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| For Academic Affairs and Research Use Only | |
| Proposal Number | SM30 |
| CIP Code: |  |
| Degree Code: |  |

**New or Modified Course Proposal Form**

**[ X ] Undergraduate Curriculum Council**

**[ ] Graduate Council**

|  |
| --- |
| **[ ]New Course, [ ]Experimental Course (1-time offering), or [ X ]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 10/25/2021 **Department Curriculum Committee Chair** | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…  **COPE Chair (if applicable)** |
| Stephen J. Mullin 10/25/2021 **Department Chair** | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…  **Head of Unit (if applicable)** |
| John Hershberger 10/25/2021 Enter date…  **College Curriculum Committee Chair** | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…  **Undergraduate Curriculum Council Chair** |
| \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date… **Director of Assessment (new courses only)** | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…  **Graduate Curriculum Committee Chair** |
| Lynn Boyd 11/3/2021 **College Dean** | Alan Utter 11/16/2021  **Vice Chancellor for Academic Affairs** |
| \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Enter date…  **General Education Committee Chair (if applicable)** |  |

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

SJ Mullin; smullin@astate.edu; x3082

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

Spring 2023 (print in AY22-23 Bulletin)

**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** | **BIO** |
| **Number\*** | **4451 (to be deleted)**  **4453 (to be deleted)** | **4454** |
| **Title** | **Herpetology Laboratory**  **Herpetology** | **Herpetology** |
| **Description\*\*** | Herpetology Laboratory: Three hours per week. Special course fees may apply. To be taken concurrently with BIO 4453.  Herpetology: Examination of the biology amphibians and reptiles, with emphasis on evolutionary history, behavior, physiology, morphology, and ecology. Prerequisites, BIO 1301 and 1303. | BIO 4454. Herpetology. The biology of amphibians and reptiles, with emphasis on behavior, ecology, field identification, morphology, physiology, and phylogenetic relationships. Lecture three hours and lab three hours per week. Special course fees may apply. Prerequisites, BIO 1301, BIO 1303, BIO 2011, BIO 2013, and BIO 3023. |

***\**** (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? Yes/No]**

(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 1301, BIO 1303, BIO 2011, BIO 2013, and BIO 3023..

* 1. Why or why not?

Student understanding of material presented in lower-level courses is needed in order to avoid unnecessary redundancy and review of foundational material. Specifically, students need background in taxonomy and basic phylogenetic relationships, which are highlighted in Biology of Animals.

1. NO Is this course restricted to a specific major? (available to BIO minors who have satisfied prerequisite requirements).
   1. If yes, which major? Enter text...
2. **Proposed course frequency [Modification requested? NO]**

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

Spring

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

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? NO]**

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?

**Course Details**

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

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

**Herpetology**

Lecture Schedule

Week Topic

1 Introduction; Herpetology’s “occupation” within biology

Phylogeny and biogeography of amphibians

2 Amphibian functional morphology

3 Amphibian physiology and energetics

1st lecture exam

4 Amphibian life-history traits & adaptations

5 Amphibian life-histories & reproduction

6 Amphibian ecology

2nd lecture exam

7 Topic paper presentations

Phylogeny and biogeography of reptiles

8 Reptilian functional morphology

9 Reptilian physiology and energetics

10 3rd lecture exam

Reptilian life-history traits & adaptations

11 Reptilian life-histories & reproduction

12 Reptilian ecology

13 4th lecture exam

Researching herpetofaunal communities

14 Conservation biology of herpetofauna

15 Content review

Final Exam

Field/Laboratory Schedule

Week Subject matter

1 Introduction; discussion of term projects & field trips/herpin’ gear.

2 Caudata & Gymnophiona

3 Anura

4 Lab practical #1

5 Testudines

6 Lacertilia

7 Early Spring Field Trip

8 Lab practical #2

9 Serpentes

10 Mid-Spring Field Trip

11 Crocodylia, Rhynchocephalia, & Amphisbaenia (+ outreach prep.)

12 Spring Field Trip

13 Lab practical #3

14 Field trip

15 Outreach Event

1. **Proposed special features** **[Modification requested? NO]**

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

Enter text...

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

Course taught by Gustafson, Mullin or Neuman-Lee, depending on their regular course rotations, and curricular demand.

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

Specimens on loan from the vertebrate collections maintained in the dept.

1. YES 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)

This proposal combines the lecture and lab into a 4-credit course with a single grade (the existing, separate sections of lecture and lab are to be deleted upon approval of this modification request). Lecture and lab content are complementary, with the student learning material in one portion of the course that reinforces terminology and concepts that are presented in the other portion of the course. As a result, students successfully completing the revised course will be better prepared for post-graduate opportunities such as graduate school or employment at an agency or non-profit conservation organization.

FEE justification: (A) The course fee has not been changed in over 5 years, and inflationary increases in commodities have resulted in higher costs to deliver the course. (B) The modification of the course to combine the lecture and lab sections will allow for a restructuring of the meeting times to allow for extended field trips. Those trips require use of vehicles in the dept. fleet, so the higher course fee will also be used to help offset the costs of vehicle maintenance.

SUMMARY of proposed changes:

* Combine lecture (3 SCH) and lab (1 SCH) sections into a single course (4 SCH)
* Change prerequisite requirement to successful completion of 16 SCH of courses with BIO prefix, including BIO 1303 and BIO 1301.
* Increase course/lab fee to $35
* Excepting the prerequisites, parallel changes to grad. version of course (BIO 5454).

**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)

Enter text...

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.

Enter text...

c. Student population served.

Enter text...

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

Enter text...

**Assessment**

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

1. NO 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?

Enter text...

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.*

|  |  |
| --- | --- |
| **Program-Level Outcome 1 (from question #19)** | Type outcome here. What do you want students to think, know, or do when they have completed the course? |
| Assessment Measure | Please include direct and indirect assessment measure for outcome. |
| Assessment  Timetable | What semesters, and how often, is the outcome assessed? |
| Who is responsible for assessing and reporting on the results? | Who (person, position title, or internal committee) is responsible for assessing, evaluating, and analyzing results, and developing action plans? |

*(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** | Type outcome here. What do you want students to think, know, or do when they have completed the course? |
| Which learning activities are responsible for this outcome? | List learning activities. |
| Assessment Measure | What will be your assessment measure for this outcome? |

*(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.** |

CURRENT VERSION (pg. 427):

The bulletin can be accessed at https://www.astate.edu/a/registrar/students/bulletins/

Major in Wildlife, Fisheries and Conservation (cont.)

Bachelor of Science

Emphasis in Fisheries

A complete 8-semester degree plan is available at https://www.astate.edu/info/academics/degrees/

Botany elective:

BIO 3542 AND BIO 3541, Plant Pathology and Laboratory

BIO 3553. Economic Botany

BIO 4513. Plant Physiology

BIO 4522 AND BIO 4521, Wetland Plant Ecology and Laboratory

BIO 4542 AND BIO 4541, Mycology and Laboratory

BIO 4552 AND BIO 4551, Medical Mycology and Laboratory

BIO 4704. Plant Systematics

BIO 4714, Dendrology

Other courses approved by advisor

3-4

Zoology elective:

BIO 3303 AND BIO 3301, General Entomology and Laboratory

BIO 3313 AND BIO 3311, Economic Entomology and Laboratory

BIO 3302 AND BIO 3312, Comparative Anatomy and Laboratory

BIO 3322 AND BIO 3332, Invertebrate Zoology and Laboratory

BIO 4332 AND BIO 4342, Animal Histology and Laboratory

BIO 4333, Marine Biology

BIO 4343 AND BIO 4341, Animal Embryology and Laboratory

BIO 4354, Mammology

BIO 4362, Applied Aquaculture

BIO 4363 AND BIO 4361, Mammalian Neurobiology and Laboratory

BIO 4372, Applied Fisheries

BIO 4373 AND 4371, Animal Ecology and Laboratory

BIO 4382 AND BIO 4392, Parasitology and Laboratory

BIO 4403, Comparative Vertebrate Reproduction

BIO 4453 AND BIO 4451, Herpetology and Laboratory

BIO 4423 AND BIO 4421, Ornithology and Laboratory

BIO 4433, Field Experience in Marine Environments

BIO 4443 AND 4441, Comparative Animal Physiology and Laboratory

NOTE: An individual course cannot be used as both a required course and an elective.

3-5

Electives:

Choose from Botany and/or Zoology electives above.

NOTE: An individual course cannot be used as both a required course and an elective.

7-10

Sub-total 81

Total Required Hours: 120

REVISED VERSION:

The bulletin can be accessed at https://www.astate.edu/a/registrar/students/bulletins/

Major in Wildlife, Fisheries and Conservation (cont.)

Bachelor of Science

Emphasis in Fisheries

A complete 8-semester degree plan is available at https://www.astate.edu/info/academics/degrees/

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BIO 3553. Economic Botany

BIO 4513. Plant Physiology

BIO 4522 AND BIO 4521, Wetland Plant Ecology and Laboratory

BIO 4542 AND BIO 4541, Mycology and Laboratory

BIO 4552 AND BIO 4551, Medical Mycology and Laboratory

BIO 4704. Plant Systematics

BIO 4714, Dendrology

Other courses approved by advisor

3-4

Zoology elective:

BIO 3303 AND BIO 3301, General Entomology and Laboratory

BIO 3313 AND BIO 3311, Economic Entomology and Laboratory

BIO 3302 AND BIO 3312, Comparative Anatomy and Laboratory

BIO 3322 AND BIO 3332, Invertebrate Zoology and Laboratory

BIO 4332 AND BIO 4342, Animal Histology and Laboratory

BIO 4333, Marine Biology

BIO 4343 AND BIO 4341, Animal Embryology and Laboratory

BIO 4354, Mammology

BIO 4362, Applied Aquaculture

BIO 4363 AND BIO 4361, Mammalian Neurobiology and Laboratory

BIO 4372, Applied Fisheries

BIO 4373 AND 4371, Animal Ecology and Laboratory

BIO 4382 AND BIO 4392, Parasitology and Laboratory

BIO 4403, Comparative Vertebrate Reproduction

BIO 4454, Herpetology

BIO 4423 AND BIO 4421, Ornithology and Laboratory

BIO 4433, Field Experience in Marine Environments

BIO 4443 AND 4441, Comparative Animal Physiology and Laboratory

NOTE: An individual course cannot be used as both a required course and an elective.

3-5

Electives:

Choose from Botany and/or Zoology electives above.

NOTE: An individual course cannot be used as both a required course and an elective.

7-10

Sub-total 81

Total Required Hours: 120

CURRENT VERSION (pg. 429):

The bulletin can be accessed at https://www.astate.edu/a/registrar/students/bulletins/

Select two of the following:

BIO 3673, Human Dimensions of Natural Resources

BIO 4613, Conservation Biology

POSC 4633, Environmental Law and Administration

6

Select two of the following:

BIO 4354, Mammalogy

BIO 4453 AND 4411, Herpetology and Laboratory

BIO 4423 AND 4421, Ornithology and Laboratory

8

Botany elective:

BIO 3501 AND BIO 3511, Wild Flowers of Arkansas and Laboratory.

BIO 3542 AND BIO 3541, Plant Pathology and Laboratory

BIO 3553. Economic Botany

BIO 4513. Plant Physiology

BIO 4522 AND BIO 4521, Wetland Plant Ecology and Laboratory

BIO 4542 AND BIO 4541, Mycology and Laboratory

BIO 4552 AND BIO 4551, Medical Mycology and Laboratory

BIO 4714, Dendrology

Other courses approved by advisor

3

Communication elective:

ENG 3063, Writing for STEM

See advisor for acceptable substitutions.

3

Zoology electives:

BIO 3303 AND BIO 3301, General Entomology and Laboratory

BIO 3313 AND BIO 3311, Economic Entomology and Laboratory

BIO 3302 AND BIO 3312, Comparative Anatomy and Laboratory

BIO 3322 AND BIO 3332, Invertebrate Zoology and Laboratory

BIO 4332 AND BIO 4342, Animal Histology and Laboratory

BIO 4333, Marine Biology

BIO 4343 AND BIO 4341, Animal Embryology and Laboratory

BIO 4354, Mammology

BIO 4362, Applied Aquaculture

BIO 4363 AND BIO 4361, Mammalian Neurobiology and Laboratory

BIO 4372, Applied Fisheries

BIO 4382 AND BIO 4392, Parasitology and Laboratory

BIO 4403, Comparative Vertebrate Reproduction

BIO 4453 AND BIO 4451, Herpetology and Laboratory

BIO 4423 AND BIO 4421, Ornithology and Laboratory

BIO 4433, Field Experience in Marine Environments

BIO 4443 AND 4441, Comparative Animal Physiology and Laboratory

An individual course cannot be used as both a required course and an elective.

4-5

Sub-total 81

Total Required Hours: 120

REVISED VERSION:

The bulletin can be accessed at https://www.astate.edu/a/registrar/students/bulletins/

Select two of the following:

BIO 3673, Human Dimensions of Natural Resources

BIO 4613, Conservation Biology

POSC 4633, Environmental Law and Administration

6

Select two of the following:

BIO 4354, Mammalogy

BIO 4454, Herpetology

BIO 4423 AND 4421, Ornithology and Laboratory

8

Botany elective:

BIO 3501 AND BIO 3511, Wild Flowers of Arkansas and Laboratory.

BIO 3542 AND BIO 3541, Plant Pathology and Laboratory

BIO 3553. Economic Botany

BIO 4513. Plant Physiology

BIO 4522 AND BIO 4521, Wetland Plant Ecology and Laboratory

BIO 4542 AND BIO 4541, Mycology and Laboratory

BIO 4552 AND BIO 4551, Medical Mycology and Laboratory

BIO 4714, Dendrology

Other courses approved by advisor

3

Communication elective:

ENG 3063, Writing for STEM

See advisor for acceptable substitutions.

3

Zoology electives:

BIO 3303 AND BIO 3301, General Entomology and Laboratory

BIO 3313 AND BIO 3311, Economic Entomology and Laboratory

BIO 3302 AND BIO 3312, Comparative Anatomy and Laboratory

BIO 3322 AND BIO 3332, Invertebrate Zoology and Laboratory

BIO 4332 AND BIO 4342, Animal Histology and Laboratory

BIO 4333, Marine Biology

BIO 4343 AND BIO 4341, Animal Embryology and Laboratory

BIO 4354, Mammology

BIO 4362, Applied Aquaculture

BIO 4363 AND BIO 4361, Mammalian Neurobiology and Laboratory

BIO 4372, Applied Fisheries

BIO 4382 AND BIO 4392, Parasitology and Laboratory

BIO 4403, Comparative Vertebrate Reproduction

BIO 4454, Herpetology

BIO 4423 AND BIO 4421, Ornithology and Laboratory

BIO 4433, Field Experience in Marine Environments

BIO 4443 AND 4441, Comparative Animal Physiology and Laboratory

An individual course cannot be used as both a required course and an elective.

4-5

Sub-total 81

Total Required Hours: 120

CURRENT VERSION (pg. 474):

**BIO 4383. Vertebrate Endocrinology** Examination of the vertebrate endocrine and neuro­endocrine processes at various levels (molecular to organismal) with a focus on comparative endocrinology. Topics will include synthesis, transport, mechanisms of action and regulation, and dysfunctions of endocrine control. Prerequisites, BIO 2013 and CHEM 1023.

**BIO 4384. Parasitology** Evolution, life cycles, pathology, treatment and identification of biomedically important vertebrate parasites. Special course fees may apply. Lecture three hours and lab three hours per week. Prerequisites, “C” or better in both BIO 1301 and BIO 1303.

**BIO 4401. Ichthyology Laboratory** Two hours per week. Special course fees may apply. To be taken concurrently with BIO 4402. Fall, even.

**BIO 4402. Ichthyology** Taxonomy, distribution, natural history, and economic importance of fishes, with emphasis on Arkansas species. Lecture two hours per week. Special course fees may apply. Prerequisites, BIO 1301 and BIO 1303. Fall, even.

**BIO 4403. Comparative Vertebrate Reproduction** This combined lecture and lab course surveys major events in the vertebrate reproductive cycles and patterns. Special course fees may apply. Prerequisites, BIO 4441 and BIO 4443, or BIO 3323 and 3321. Dual Listed BIO 5403. Fall, even.

**BIO 4413. Wildlife Program Internship** Participation in a professional wildlife or fisheries educational, management or research program activity. Internship is arranged by the student and may be a volunteer or paid position. Entails a minimum of 160 work hours. Special course fees may apply. Must be approved by advisor or chair. Fall, Spring, Summer.

**BIO 4421. Ornithology Laboratory** Three hours per week. Special course fees may apply. To be taken concurrently with BIO 4423. Spring.

**BIO 4423. Ornithology** Morphology, physiology, taxonomy, behavior, ecology, natu­ral history, zoogeography, and evolution of birds. Lecture three hours per week. Special course fees may apply. Prerequisites, BIO 1301 and BIO 1303. Spring.

**BIO 4433. Field Experience in Marine Environments** Hands on experience with living and non living components of environments. Emphasis on marine organisms and habi­tats but will incorporate human interactions associated with marine environments. Course is comprised of an intensive 12 day, 10 hours a day, field trip to an appropriate marine environ­ment. Special course fees may apply. Prerequisites, BIO 4333, or BIOL 1003 and BIOL 1001, or instructor permission.

**BIO 4441. Comparative Animal Physiology Laboratory** Three hours per week. Special course fees may apply. To be taken concurrently with BIO 4443. Fall, even.

**BIO 4443. Comparative Animal Physiology** Examination of physiological systems and processes across vertebrate and invertebrate groups. Broad topics include energetic relation­ships, integrating systems, reproduction, internal transport, and maintenance of internal balance. Prerequisites, BIO 1301, BIO 1303, BIO 2013, CHEM 1021, and CHEM 1023. Dual Listed BIO 5443. Fall, even.

**BIO 4451. Herpetology Laboratory** Three hours per week. Special course fees may apply. To be taken concurrently with BIO 4453. Spring.

**BIO 4453. Herpetology** Examination of the biology amphibians and reptiles, with emphasis on evolutionary history, behavior, physiology, morphology, and ecology. Prerequisites, BIO 1301 and 1303. Spring.

**BIO 4513. Plant Physiology** General principles of conduction, cellular reactions, respira­tion, growth, photosynthesis, movement, hormones, and metabolism in plants. Lecture three hours per week. Special course fees may apply. Prerequisites, BIO 1501, BIO 1503, and CHEM 2064 or 3103 and 3101.

**BIO 4521. Wetland Plant Ecology Laboratory** Three hours per week. To be taken concurrently with BIO 4522. Special course fees may apply. Fall, odd.

REVISED VERSION:

**BIO 4383. Vertebrate Endocrinology** Examination of the vertebrate endocrine and neuro­endocrine processes at various levels (molecular to organismal) with a focus on comparative endocrinology. Topics will include synthesis, transport, mechanisms of action and regulation, and dysfunctions of endocrine control. Prerequisites, BIO 2013 and CHEM 1023.

**BIO 4384. Parasitology** Evolution, life cycles, pathology, treatment and identification of biomedically important vertebrate parasites. Special course fees may apply. Lecture three hours and lab three hours per week. Prerequisites, “C” or better in both BIO 1301 and BIO 1303.

**BIO 4401. Ichthyology Laboratory** Two hours per week. Special course fees may apply. To be taken concurrently with BIO 4402. Fall, even.

**BIO 4402. Ichthyology** Taxonomy, distribution, natural history, and economic importance of fishes, with emphasis on Arkansas species. Lecture two hours per week. Special course fees may apply. Prerequisites, BIO 1301 and BIO 1303. Fall, even.

**BIO 4403. Comparative Vertebrate Reproduction** This combined lecture and lab course surveys major events in the vertebrate reproductive cycles and patterns. Special course fees may apply. Prerequisites, BIO 4441 and BIO 4443, or BIO 3323 and 3321. Dual Listed BIO 5403. Fall, even.

**BIO 4413. Wildlife Program Internship** Participation in a professional wildlife or fisheries educational, management or research program activity. Internship is arranged by the student and may be a volunteer or paid position. Entails a minimum of 160 work hours. Special course fees may apply. Must be approved by advisor or chair. Fall, Spring, Summer.

**BIO 4421. Ornithology Laboratory** Three hours per week. Special course fees may apply. To be taken concurrently with BIO 4423. Spring.

**BIO 4423. Ornithology** Morphology, physiology, taxonomy, behavior, ecology, natu­ral history, zoogeography, and evolution of birds. Lecture three hours per week. Special course fees may apply. Prerequisites, BIO 1301 and BIO 1303. Spring.

**BIO 4433. Field Experience in Marine Environments** Hands on experience with living and non living components of environments. Emphasis on marine organisms and habi­tats but will incorporate human interactions associated with marine environments. Course is comprised of an intensive 12 day, 10 hours a day, field trip to an appropriate marine environ­ment. Special course fees may apply. Prerequisites, BIO 4333, or BIOL 1003 and BIOL 1001, or instructor permission.

**BIO 4441. Comparative Animal Physiology Laboratory** Three hours per week. Special course fees may apply. To be taken concurrently with BIO 4443. Fall, even.

**BIO 4443. Comparative Animal Physiology** Examination of physiological systems and processes across vertebrate and invertebrate groups. Broad topics include energetic relation­ships, integrating systems, reproduction, internal transport, and maintenance of internal balance. Prerequisites, BIO 1301, BIO 1303, BIO 2013, CHEM 1021, and CHEM 1023. Dual Listed BIO 5443. Fall, even.

**BIO 4454. Herpetology** The biology of amphibians and reptiles, with emphasis on behavior, ecology, field identification, morphology, physiology, and phylogenetic relationships. Lecture three hours and lab three hours per week. Special course fees may apply. Prerequisites, BIO 1301, BIO 1303, BIO 2011, BIO 2013, and BIO 3023. Spring.

**BIO 4513. Plant Physiology** General principles of conduction, cellular reactions, respira­tion, growth, photosynthesis, movement, hormones, and metabolism in plants. Lecture three hours per week. Special course fees may apply. Prerequisites, BIO 1501, BIO 1503, and CHEM 2064 or 3103 and 3101.

**BIO 4521. Wetland Plant Ecology Laboratory** Three hours per week. To be taken concurrently with BIO 4522. Special course fees may apply. Fall, odd.