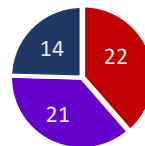


How will my coursework be distributed?

Program Planning Worksheet

BIOLOGY MAJOR - Degree: Bachelor of Science

BIOTECHNOLOGY CONCENTRATION



- Foundation (SH)
- Breadth (SH)
- Depth (SH)

The Biology degree with a Biotechnology concentration is designed for scholars seeking work in the pharmaceutical or biotech industry and allows students to gain hands-on experience using several cutting-edge molecular techniques and research instrumentation. Additionally, this concentration focuses on developing more advanced technical skills that are essential for career success. This concentration is also recommended for those students that will be transferring into the Department of Biological Sciences with an Associate's Degree in Biotechnology.

Students majoring in biology must complete a minimum of 120 semester hours (**SH**) in order to graduate. This includes satisfying the General Education (**GE**) course requirements, completing outlined areas of foundation, breadth, and depth courses, and appropriate elective requirements. Several of these courses can also be taken as part of the GE requirements. A minimum grade of C- or better is required in each biology and chemistry course. Required major courses include 22 SH of Foundation courses, 21 SH of Breadth courses, and 14 SH of Depth courses. In addition, during the senior year, all students must complete and present a Senior Reflection Project.

FOUNDATION COURSES (22 SH)

Course	SH	Grade
BIO 1313 General Biology I (GE)	3	
BIO 1113 General Biology I Lab (GE) <i>Co-requisite: BIO 2301</i>	1	
BIO 1314 General Biology II (GE)	3	
BIO 1114 General Biology II Lab (GE) <i>Co-requisite: BIO 2302</i>	1	
BIO 1307 Scientific Writing (GE) <i>Pre-requisite: Level I GE writing course</i>	3	
CHE 1313 Chemistry I (GE)	3	
CHE 1113 General Chemistry I Lab (GE) <i>Co-requisite: CHE 1313</i>	1	
CHE 1314 General Chemistry II (GE)	3	
CHE 1114 General Chemistry II Lab (GE) <i>Co-requisite: CHE 1314</i>	1	
Select 1 of the following courses: MAT 2326 Elementary Statistics (GE) GER 2326 Statistics for Social and Behavioral Sciences (GE) PSY 2326 Statistics for Social and Behavioral Sciences (GE) SOC 2326 Statistics for Social and Behavior Sciences (GE) MAT 3310 Probability and Statistics I EXS 2310 Demystifying the Statistics of the Health Sciences (GE) MAT 2317 Calculus I (GE) - possible prerequisite(s) required if student did not test into this course	3	
Total Foundation		

BREADTH COURSES (21 SH)

Course	SH	Grade
CHE 2326 Organic Chemistry - CHE 2126 lab optional (1 SH)	3	
PHY 1321 College Physics I	3	
PHY 1121 College Physics I Lab Co-requisite: PHY 1321	1	

Students must complete the remaining 14 hours by taking at least one course from Areas I, II, III, and IV detailed below. To reach the remaining 14 hours students may have to take an additional course from Area I or an optional laboratory course(s) in Areas II, III, or IV. Courses used to fulfill the breadth areas may not be used to fulfill depth concentration requirements.

Area I (2–4 SH): Bio-techniques and Lab Skills

Course	SH	Grade
Select 1 of the following course(s) BIO 1115 & 1315 Intro to Biotech w/ lab (3 SH & 1 SH) - Preferred Course(s) BIO 3201 Tissue Culture (2 SH) BIO 2277 Investigation & Research I (2 SH) BIO 3277 Investigation & Research II (2SH) BIO 3333 Field Biology (3 SH)		
Optional Course (if necessary):		

Area II (3–4 SH): Cells & Molecules

Course	SH	Grade
Select 1 of the following course(s) BIO 3337 Biomolecules (3 SH) - BIO 3137 lab optional (1 SH) BIO 3342 Introduction to Molecular Biology (3 SH) BIO 3364 Cell Biology (3SH) - BIO 3164 lab optional (1 SH)		
Optional Course (if necessary):		

Area III (3–4 SH): Structure & Function

Course	SH	Grade
Select 1 of the following course(s) BIO 3231/3232 Microbiology with lab (2 SH & 2 SH) BIO 3311/3111 Fund. of Anatomy and Physiology with lab (3 SH & 1 SH) BIO 3336 Developmental Bio (3SH) - BIO 3136 lab optional (1 SH) BIO 3343 Histology (3 SH) - BIO 3143 lab optional (1 SH) BIO 2311/2111 Anatomy & Physiology I with Lab (3 SH & 1 SH)		
Optional Course (if necessary):		

Area IV (3 SH): Heredity, Evolution, & Diversity

Course	SH	Grade
Select 1 of the following course(s) BIO 2310 Zoology (3 SH) - <i>BIO 2110 lab optional (1 SH)</i> BIO 2316 Botany (3 SH) - <i>BIO 2116 lab optional (1 SH)</i> BIO 3366 Genetics (3SH) - <i>BIO 3166 lab optional (1 SH)</i> BIO 3371 Ecology & Evolution (3 SH) - <i>BIO 3171 lab optional (1 SH)</i>		
Optional Course (if necessary):		

Total Breadth		
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DEPTH COURSES (14 SH)

Course	SH	Grade
BIO 4276 Seminar	2	
BIO 4277 Investigation and Research III <i>Or</i> BIO 4406 Biotechnology Internship	2 - 6	

To fulfill the biotechnology concentration students must complete ≥ 10 SH of any of the following depth courses:

- BIO 3305 Topics in Bioinformatics (3 SH)
- BIO 3334 Molecular Biology and Biotech I (3 SH)
- BIO 3335 Molecular Biology and Biotech II (3 SH)
- BIO 4374 Proteomics (3 SH)
- BIO 4347 Molecular Genetics (3 SH)
- BIO 3201 Tissue Culture (2 SH)
- BIO 3347 Industrial Microbiology (3 SH)
- BIO 3147 Industrial Microbiology Lab (1 SH)
- BIO 3352 Biotechnology Regulations, Laws, & Ethics (3 SH)
- BUA 3302 Business Ethics (3 SH)

Course	SH	Grade
Total Depth		

***Graduation Requirement: Department of Biological Sciences E-Portfolio Senior Project**

Refer to E-portfolio Guidelines and Checklist

Program Notes

General Education

The General Education curriculum is designed to foster the development of critical skills such as thinking, writing, and speaking; while offering students the opportunity to explore the vast fields that make up the academy. The General Education curriculum at Winston-Salem State University is designed to offer students a mix of the liberal arts as a foundation for the major. Students are required to take approximately one-half (a minimum of 60 semester hours) of their courses outside of their major field of study. Most of these courses are taken in the first two years at the university. Students have choice in the courses they take and are encouraged to sample widely across the curriculum. There are some minimum expectations about the courses taken in general education, dependent on the student's status upon entering the university. Students should work closely with their pre-major advising in planning their course schedules prior to transitioning into the major.

The Biology Degree with Biotechnology Concentration

The student is responsible for the completeness and accuracy of registration and for determining the requirements of the selected program/concentration. It is strongly advised for students to read course descriptions before registering for a course to determine if they have necessary prerequisites. **Students who want to attend graduate, professional, or medical school may have additional requirements that are not required for the biology major, including a full year of organic chemistry with lab, a full year of physics with lab, and other courses. As requirements vary by school and program, students are strongly advised to investigate the requirements early, consult their advisor, and plan their schedules accordingly.**

The Biotechnology curriculum builds upon the university-wide general education requirements with critical courses in the biological sciences and biotechnology as well as business. Students in the biotechnology concentration are trained to work knowledgeably within the biotechnology culture to enhance their academic training and professional competitiveness. While firmly grounding students in the knowledge and skills of biotechnology and the biological sciences, the curriculum emphasizes critical thinking and creative activity.

Special Programs, Co-ops, and Internship

Participation in an internship or supervised undergraduate research experience is required of all students. It is strongly recommended that students apply for a research or experiential learning programs related to biotechnology during the academic year and summer. Full-time summer internships are available at selected local, regional, and national companies or institutions. Part-time summer or semester internships and research experiences are available within the Department of Biological Sciences, other university departments, and local commercial firms. The student's major advisor and/or the departmental student development liaison can assist in selecting beneficial programs.

Career Opportunities

Graduates with a Biotechnology concentration can move into entry level research positions in the biotechnology industry in areas such as tissue culture, transformation, recombinant DNA and molecular biology, protein and nucleic acid biochemistry, genomics, proteomics, and bioinformatics. Biotechnology is a global industry, and most of the companies in the world have significant research laboratories right here in the Triad and Research Triangle Park in Raleigh. Students may continue their education in graduate school earning the MS or PhD to enable them to pursue careers in research and/or higher education. Increasingly, professions such as law, technical sales, and business have found students with education in biotechnology to be strategic hires.