

THE UNIVERSITY OF NORTH CAROLINA ASHEVILLE
FACULTY SENATE

Senate Document Number SD1523S
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Statement of Faculty Senate Action:

APC Document 10 (BIOL): Add new course, **BIOL 361, Immunology;**
Delete 3-credit BIOL 423, Molecular Biology, replacing
with 4-credit BIOL 426, Molecular Biology;
Update the category listing of the required Biology
electives to include the new courses

Effective Date: Fall 2023

1. **Add:** On page 101, new course, **BIOL 361, Immunology:**

361 Immunology (3)

Provides an introduction to the molecular and cellular biology of the human immune system. This lecture-only class will cover the anatomy, composition, and function of both the innate and adaptive immune systems, including development of specific T- and B-cell immunity, antibody production, and the vaccination strategies. The course further includes sections on allergies, autoimmune disorders, and other diseases and disorders of the human immune system. Prerequisite: BIOL 136. Typically Summer.

Impact Statement:

Curriculum contribution. This revision will add a new 300-level course to the curriculum within the Biology Department, that satisfies *Genetics* and *Integrative Biology* for majors, and it will be a 300-level elective for minors.

Course information.

Course SLOs: By the end of the course, students should be able to:

- Describe the anatomy, major varieties of cells, and major biomolecules that comprise both the innate and adaptive immune systems in humans.
- Understand several different vaccination methodologies and strategies, and the types of immunity induced via these varying methodologies.
- Understand the molecular basis for a number of different autoimmune disorders.
- Understand the molecular basis for allergies and other disorders of the immune system.
- Understand the genetics that provide the human immune system the ability to recognize and respond to nearly any specific threat encountered in the environment.

Anticipated class size: Approximately 25, limited by classroom space constraints; there is no lab section, and as such no space constraints are imposed by labs.

Scheduled class time: Course will currently continue to be offered as a summer class (4 days/week for 2.75 hours/day) but may be offered during a regular semester as faculty availability permits.

Special space or materials: None

Faculty contribution. This course has been designed and historically delivered by Dr. Greene as a special topics course and will continue to be taught by him. The course content also lies well within the expertise of Dr. Melinda Grosser, as well as Dr. Thomas Meigs, who could also deliver this course content

Delivering the curriculum. Dr. Matthew Greene has taught BIOL 373 ST: Immunology during four of the last five summer sessions. Therefore, inclusion of BIOL 361: Immunology, will not dramatically affect the teaching responsibilities of Dr. Greene or other faculty. Multiple other faculty members, including Dr. Grosser and Dr. Meigs could also teach the course if needed to continue its regular offering.

Rationale: This course has been offered as a summer course for a number of years and serves as a valuable 300-level elective to Biology Majors. Furthermore, the course provides instruction into an area of human biology not able to be addressed in other courses in the biology department, including providing knowledge that is valuable, important, and necessary to a variety of career paths, including future medical students, nurses, and members of health and wellness-oriented majors. Inclusion of this course offers several potential positive impacts on our students. First, the course provides majors with an additional 300-level elective that satisfies both the *Genetics* and *Integrative Biology* elements of the major, while all other categories have at least eight potential 4-credit offerings. Second, the course has been a consistent offering in the department's summer curriculum and serves as one of the few options for on-campus learning in the Biology department during the summer, as most courses taught at this time are field classes. Third, the course provides an overview of topics not otherwise formally addressed in the Biology department that are important for a variety of medical, research, or health-sciences related career paths.

2. **Delete:** On page 101, the entry for **BIOL 423, Molecular Biology:**

423 Molecular Biology (3)

Study of nucleic acid structure and function, chromosomal architecture, and mechanisms of gene expression including the function of proteins and non-coding RNA molecules in regulating these processes. Prerequisites: BIOL 136; CHEM 231. Fall.

Add: On page 101, in place of deleted entry, new 4-credit **BIOL 426, Molecular Biology:**

426 Molecular Biology (4)

Study of nucleic acid structure and function, chromosomal architecture, and mechanisms of gene expression including the function of proteins and non-coding RNA molecules in regulating these processes. Lectures will introduce new molecular concepts and associated experimental assays each week, followed by in-class discussions of current or classical scientific literature demonstrating application of concepts/assays and their relevance to health or biotechnology. During the lab portion of the course, students will learn to perform cutting-edge molecular techniques, including CRISPR-based genome manipulation, and will gain proficiency in computer-based molecular biology toolkits. Prerequisites: BIOL 136; CHEM 231. Fall.

Impact Statement:

Curriculum contribution. This revision will change an upper-level 3-credit lecture course to a 4-credit lecture + laboratory course offering in the curriculum categories of *Genetics* and *Critical Thinking and Quantitative Analysis* for majors, and it will be a 300-400 level elective for minors.

Course information.

Course SLOs: By the end of the course, students should be able to:

- Explain the organization, flow, and regulation of information in a cell from DNA to functional RNA and/or protein molecules.
- Choose and apply appropriate molecular biology techniques to answer relevant experimental questions in the field.
- Interpret data generated via a variety of molecular biology assays including gel electrophoresis, Western/Northern/Southern blots, gene/protein expression assays (e.g., quantitative PCR, quantitative mass spectrometry), gel shift assays, DNase footprinting, high-throughput sequencing, immunohistochemistry, etc.
- Interpret, evaluate, and fluently discuss both classic and current primary literature in the field.
- Identify novel questions and current areas of research in molecular biology, as well as their relevance to healthcare and biotechnology.
- Demonstrate proficiency in common molecular techniques performed in lab, including traditional molecular cloning and Golden Gate assembly, genomic and plasmid DNA purification/quantification, CRISPR/Cas genome editing, CRISPR interference, Sanger sequencing, primer design, PCR, gel electrophoresis, quantitative real-time PCR, and basic use of free online molecular biology and bioinformatics toolkits.

Anticipated class size: maximum 16 due to space constraints in the laboratory

Scheduled class time: Two 1:15 h sessions plus one 2:30 h laboratory session weekly every Fall

Instructional format: “Lecture” sessions will involve discussion of reading material from peer-reviewed scientific journals, alternating with lectures to solidify content. Labs will include a combination of computer-based bioinformatics activities and class experiments where students will learn to perform techniques in molecular cloning, CRISPR-based genome manipulation, and nucleic acid and/or protein purification and analysis.

Special space or materials: Labs will be taught in Zeis 224 which is set up for Molecular Biology work and is a designated Biosafety Level 2 space for safe bacterial work. Because the lab has been taught as a special topics course twice already, supplies fit within the current departmental budget.

Faculty contribution. This course was redesigned by Dr. Grosser as a 4-credit special topics course and will continue to be taught by her with the new number. Dr. Matthew Greene has previously taught BIOL 423 during the summer as a 3-credit course and could also deliver the revised curriculum.

Delivering the curriculum. Dr. Melinda Grosser has taught Molecular Biology with lab as a 4-credit Special Topics course during the past two fall semesters. Therefore, revision of Molecular Biology as a 4-credit course will not create a net change in teaching responsibilities of Dr. Grosser or other faculty. Multiple other faculty including Dr. Green and Dr. Meigs could also teach the course if needed to continue its regular offering.

Rationale: This course was redesigned by Dr. Grosser to include a lab component and offered as a special topics course in the fall of 2021 and 2022. The course had not been taught for several years prior to that due to changes in the Biology Department faculty. Although the scope of the course and included topics have not changed, a new emphasis on primary literature discussion in the lecture portion of the course facilitates keeping students up-to-date with a constantly-evolving field, improves fluency in molecular terminology, and helps students connect course concepts to real-world applications. Revising the course to include a laboratory has several advantages. First, majors are required to have at least three, 4-credit laboratory courses in their five upper-level electives from each of five categories; this will become the fifth 4-credit offering in the Genetics category, while all other categories have at least eight potential 4-credit offerings. Second, many molecular biology

skills and concepts are best taught via hands-on learning, so a lab component is important for providing students with a full molecular skillset and effective preparation for pre-health and/or graduate programs.

3. Delete: On page 97, the listing of courses for **Genetics, Integrative Biology, and Critical Thinking and Quantitative Analysis:**

- b) Genetics: BIOL 339, ~~423~~, 425, 443, 444
- c) Integrative Biology: BIOL 320, 322, 328, 334, 335, 338, 356, 357, 424, 425
- e) Critical Thinking and Quantitative Analysis: BIOL 338, 344, 345, 350, 360, 365, ~~423~~, 442, 443

Add: On page 97, in place of deleted entries:

- b) Genetics: BIOL 339, 361, 425, 426, 443, 444
- c) Integrative Biology: BIOL 320, 322, 328, 334, 335, 338, 356, 357, 361, 424, 425
- e) Critical Thinking and Quantitative Analysis: BIOL 338, 344, 345, 350, 360, 365, 426, 442, 443

Impact: The new courses, BIOL 361 and 426, will add upper-level elective options for Biology majors and minors. BIOL 426, a 4-credit course with lab, is replacing the 3-credit BIOL 423, thus giving students another lab option for the requirement of 3 courses with labs.

Rationale: These are editorial changes to include the new courses in the appropriate categories.