been located, please search the bulletin (ctrl+F) for the appropriate courses before submission of this form.**  |

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**Before:**

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| **Biology** |
|    | •  [BIO 403V - Special Problems in Biology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3966) **Sem. Hrs:** **Variable** |
|    | •  [BIO 404V - Special Topics in Biological Sciences](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3967) **Sem. Hrs:** **Variable** |
|    | •  [BIO 1013 - Making Connections Biology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3914) **Sem. Hrs:** **3** |
|    | •  [BIO 1023 - Biological Inquiry](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3915) **Sem. Hrs:** **3** |
|    | •  [BIO 1301 - Biology of Animals Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3916) **Sem. Hrs:** **1** |
|    | •  [BIO 1303 - Biology of Animals](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3917) **Sem. Hrs:** **3** |
|    | •  [BIO 1501 - Biology of Plants Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3918) **Sem. Hrs:** **1** |
|    | •  [BIO 1503 - Biology of Plants](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3919) **Sem. Hrs:** **3** |
|    | •  [BIO 2011 - Biology of the Cell Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3920) **Sem. Hrs:** **1** |
|    | •  [BIO 2013 - Biology of the Cell](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3921) **Sem. Hrs:** **3** |
|    | •  [BIO 2042 - Biotechnology in Global Society](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3922) **Sem. Hrs:** **2** |
|    | •  [BIO 2101 - Microbiology for Nursing and Allied Health Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3923) **Sem. Hrs:** **1** |
|    | •  [BIO 2103 - Microbiology for Nursing and Allied Health](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3924) **Sem. Hrs:** **3** |
|    | •  [BIO 2201 - Human Anatomy and Physiology I Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3925) **Sem. Hrs:** **1** |
|    | •  [BIO 2203 - Human Anatomy and Physiology I](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3926) **Sem. Hrs:** **3** |
|    | •  [BIO 2221 - Human Anatomy and Physiology II Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3927) **Sem. Hrs:** **1** |
|    | •  [BIO 2223 - Human Anatomy and Physiology II](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3928) **Sem. Hrs:** **3** |
|    | •  [BIO 3011 - Genetics Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3929) **Sem. Hrs:** **1** |
|    | •  [BIO 3013 - Genetics](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3930) **Sem. Hrs:** **3** |
|    | •  [BIO 3023 - Principles of Ecology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3931) **Sem. Hrs:** **3** |
|    | •  [BIO 3051 - Try Out the Classroom](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3933) **Sem. Hrs:** **1** |
|    | •  [BIO 3201 - Introduction to Medical and Dental Practices](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3934) **Sem. Hrs:** **1** |
|    | •  [BIO 3203 - Pathophysiology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3935) **Sem. Hrs:** **3** |
|    | •  [BIO 3211 - Techniques for Medical Exam Test Taking](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3936) **Sem. Hrs:** **1** |
|    | •  [BIO 3221 - Human Structure and Function I Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3937) **Sem. Hrs:** **1** |
|    | •  [BIO 3223 - Human Structure and Function I](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3938) **Sem. Hrs:** **3** |
|    | •  [BIO 3231 - Human Structure and Function II Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3939) **Sem. Hrs:** **1** |
|    | •  [BIO 3233 - Human Structure and Function II](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3940) **Sem. Hrs:** **3** |
|    | •  [BIO 3241 - Physical Diagnosis](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3941) **Sem. Hrs:** **1** |
|    | •  [BIO 3251 - Introduction to Pathology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3942) **Sem. Hrs:** **1** |
|    | •  [BIO 3261 - Health Coaching I](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3943) **Sem. Hrs:** **1** |
|    | •  [BIO 3271 - Health Coaching II](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3944) **Sem. Hrs:** **1** |
|    | •  [BIO 3301 - General Entomology Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3945) **Sem. Hrs:** **1** |
|    | •  [BIO 3303 - General Entomology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3947) **Sem. Hrs:** **3** |
|    | •  [BIO 3311 - Economic Entomology Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3948) **Sem. Hrs:** **1** |
|    | •  [BIO 3313 - Economic Entomology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3950) **Sem. Hrs:** **3** |
|    | •  [BIO 3322 - Invertebrate Zoology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3951) **Sem. Hrs:** **2** |
|    | •  [BIO 3332 - Invertebrate Zoology Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3952) **Sem. Hrs:** **2** |
|    | •  [BIO 3501 - Wild Flowers of Arkansas](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3953) **Sem. Hrs:** **1** |
|    | •  [BIO 3511 - Wild Flowers of Arkansas Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3954) **Sem. Hrs:** **1** |
|    | •  [BIO 3541 - Plant Pathology Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3955) **Sem. Hrs:** **1** |
|    | •  [BIO 3542 - Plant Pathology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3956) **Sem. Hrs:** **2** |
|    | •  [BIO 3553 - Economic Botany](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3957) **Sem. Hrs:** **3** |
|    | •  [BIO 3673 - Human Dimensions of Natural Resources](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3958) **Sem. Hrs:** **3** |
|    | •  [BIO 4011 - Microtechnique](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3961) **Sem. Hrs:** **1** |
|    | •  [BIO 4012 - Microtechnique Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3962) **Sem. Hrs:** **2** |
|    | •  [BIO 4013 - Population Genetics](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3963) **Sem. Hrs:** **3** |
|    | •  [BIO 4021 - Biological Seminar](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3964) **Sem. Hrs:** **1** |
|    | •  [BIO 4033 - Bioinformatics and Applications](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3965) **Sem. Hrs:** **3** |
|    | •  [BIO 4043 - Biometry](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=16194) **Sem. Hrs:** **3** |
|    | •  [BIO 4053 - Applications in Biotechnology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3968) **Sem. Hrs:** **3** |
|    | •  [BIO 4063 - Biosafety and Ethics in Research](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3969) **Sem. Hrs:** **3** |
|    | •  [BIO 4083 - Evolution](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3932) **Sem. Hrs:** **3** |
|    | •  [BIO 4103 - Virology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3970) **Sem. Hrs:** **3** |
|    | •  [BIO 4104 - Microbiology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3971) **Sem. Hrs:** **4** |
|    | •  [BIO 4111 - Immunology Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3972) **Sem. Hrs:** **1** |
|    | •  [BIO 4113 - Immunology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3973) **Sem. Hrs:** **3** |
|    | •  [BIO 4123 - Cell Signaling](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3974) **Sem. Hrs:** **3** |
|    | •  [BIO 4131 - Cell Biology Lab](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3975) **Sem. Hrs:** **1** |
|    | •  [BIO 4133 - Cell Biology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3976) **Sem. Hrs:** **3** |
|    | •  [BIO 4143 - Pharmacology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3977) **Sem. Hrs:** **3** |
|    | •  [BIO 4153 - Laboratory in BioTechniques I](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3978) **Sem. Hrs:** **3** |
|    | •  [BIO 4163 - Laboratory in BioTechniques II](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3979) **Sem. Hrs:** **3** |
|    | •  [BIO 4173 - Molecular Biology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3980) **Sem. Hrs:** **3** |
|    | •  [BIO 4201 - Issues in Human Ecology Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3981) **Sem. Hrs:** **1** |
|    | •  [BIO 4202 - Issues in Human Ecology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3982) **Sem. Hrs:** **2** |
|    | •  [BIO 4213 - Human Genetics](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3983) **Sem. Hrs:** **3** |
|    | •  [BIO 4301 - Aquatic Entomology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3984) **Sem. Hrs:** **1** |
|    | •  [BIO 4302 - Aquatic Entomology Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3985) **Sem. Hrs:** **2** |
|    | •  [BIO 4311 - Fisheries Biology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3986) **Sem. Hrs:** **1** |
|    | •  [BIO 4312 - Fisheries Biology Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3987) **Sem. Hrs:** **2** |
|    | •  [BIO 4324 - Comparative Vertebrate Anatomy](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=16190) **Sem. Hrs:** **4** |
|    | •  [BIO 4332 - Animal Histology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3988) **Sem. Hrs:** **2** |
|    | •  [BIO 4333 - Marine Biology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3989) **Sem. Hrs:** **3** |
|    | •  [BIO 4341 - Animal Embryology Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3990) **Sem. Hrs:** **1** |
|    | •  [BIO 4342 - Animal Histology Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3991) **Sem. Hrs:** **2** |
|    | •  [BIO 4343 - Animal Embryology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3992) **Sem. Hrs:** **3** |
|    | •  [BIO 4354 - Mammalogy](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3993) **Sem. Hrs:** **4** |
|    | •  [BIO 4362 - Applied Aquaculture](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3995) **Sem. Hrs:** **2** |
|    | •  [BIO 4371 - Animal Ecology Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3997) **Sem. Hrs:** **1** |
|    | •  [BIO 4372 - Applied Fisheries](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3998) **Sem. Hrs:** **2** |
|    | •  [BIO 4373 - Animal Ecology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3999) **Sem. Hrs:** **3** |
|    | •  [BIO 4383 - Vertebrate Endocrinology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=4000) **Sem. Hrs:** **3** |
|    | •  [BIO 4384 - Parasitology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=4001) **Sem. Hrs:** **4** |
|    | •  [BIO 4401 - Ichthyology Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=4002) **Sem. Hrs:** **1** |
|    | •  [BIO 4402 - Ichthyology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=4003) **Sem. Hrs:** **2** |
|    | •  [BIO 4413 - Wildlife Program Internship](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=4005) **Sem. Hrs:** **3** |
|    | •  [BIO 4421 - Ornithology Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=4006) **Sem. Hrs:** **1** |
|    | •  [BIO 4423 - Ornithology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=4007) **Sem. Hrs:** **3** |
|    | •  [BIO 4433 - Field Experience in Marine Environments](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=4008) **Sem. Hrs:** **3** |
|    | •  [BIO 4441 - Comparative Animal Physiology Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=4009) **Sem. Hrs:** **1** |
|    | •  [BIO 4443 - Comparative Animal Physiology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=4010) **Sem. Hrs:** **3** |
|    | •  [BIO 4454 - Herpetology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=16191) **Sem. Hrs:** **4** |
|    | •  [BIO 4513 - Plant Physiology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=4013) **Sem. Hrs:** **3** |
|    | •  [BIO 4521 - Wetland Plant Ecology Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=4014) **Sem. Hrs:** **1** |
|    | •  [BIO 4522 - Wetland Plant Ecology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=4015) **Sem. Hrs:** **2** |
|    | •  [BIO 4541 - Mycology Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=4016) **Sem. Hrs:** **1** |
|    | •  [BIO 4542 - Mycology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=4017) **Sem. Hrs:** **2** |
|    | •  [BIO 4551 - Medical Mycology Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=4018) **Sem. Hrs:** **1** |
|    | •  [BIO 4552 - Medical Mycology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=4019) **Sem. Hrs:** **2** |
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**After:**

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| **Biology** |
|    | •  [BIO 403V - Special Problems in Biology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3966) **Sem. Hrs:** **Variable** |
|    | •  [BIO 404V - Special Topics in Biological Sciences](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3967) **Sem. Hrs:** **Variable** |
|    | •  [BIO 1013 - Making Connections Biology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3914) **Sem. Hrs:** **3** |
|    | •  [BIO 1023 - Biological Inquiry](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3915) **Sem. Hrs:** **3** |
|    | •  [BIO 1301 - Biology of Animals Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3916) **Sem. Hrs:** **1** |
|    | •  [BIO 1303 - Biology of Animals](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3917) **Sem. Hrs:** **3** |
|    | •  [BIO 1501 - Biology of Plants Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3918) **Sem. Hrs:** **1** |
|    | •  [BIO 1503 - Biology of Plants](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3919) **Sem. Hrs:** **3** |
|    | •  [BIO 2011 - Biology of the Cell Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3920) **Sem. Hrs:** **1** |
|    | •  [BIO 2013 - Biology of the Cell](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3921) **Sem. Hrs:** **3** |
|    | •  [BIO 2042 - Biotechnology in Global Society](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3922) **Sem. Hrs:** **2** |
|    | •  [BIO 2101 - Microbiology for Nursing and Allied Health Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3923) **Sem. Hrs:** **1** |
|    | •  [BIO 2103 - Microbiology for Nursing and Allied Health](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3924) **Sem. Hrs:** **3** |
|    | •  [BIO 2201 - Human Anatomy and Physiology I Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3925) **Sem. Hrs:** **1** |
|    | •  [BIO 2203 - Human Anatomy and Physiology I](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3926) **Sem. Hrs:** **3** |
|    | •  [BIO 2221 - Human Anatomy and Physiology II Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3927) **Sem. Hrs:** **1** |
|    | •  [BIO 2223 - Human Anatomy and Physiology II](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3928) **Sem. Hrs:** **3** |
|    | •  [BIO 3011 - Genetics Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3929) **Sem. Hrs:** **1** |
|    | •  [BIO 3013 - Genetics](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3930) **Sem. Hrs:** **3** |
|    | •  [BIO 3023 - Principles of Ecology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3931) **Sem. Hrs:** **3** |
|    | •  [BIO 3051 - Try Out the Classroom](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3933) **Sem. Hrs:** **1** |
|    | •  [BIO 3201 - Introduction to Medical and Dental Practices](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3934) **Sem. Hrs:** **1** |
|    | •  [BIO 3203 - Pathophysiology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3935) **Sem. Hrs:** **3** |
|    | •  [BIO 3211 - Techniques for Medical Exam Test Taking](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3936) **Sem. Hrs:** **1** |
|    | •  [BIO 3221 - Human Structure and Function I Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3937) **Sem. Hrs:** **1** |
|    | •  [BIO 3223 - Human Structure and Function I](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3938) **Sem. Hrs:** **3** |
|    | •  [BIO 3231 - Human Structure and Function II Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3939) **Sem. Hrs:** **1** |
|    | •  [BIO 3233 - Human Structure and Function II](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3940) **Sem. Hrs:** **3** |
|    | •  [BIO 3241 - Physical Diagnosis](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3941) **Sem. Hrs:** **1** |
|    | •  [BIO 3251 - Introduction to Pathology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3942) **Sem. Hrs:** **1** |
|    | •  [BIO 3261 - Health Coaching I](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3943) **Sem. Hrs:** **1** |
|    | •  [BIO 3271 - Health Coaching II](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3944) **Sem. Hrs:** **1** |
|    | •  [BIO 3301 - General Entomology Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3945) **Sem. Hrs:** **1** |
|    | •  [BIO 3303 - General Entomology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3947) **Sem. Hrs:** **3** |
|    | •  [BIO 3311 - Economic Entomology Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3948) **Sem. Hrs:** **1** |
|    | •  [BIO 3313 - Economic Entomology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3950) **Sem. Hrs:** **3** |
|    | •  [BIO 3322 - Invertebrate Zoology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3951) **Sem. Hrs:** **2** |
|    | •  [BIO 3332 - Invertebrate Zoology Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3952) **Sem. Hrs:** **2** |
|    | •  [BIO 3501 - Wild Flowers of Arkansas](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3953) **Sem. Hrs:** **1** |
|    | •  [BIO 3511 - Wild Flowers of Arkansas Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3954) **Sem. Hrs:** **1** |
|    | •  [BIO 3541 - Plant Pathology Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3955) **Sem. Hrs:** **1** |
|    | •  [BIO 3542 - Plant Pathology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3956) **Sem. Hrs:** **2** |
|    | •  [BIO 3553 - Economic Botany](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3957) **Sem. Hrs:** **3** |
|    | •  [BIO 3673 - Human Dimensions of Natural Resources](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3958) **Sem. Hrs:** **3** |
|    | •  [BIO 4011 - Microtechnique](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3961) **Sem. Hrs:** **1** |
|    | •  [BIO 4012 - Microtechnique Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3962) **Sem. Hrs:** **2** |
|    | •  [BIO 4013 - Population Genetics](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3963) **Sem. Hrs:** **3** |
|    | •  [BIO 4021 - Biological Seminar](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3964) **Sem. Hrs:** **1** |
|    | •  [BIO 4033 - Bioinformatics and Applications](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3965) **Sem. Hrs:** **3** |
|    | •  [BIO 4043 - Biometry](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=16194) **Sem. Hrs:** **3** |
|    | •  [BIO 4053 - Applications in Biotechnology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3968) **Sem. Hrs:** **3** |
|    | •  [BIO 4063 - Biosafety and Ethics in Research](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3969) **Sem. Hrs:** **3** |
|    | •  [BIO 4083 - Evolution](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3932) **Sem. Hrs:** **3** |
|    | •  [BIO 4103 - Virology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3970) **Sem. Hrs:** **3** |
|    | •  [BIO 4104 - Microbiology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3971) **Sem. Hrs:** **4** |
|    | •  [BIO 4111 - Immunology Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3972) **Sem. Hrs:** **1** |
|    | •  [BIO 4113 - Immunology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3973) **Sem. Hrs:** **3** |
|  | BIO 4114 – Phylogenetics and Systematics**BIO 4114 – Phylogenetics and Systematics**Sem. Hrs.: 4Theory, history, and application of phylogenetic methods, especially in the context of understanding evolution, taxonomy, biodiversity, and genetics. Lecture three hours and lab three hours per week. Fall, odd**Prerequisites**: BIO 3011, BIO 3013, and BIO 4083.  |
|    | •  [BIO 4123 - Cell Signaling](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3974) **Sem. Hrs:** **3** |
|    | •  [BIO 4131 - Cell Biology Lab](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3975) **Sem. Hrs:** **1** |
|    | •  [BIO 4133 - Cell Biology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3976) **Sem. Hrs:** **3** |
|    | •  [BIO 4143 - Pharmacology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3977) **Sem. Hrs:** **3** |
|    | •  [BIO 4153 - Laboratory in BioTechniques I](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3978) **Sem. Hrs:** **3** |
|    | •  [BIO 4163 - Laboratory in BioTechniques II](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3979) **Sem. Hrs:** **3** |
|    | •  [BIO 4173 - Molecular Biology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3980) **Sem. Hrs:** **3** |
|    | •  [BIO 4201 - Issues in Human Ecology Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3981) **Sem. Hrs:** **1** |
|    | •  [BIO 4202 - Issues in Human Ecology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3982) **Sem. Hrs:** **2** |
|    | •  [BIO 4213 - Human Genetics](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3983) **Sem. Hrs:** **3** |
|    | •  [BIO 4301 - Aquatic Entomology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3984) **Sem. Hrs:** **1** |
|    | •  [BIO 4302 - Aquatic Entomology Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3985) **Sem. Hrs:** **2** |
|    | •  [BIO 4311 - Fisheries Biology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3986) **Sem. Hrs:** **1** |
|    | •  [BIO 4312 - Fisheries Biology Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3987) **Sem. Hrs:** **2** |
|    | •  [BIO 4324 - Comparative Vertebrate Anatomy](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=16190) **Sem. Hrs:** **4** |
|    | •  [BIO 4332 - Animal Histology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3988) **Sem. Hrs:** **2** |
|    | •  [BIO 4333 - Marine Biology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3989) **Sem. Hrs:** **3** |
|    | •  [BIO 4341 - Animal Embryology Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3990) **Sem. Hrs:** **1** |
|    | •  [BIO 4342 - Animal Histology Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3991) **Sem. Hrs:** **2** |
|    | •  [BIO 4343 - Animal Embryology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3992) **Sem. Hrs:** **3** |
|    | •  [BIO 4354 - Mammalogy](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3993) **Sem. Hrs:** **4** |
|    | •  [BIO 4362 - Applied Aquaculture](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3995) **Sem. Hrs:** **2** |
|    | •  [BIO 4371 - Animal Ecology Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3997) **Sem. Hrs:** **1** |
|    | •  [BIO 4372 - Applied Fisheries](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3998) **Sem. Hrs:** **2** |
|    | •  [BIO 4373 - Animal Ecology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=3999) **Sem. Hrs:** **3** |
|    | •  [BIO 4383 - Vertebrate Endocrinology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=4000) **Sem. Hrs:** **3** |
|    | •  [BIO 4384 - Parasitology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=4001) **Sem. Hrs:** **4** |
|    | •  [BIO 4401 - Ichthyology Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=4002) **Sem. Hrs:** **1** |
|    | •  [BIO 4402 - Ichthyology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=4003) **Sem. Hrs:** **2** |
|    | •  [BIO 4413 - Wildlife Program Internship](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=4005) **Sem. Hrs:** **3** |
|    | •  [BIO 4421 - Ornithology Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=4006) **Sem. Hrs:** **1** |
|    | •  [BIO 4423 - Ornithology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=4007) **Sem. Hrs:** **3** |
|    | •  [BIO 4433 - Field Experience in Marine Environments](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=4008) **Sem. Hrs:** **3** |
|    | •  [BIO 4441 - Comparative Animal Physiology Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=4009) **Sem. Hrs:** **1** |
|    | •  [BIO 4443 - Comparative Animal Physiology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=4010) **Sem. Hrs:** **3** |
|    | •  [BIO 4454 - Herpetology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=16191) **Sem. Hrs:** **4** |
|    | •  [BIO 4513 - Plant Physiology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=4013) **Sem. Hrs:** **3** |
|    | •  [BIO 4521 - Wetland Plant Ecology Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=4014) **Sem. Hrs:** **1** |
|    | •  [BIO 4522 - Wetland Plant Ecology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=4015) **Sem. Hrs:** **2** |
|    | •  [BIO 4541 - Mycology Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=4016) **Sem. Hrs:** **1** |
|    | •  [BIO 4542 - Mycology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=4017) **Sem. Hrs:** **2** |
|    | •  [BIO 4551 - Medical Mycology Laboratory](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=4018) **Sem. Hrs:** **1** |
|    | •  [BIO 4552 - Medical Mycology](https://catalog.astate.edu/preview_course_nopop.php?catoid=3&coid=4019) **Sem. Hrs:** **2** |
|   |