THE UNIVERSITY OF NORTH CAROLINA ASHEVILLE
FACULTY SENATE

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Statement of Faculty Senate Action:

APC Document 23 (BIOL): Add new courses to the Biology Curriculum:
BIOL 424, Reproductive Biology
BIOL 425, Developmental Biology

Effective date: Fall 2021

1. Add: On page 94, entry for new course**, BIOL 424, Reproductive Biology:**

424 Reproductive Biology (4)
Students examine animal and plant reproductive biology by integrating evolutionary biology, reproductive theory, reproductive physiology, and genetics. Topics include the evolution of sex and sex determination, mating systems, life histories, reproductive strategies, and reproductive physiology. Class time is heavy on discussion of reading material, with lectures to solidify content. Labs are a combination of computer-based activities, class experiments, specimen study/dissections, and field trips. Prerequisites: BIOL 134, 135, 136, and 210 or 211. Recommended prerequisite: BIOL 344 or 443. Odd years Fall.

Impact Statement:

1. Curriculum contribution. This course will be added to the *Evolution* and *Integrative Biology* categories for the major, and will be an upper-level elective for minors.
2. Course information.
   Course SLOs: By the end of the course, students should be able to
   - describe the process of meiosis in animal, plant, and fungal sexual reproduction;
   - apply theory of sex evolution to explain variation in reproductive strategies in plants and animals;
   - map the role of specific genes and hormones in the development of gender phenotypes;
   - describe mechanisms of sex determination in multiple groups of invertebrates and vertebrates;
   - compare and contrast mating systems in plants and animals;
   - describe spermatogenesis, oogenesis, and fertilization in deuterostomes;
   - explain the genetic and physiological origins of sexual conflict and parent-offspring conflict.

   Anticipated class size: maximum 18 due to vehicle constraints for field trips
   Scheduled class time: Two 1:15 h sessions plus one 2:30 h laboratory session
   Instructional format: "Lecture" sessions will involve discussion of reading material, with lectures to solidify content. Labs are a combination of computer-based activities, class experiments, specimen study/dissections, and field trips.
   Special space or materials: none
3. Faculty contribution. This course has been developed by Dr. Rebecca Hale as a special topics course and will continue to be taught by her. However, departmental support for the course

stemmed from its ability to be taught by multiple faculty, due to the broad nature of the topic and course description. This breadth will allow the department to offer the course regularly.

4. Timing. This course will be offered in alternate fall semesters. Currently, there are only three courses offered during fall terms that fulfill the *Evolution* requirement. This number will fall to two beginning in the 2021-2022 academic year, when Entomology/Invertebrate Zoology may no longer be taught due to the retirement of Dr. Timothy Forrest. Therefore, additional fall Evolution offerings are needed.
5. Delivering the curriculum. As faculty composition in Biology has changed, some course offerings are no longer possible to support. One of these sunsetting courses, Vertebrate Zoology, currently fulfills the same two categories(Evolution and Integrative Biology), so Reproductive Biology will directly replace this course with respect to options for students. In addition, Dr. Rebecca Hale, who has developed and taught Reproductive Biology once, taught Vertebrate Zoology (collaboratively with Dr. Chris Nicolay) for its two most recent offerings. Therefore, addition of Reproductive Biology as Vertebrate Zoology sunsets will not create a net change in teaching responsibilities of Dr. Rebecca Hale or other faculty.

Rationale: This course was developed and offered as a special topics course in the fall of 2018 with two goals. First the department aimed to provide a course that will naturally bridge the interests of pre-health/cell biology students and students with more organismal interests (ecology/evolution; plants/animals). Second, the department aimed to develop a course that could be taught by multiple faculty, due to the broad nature of the topic and course description. This breadth will ensure that the course can be taught regularly by rotating faculty.

2. Add: On page 94, entry for new course**, BIOL 425, Developmental Biology:**

425 Developmental Biology (4)
Introduces students to the processes of morphological development, with a focus on animal embryogenesis. Students will learn about the molecular and cellular mechanisms underlying development from a fertilized egg to a reproductive adult. This class will also introduce students to key methods in developmental biology, and how these methods can be used to understand both healthy development and developmental conditions. Lectures will include an introduction to concepts and detailed notes, and labs will involve a mixture of molecular and computational methods. Prerequisites: BIOL 134, 135, 136, 210, and one course from BIOL 344, 423, or 443. Even years Fall.

Impact Statement:

6. Curriculum contribution. This course will be added to the *Genetics* and *Integrative Biology* categories for the major, and will be an upper-level elective for minors.
7. Course information.
   Course SLOs: By the end of the course, students should be able to
   - Describe and depict fertilization and early development in a diversity of animals;
   - Depict transcriptional regulatory networks in cell signaling and discuss their importance in the context of differentiation and developmental specification;
   - Discuss the role of tissue signaling during morphogenesis, and the specific molecular mechanisms associated with directional development and terminal differentiation;
   - Describe the developmental mechanisms of vertebrate morphogenesis, including gut, heart, musculature, nervous system, and dermis;
   - Describe techniques used in developmental biology, including mRNA staining (*in situ* hybridization), DNA sequencing, protein staining (immunohistochemistry) and genetic engineering using both traditional and CRISPR-Cas9 methods;

- Generate hypotheses for the causes of variations in development;
- Read developmental biology literature and conduct basic histochemical analyses.

Anticipated class size: maximum 16 due to lab constraints
Scheduled class time: Two 1:15 h sessions plus one 2:30 h laboratory session
Instructional format: Lectures will involve white-board notes, break-out problem solving group sessions, and observation of organisms. Labs use live organisms and fixed to observe embryogenesis, regeneration, and metamorphosis, and utilize histochemical methods and microdissection experiments. Online labs include data analysis, literature discussion, and bioinformatics.
Special space or materials: none

8. Faculty contribution. Rebecca Helm developed this course, which is currently being taught as a special topics section. This course will continue to be taught by Rebecca Helm.
9. Timing. This course will be offered every other fall semester, alternating with Invertebrate Zoology.
10. Delivering the curriculum. Currently there are only four classes that meet the *Genetics* category requirement, and this will be the fifth. In contrast, for all other categories there are at least 9 classes or more. Therefore, this class is a useful addition to the curriculum.

Rationale: This course has been offered for three years as a special topics course with strong enrollment. Because of the number of majors in Biology, there is a need to continue offering this course. Developmental Biology is a critical field of study for both those interested in general biology and those pursuing a career in medicine. The aim of this course is to provide a holistic understanding of the processes involved in animal development, from evolutionary to cellular. Students in this class learn to utilize molecular methods to answer hypotheses about morphogenesis, and the medical implications of various gene pathways. This course connects multiple disciplines and is a valuable addition to our department.