



# Department of Biology

## Undergraduate Advising Handbook

### 2019-2020

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## PROGRAM INFORMATION

### BACHELOR OF SCIENCE: INTEGRATIVE CONCENTRATION

The B.S. Biology: Integrative Concentration is for students who wish to earn a general degree in Biology. Students may select from a variety of courses that provide skills needed to achieve a number of different career goals. This program prepares students for admission into graduate or professional schools. Students preparing for professional school who need to take the MCAT should take at least one semester of psychology and one semester of sociology.

For more information contact **Dr. Began**.

### ACCELERATED PROGRAM - BACHELOR OF SCIENCE: INTEGRATIVE CONCENTRATION + MASTER OF SCIENCE IN BIOLOGY

The Accelerated Program allows students to start making progress on the Master's degree before completing their Bachelor's degree. Twelve credits of graduate coursework are used to satisfy the Bachelor's degree, allowing a student to earn both a B.S. and M.S. degree in as few as 138 credits. Students are considered undergraduates until conferral of the B.S. degree. Students can apply to the Accelerated Program in their junior year. *Students are responsible for finding a biology faculty member that is willing to serve as their thesis advisor as well as a thesis committee that will supervise the project.*

To be considered for the Accelerated Program and enroll in BIO 608 (Thesis Proposal), students must have attained (completed) 75 credits with a minimum of 18 biology credits. Students must have a minimum cumulative GPA of 3.00 including a minimum GPA of 3.00 for biology courses. BIO 608 requires departmental permission to enroll; students must arrange a committee meeting prior to enrolling in BIO 608 (e.g., during their third year). The accelerated program in biology is only open to thesis students. Any student wishing to switch out of the thesis option will be required to complete all requirements of the B.S. degree. Once admitted to the graduate program, graduate policies apply, including minimum GPA (3.00).

For more information contact **Dr. Casotti** or **Dr. Auld**.

### BACHELOR OF SCIENCE: CELL AND MOLECULAR CONCENTRATION

The B.S. Biology: Cell and Molecular Biology Concentration is designed to prepare students for graduate study or employment in research positions within the Cell and Molecular Biology field. The curriculum entails a core of concentration requirements (designed to provide an appropriate academic foundation) followed by a selection of upper-level concentration electives to be chosen in consultation with the student's academic advisor. Several Biology Department faculty members are actively engaged in Cell and Molecular Biology related research, and opportunities exist for qualified undergraduates to obtain hands-on research experience working in one of these laboratories. This program is appropriate for students anticipating a career in Medicine or other

Health Professions. Students preparing for professional school who need to take the MCAT should take at least one semester of psychology and one semester of sociology.

For more information contact **Dr. Sullivan-Brown**.

## **BACHELOR OF SCIENCE: MICROBIOLOGY CONCENTRATION**

The B.S. Biology: Microbiology Concentration is designed to provide students with the special preparation required for careers in clinical laboratories, industrial, academic research and government service in the areas of microbiology, immunology, virology, and mycology. The training students receive should make them especially attractive to biotechnology industries, several of which are developing or expanding in Pennsylvania and surrounding areas. Generation of highly trained individuals requires that the courses incorporated into the program provide extensive "hands-on" experience with the techniques that are most useful and important to modern biomedical sciences. Students will be exposed to fundamental knowledge of the characteristics, genetics, cultivation, metabolic properties, and host interaction of microorganisms including bacteria, fungi, intracellular and extracellular parasites, and viruses. Also included is the identification and characterization of such microorganisms. Emphasis will also be placed on acquisition of skills needed to evaluate and technically interpret results obtained.

Satisfactory completion of this program gives the student the option of taking the National Registry Examinations that provide recognition by the National Registry of Microbiologists at specific levels of training and/or experience mastered. Circulation of the student name in the registry brings the student to the attention of prospective employers.

This program also provides the basic preparation needed for entry into graduate school in several specialized areas of biology or into professional schools.

Students whose primary interests relate to the role of microorganisms in nature (i.e., Microbial Ecology) should consider taking the following courses as directed electives: Chemistry of the Environment (CHE 403), Wastewater Systems (ENV 463), and Water Quality and Health (ENV 462).

For more information contact **Dr. Pisciotta**.

## **BACHELOR OF SCIENCE: ECOLOGY AND CONSERVATION CONCENTRATION**

The B.S. Biology: Ecology and Conservation Concentration provides an opportunity for interested students to obtain a strong background in field biology. The required core curriculum and choice of electives provide opportunities for later careers as biologists in State and Federal Environmental agencies, industry, environmental consulting firms and similar organizations. Internships are strongly recommended as part of the program. Coursework emphasizes skills obtained in Biology, Chemistry and Mathematics. Additional coursework from other departments may be recommended

to fulfill particular career objectives. Whereas many students obtain jobs in some area of Ecology directly after obtaining the B.S. degree, many jobs in Ecology today require a M.S. degree.

Although the basic purpose of the program is to develop strong analytical skills suitable for a broad range of careers in ecology, conservation, and environmental biology, the opportunity exists for some specialization at the undergraduate level through 1) recommended courses, 2) internships with local organizations, and 3) summer courses offered at appropriate biological field stations.

1) Recommended Courses: Students interested in aquatic ecology, water quality, fisheries and related fields should consider taking Freshwater Ecology (BIO 476), Wetlands (BIO 471), Water Quality and Health (ENV 462), and Chemistry of the Environment (CHE 403). Students interested in plant ecology, horticulture, and related fields should take Plant Physiology (BIO 466), Wetlands (BIO 471), Plant Communities (BIO 475), Systematic Botany (BIO 485), and selected courses such as Entomology (BIO 377) and Fundamentals of Soil (ESS 490). Students wishing to specialize in wetland ecology should plan to take Wetlands (BIO 471), Freshwater Ecology (BIO 476), Hydrogeology (ESS 339) and Soils (ESS 490). Students interested in microbial ecology should consider taking General Microbiology (BIO 214), Microbial Ecology (BIO 474), Microbial Physiology (BIO 464), Chemistry of the Environment (CHE 403), and Water Quality and Health (ENV 462). Students with an interest in animal ecology should plan to take Vertebrate Ecology (BIO 277), Entomology (BIO 377), Invertebrate Zoology (BIO 387) and Animal Behavior (PSY 335, 336).

2) Internships: A large number of local organizations are interested in providing student internships, and can supply valuable experience and contacts. Students should expect to seek internships during their senior year, or during the summer between their junior and senior years. Internships receive course credit as BIO 409. A maximum of 8 credit hours may be used to satisfy Biology elective credit.

3) Biological Field Stations: Course taken during the summer at Biological Field Stations are highly recommended. Field stations provide an intensive exposure to field biology and can offer courses complementary to those available at West Chester. Courses taken under advisement can be applied to the degree.

For more information contact **Dr. Schedlbauer**.

## ***ACCELERATED PROGRAM - BACHELOR OF SCIENCE: ECOLOGY AND CONSERVATION CONCENTRATION + MASTER OF SCIENCE IN BIOLOGY***

The Accelerated Program allows students to start making progress on the Master's degree before completing their Bachelor's degree. Twelve credits of graduate coursework are used to satisfy the Bachelor's degree, allowing a student to earn both a B.S. and M.S. degree in as few as 138 credits. Students are considered undergraduates until conferral of the B.S. degree. Students can apply to the Accelerated Program in their junior year. *Students are responsible for finding a biology faculty member that is willing to serve as their thesis advisor as well as a thesis committee that will supervise the project.*



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For more information contact **Dr. Casotti** or **Dr. Auld**.

## **BACHELOR OF SCIENCE: MARINE SCIENCE CONCENTRATION**

The B.S. Biology: Marine Science Concentration provides the opportunity for interested students to obtain a strong educational background in marine biology and other topics in a field that stretches from marine organisms to biotechnology and even oceanography interests from the coastal waters to deep oceans. The required core curriculum and electives will allow students the opportunity to draw on educational resources at West Chester University and Marine Field stations, such as the Wallops Island Marine Science Consortium, VA. Course work emphasizes techniques in biological sciences, oceanography, chemistry, physics and mathematics. Field and laboratory courses form a strong foundation of this program and students are encouraged to engage in directed research projects or internships.

For more information contact **Dr. Boettger**.

## **BACHELOR OF SCIENCE: MEDICAL LABORATORY SCIENCE CONCENTRATION**

The B.S. Biology: Medical Laboratory Science Concentration offers students the opportunity to enter the field of medical laboratory science with emphasis on the techniques and instrumentation used to evaluate patient samples. This concentration allows students to complete the necessary general education and departmental requirements in three years. The fourth year is spent in a hospital internship training program at one of the several affiliated hospitals and students receive 26 semester hour credits for the internship year (BIO 407 & 408, Internship in Medical Laboratory Science). To qualify for the internship, students must have a minimum 2.75 GPA and be accepted by an accredited hospital Medical Laboratory Science program. Applications should be submitted by the summer of the junior year (60 credits completed). Internships are very competitive and acceptance depends on the cumulative GPA, excellent letters of recommendation and successful completion of an on-site interview. Please note that some programs require computer science or Anatomy and Physiology courses. Students completing the internship will receive a B.S. in Biology: Medical Laboratory Science concentration and the training necessary to take the national certification exam.

Affiliated hospitals include Pennsylvania Hospital, Pennsylvania College of Health Sciences (formerly Lancaster General Hospital), Reading Hospital, and St. Christopher's Hospital.

For more information contact **Dr. Pisciotta**.

## **MINOR IN BIOLOGY**

The Department of Biology offers a minor in biology. The Minor in Biology requirements include the following:

1. Required prerequisite: BIO 110 (must be passed with a C- or better), or BIO 100 (must be passed with a grade of A or A-). These courses are prerequisites and must be completed before admission to the minor. The grades in these courses are not used in calculating the GPA in the minor and do not count toward the 18 semester hours required.
2. Students must complete 18 credits at the 200 level or higher for the minor. At least three credits must be in addition to the biology courses required by the student's major. A grade of C- or better is required in all courses.
3. To graduate with a minor in Biology, students must maintain a GPA of 2.00 in the minor courses.

For more information contact **Dr. Auld**.

## **BACHELOR OF SCIENCE IN EDUCATION: BIOLOGY**

This program is designed to prepare the student for a career in teaching in Secondary Schools. Professional certification in biology is awarded to the student who completes the program satisfactorily. Each student is strongly advised to seek certification in a related area to enhance employment potential. Related areas include the following: General Science, Health Education, Athletic Training, and Environmental Education. Students in this program have two Academic Advisors, one for Biology and one for Secondary Education.

**\*THE BSED PROGRAM REQUIRES 124 CREDITS FOR GRADUATION.**

For more information contact **Dr. Laura Renzi, Department of Secondary Education**.

## **OTHER OPTIONS**

### **Pre-Professional Studies**

West Chester University has a Pre-Professional program design to help students gain entry into professional school once they graduate with an undergraduate degree from the University. The program aids student admission into programs such as medicine, veterinary sciences, physical

assistants, physical therapists and dentistry. The program advises students on the courses appropriate for entry into the above programs and conducts mock interviews with applicants in their junior year to prepare them for successful admission. If recommended by the program, each applicant receives a committee letter of recommendation forwarded directly to their schools of choice. Although any biology major can qualify for these programs the department strongly encourages majors to be in either the *Integrative or Cell and Molecular Biology concentrations*, as these offer almost all of the pre-requisite courses needed for entry into future programs.

Appropriate Biology courses students should take to gain admission to the schools include Organic Chemistry II lab (CRL 232) (not a biology requirement), Comparative Vertebrate Anatomy (BIO 357), Animal Histology (BIO 428), Animal Development (BIO 448) and Comparative Vertebrate Physiology (BIO 468), these BIO courses fulfill Biology Elective credit. Other useful courses include Molecular Biology Techniques (BIO 333), Cellular and Molecular Biology (BIO 421), Molecular Genetics (BIO 431), Human Genetics (BIO 440), Virology (BIO 456), Immunology (BIO 465), Light Microscopy and the Living Cell (BIO 480), Epidemiology (BIO 484), and Special Problems in Biology (BIO 491).

Other courses that are highly recommended include Biomedical Ethics (PHI 371), Business & Organizations Writing (ENG 368), Technical Writing (ENG 371), and Biochemistry I (CHE 476, required for Cell & Molecular students).

Interested students may apply in their second semester. Please note that five letters of reference are required for an interview or eligibility for a letter of recommendation from the Pre-Med committee. MCAT and GRE prep assistance is available through the Pre-Professional Office as well.

### **Pre-Physical Therapy Option**

There are several academic paths a student may follow to prepare for a professional physical therapy program. The Department of Kinesiology has a Pre-Physical Therapy Concentration in Exercise Science, for students who wish to emphasize Exercise Science; we strongly recommend a minor in Biology for those students. Students may also meet the requirements for Physical Therapy programs by following the general concentration in the BS in Biology. In addition, within the College of Arts and Sciences, the Department of Biology and the Liberal Studies Program have cooperated on a degree plan that will allow students the flexibility necessary to meet the requirements of virtually all physical therapy schools in the Northeast. Students who are interested in a career in physical therapy are strongly advised to write to the admissions office of the schools they are interested in to determine specific prerequisites for those programs. Required biology courses are particularly variable.

Students interested in pre-physical therapy in the College of Arts and Sciences should enter West Chester University as biology majors in the BS: General program, and identify themselves as pre-physical therapy during their summer orientation and advising session. They will be given a pre-physical therapy guidance sheet, and all assigned to the same advisor. The basic skills, science, and math courses taken during the first year are virtually the same as the BS: General program, but specific courses are recommended for the general education electives. These include Psychology 100 and Philosophy 180.

After completing 32 credits with a minimum GPA of 2.00, the student may elect to transfer to the B.S. in Liberal Studies, Science and Mathematics Track, and declare a biology minor. Biology courses that will fulfill the requirements of the minor will be selected after advisement and consideration of the particular physical therapy school the student plans to enter.

### **Pre-MBA Option**

Students interested in pursuing a Master's in Business Administration following a Bachelor of Science degree in Biology can be admitted to the M.B.A. program with a GMAT score of 460 (or its equivalent GRE score). The GMAT requirement will be waived if your overall GPA is 3.3 (or higher), and you earn a B or better in each of the following courses: Management, Accounting, Marketing, Economics (ECO 111 or ECO 112), Finance, and Statistics (MAT 121).

## **INFORMATION & POLICIES**

### **Research Opportunities in Biology**

All of the Biology professors hold doctoral degrees and most are actively engaged in research in such areas as molecular genetics, immunology, cell physiology, ecology, and functional morphology. These individuals are nationally and internationally recognized with over 50 articles and papers appearing over the last five years in prestigious journals. Almost half have recently received grant support from either the National Institutes of Health or the National Science Foundation. Research facilities, as well as classrooms, are equipped with such state-of-the-art equipment as liquid scintillation and gamma counters, spectrophotometers with recorders, a digitized HPLC system, and scanning and transmitting electron microscopes. The Biology Department also manages the 20,000 specimen William Darlington Herbarium and a 126-acre Robert B. Gordon Natural Area for Environmental Studies.

Undergraduates interested in receiving academic credit for participating in departmental research activities should take BIO 491, Special Problems in Biology. Senior biology majors interested in gaining research experience in an off-campus medical, commercial, industrial or government agency should take BIO 409, Internship in Biological Sciences. Students interested in these research opportunities should consult their advisor or any faculty member in their field of interest. An overall GPA of 2.5 and a GPA 2.5 or better in BIO courses is required before taking BIO 409 or BIO 491.

### **Advising & Graduation Requirements**

The following pages (advising sheets) list the requirements for each of the programs within the Biology Department. You should use the appropriate section to plan and record your academic progress. Students are assigned to an Academic Advisor during summer orientation; consult with

your Academic Advisor regularly. As academic advisors, Biology faculty members are expected to provide accurate, helpful information to students; students are expected to be knowledgeable about the academic policies and procedures governing the completion of their degrees. The ultimate responsibility for satisfying all graduation requirements is the student's. The ultimate responsibility for constructing each semester's schedule is also the student's. For university policy information and degree requirements, refer to the WCU Undergraduate Catalog for the year you entered the university. This is your contract with the university for your General Education Requirements, provided you maintain full-time student status, for the duration of your academic career and terminates upon earning your degree. You may at any time review your major requirements with your academic advisor. Students are expected to utilize campus email.

Every semester, a Scheduling Hold is placed on your account. This hold prevents you from scheduling until you meet with your Academic Advisor. Your advisor then removes the hold. This system is designed to assist you selecting the best coursework each semester to meet graduation guidelines in a timely fashion.

Please note that several courses WILL NOT count as a Biology major elective: BIO 102, 204, 259, 269, 307, and 469, and SCB courses. *See the WCU Undergraduate Catalog for prerequisites for individual courses.*

Be aware as well, that Interdisciplinary (“I”) courses can **ONLY** be used to fulfill an interdisciplinary requirement, not a distributive requirement.

**You must apply for graduation one full year before you anticipate graduating.** This allows you the time to take required courses that may be offered only once per year in case you need them to graduate. The application process begins online in your myWCU account. The Registrar’s Office will review your general education requirements with you prior to graduation. You should review your major requirements with your Academic Advisor. Students must have a GPA of 2.0 overall and in their BIO classes to receive a degree in Biology. Transfer students must complete at least half of their Biology credits at WCU to receive a degree in Biology.

## **Internal and External Transfer Students**

For an internal transfer into any biology degree program, a student must:

1. be in good academic standing (2.00 GPA or better);
2. have already passed BIO 100 with an A- or better, or BIO 110 with a C- or better; and
3. complete the application for change of major.

For newly admitted transfer students, a student must:

1. meet University standards for admission to West Chester University;
2. have a grade of C- (70%) or better if they have taken a BIO 110 equivalent; and
3. interview with a department representative.

NOTE: In order to receive a degree in biology from West Chester University, a transfer student must successfully complete 30 credits at WCU and a minimum of 50 percent of the required

biology credits (excluding cognates such as Chemistry, Physics, & Calculus) in the WCU Department of Biology.

## **Advanced Placement Policy**

A score of three or better on the Biology Advanced Placement Exam will transfer as credit for BIO 110, General Biology.

## **Darlington Biological Society**

The Darlington Biological Society (DBS) is the Biology Club at WCU. This dedicated group of students meets regularly to discuss a variety of topics and events with the assistance of a biology faculty advisor. Past service opportunities include Gordon Natural Area Clean-Up Days, West Chester's Adopt-a-Block program, Alex's Lemonade Stand, Earth Week, Aid to South Africa, and Native Plant Garden (planted outside Merion's window wall). They also hold an annual Paintball Tournament and All Science Semi-Formal along with the Chemistry Club. Trips to the Philadelphia Zoo, NYC, the Mutter Museum and the Franklin Institute were also taken last year. Camping and hiking events take place throughout the year. DBS hosts a successful monthly Seminar Series highlighting faculty and guests' research. Additionally, the DBS runs a tutoring program for biology courses. The first meeting of the year is announced via campus email to Biology students using OrgSync. Meetings are held in the Biology Student Lounge in Schmucker Science Link, Room 159.

Students should contact the Darlington Biological Society at [BioClub@wcupa.edu](mailto:BioClub@wcupa.edu).

## **Approved General Education Distributive Requirements**

Beginning Fall 2014, only certain courses will be approved for general education credit for incoming first-year students. For a complete list of approved General Education Distributive classes consult the online Undergraduate Catalog. This can be found by going to [www.wcupa.edu](http://www.wcupa.edu) and typing in the words "approved general education course" using the search engine. or entering the following URL:

<https://catalog.wcupa.edu/undergraduate/general-education-requirements/approved-gen-ed-course-list/>

For transfer students, WCU will continue to accept transfer credit for courses other than those identified as "approved" general education courses, if the course equivalent has the same prefix as those in the sciences, behavioral and social sciences, humanities, or arts categories within the distributed requirements, including those assigned the 199 course number.

**ADVISING SHEETS:**  
**B. S. IN BIOLOGY: INTEGRATIVE BIOLOGY CONCENTRATION**  
 Fall 2019 – Spring 2020

**I. ACADEMIC FOUNDATIONS & DEGREE REQUIREMENTS**

<i>Requirement</i>	<i>Course</i>	<i>Credits</i>	<i>Term</i>	<i>Year</i>	<i>Grade</i>
First Year Experience	FYE 100	4	_____	_____	_____
Effective Writing I	WRT 120	3	_____	_____	_____
Effective Writing II	WRT 2__ <sup>▲</sup>	3	_____	_____	_____
Mathematics: Statistics	MAT 121 or 125	3	_____	_____	_____
Interdisciplinary (“I”)	_____	3	_____	_____	_____
Diverse Communities (“J”)	_____♥	3	_____	_____	_____
Ethics (“ET”)	_____♥	3	_____	_____	_____

**Writing Emphasis** *Nine credits\**, integrated across General Education & Major courses.

BIO 220      \_\_\_\_\_      \_\_\_\_\_      \_\_\_\_\_

*One at 300/400-level:*      \_\_\_\_\_      \_\_\_\_\_      \_\_\_\_\_

**Speaking Emphasis** *Nine credits\**, integrated across General Education & Major courses.

\_\_\_\_\_      \_\_\_\_\_      \_\_\_\_\_      \_\_\_\_\_

*One at 300/400-level:*      \_\_\_\_\_      \_\_\_\_\_      \_\_\_\_\_

**II. GENERAL EDUCATION DISTRIBUTIVE REQUIREMENTS**

- Courses must be selected from the approved General Education list (see the [catalog](#)).
- Interdisciplinary (“I”) courses cannot also be a General Education distributive course.
- Biology majors fulfill their science requirements with CHE 103 and PHY 130/170.
- Distributive requirements can be simultaneously satisfied with other degree requirements, see some examples♦.

**A. Humanities** (6 credits): E.g., Literature (LIT/CLS), History (HIS), Philosophy (PHI)  
*Courses must be selected from two different subject areas.*

\_\_\_\_\_      3      \_\_\_\_\_      \_\_\_\_\_  
 \_\_\_\_\_      3      \_\_\_\_\_      \_\_\_\_\_

**B. Behavioral and Social Sciences** (6 credits): E.g., Psychology (PSY), Sociology (SOC), Anthropology (ANT), Political Science (PSC), Geography (GEO), Economics (ECO)  
*Courses must be selected from two different subject areas.*

*Note: Students taking the MCAT should take PSY 100 and SOC 200.*

\_\_\_\_\_      3      \_\_\_\_\_      \_\_\_\_\_  
 \_\_\_\_\_      3      \_\_\_\_\_      \_\_\_\_\_

**C. Arts** (3 credits): E.g., Art (ART), Art History (ARH), Dance (DAN), Film (FLM), Music (MHL, MTC), Theater (THA)

\_\_\_\_\_      3      \_\_\_\_\_      \_\_\_\_\_

**III. DIRECTED ELECTIVES – 16-17 credits (as many as needed to reach 120 total credits)**

_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

**IV. SUPPORTING COURSES (28-29 credits)**

Calculus *	MAT ____	3/4	_____	_____	_____
General Chemistry I	CHE 103	3	_____	_____	_____
General Chemistry I Lab	CRL 103	1	_____	_____	_____
General Chemistry II	CHE 104	3	_____	_____	_____
General Chemistry II Lab	CRL 104	1	_____	_____	_____
Organic Chemistry I	CHE 231	4	_____	_____	_____
Organic Chemistry I Lab	CRL 231	2	_____	_____	_____
Organic Chemistry II	CHE 232	3	_____	_____	_____
General Physics I **	PHY 130	4	_____	_____	_____
General Physics II	PHY 140	4	_____	_____	_____

**V. BIOLOGY COURSES (42 credits) -- GPA must be 2.0 or higher to graduate.**

*A. Required courses (21 credits)*

General Biology ***	BIO 110	3	_____	_____	_____
General Botany ***	BIO 215	3	_____	_____	_____
General Zoology ***	BIO 217	3	_____	_____	_____
Cell Physiology ***	BIO 220	3	_____	_____	_____
Genetics ***	BIO 230	3	_____	_____	_____
General Ecology ***	BIO 270	3	_____	_____	_____
Seminar or Internship or Independent Study*** <sup>△</sup>	BIO 490/409/491	3	_____	_____	_____

*B. Biology Electives.* Select 21 semester hours under advisement. Courses may be selected from BIO 214, BIO 275, BIO 277 or BIO courses at or above the 300 level, except BIO 307 and BIO 469.

_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____



## Notes and Requirements

Total degree program: 120 credits.

♠ The second (200-level) WRT course is chosen from WRT 200, 204, 205, 206, 208, or 220.

♥ The Diverse Communities (“J”) course and the Ethics (“ET”) courses can be satisfied through another requirement (e.g., Interdisciplinary or Distributive) as long as the course carries the appropriate attribute(s). *Note:* Credits are not duplicated such that if a course satisfies two requirements, those credits must be made up via directed electives (the minimum total credits for a B.S. degree is 120).

♣ All students must take at least 9 credits of Writing Emphasis courses and 9 credits of Speaking Emphasis courses. Students who enter WCU with 40-70 transfer credits only need 6 credits of each; students who enter with >70 transfer credits only need 3 credits of each. **All students must take at least 3 credits of Writing Emphasis and 3 credits of Speaking Emphasis at the 300-400 level.**

♦ Students should think about how requirements can be simultaneously satisfied. As examples: LNC 110 is a Humanities distributive that satisfies the Ethics requirement; PHI 180 is a Humanities distributive that satisfies the Diverse Communities & Ethics requirements; LIT 165 is a Humanities distributive that is also Writing Emphasis; PSC 101 is a Behavioral & Social Science distributive that satisfies the Diverse Communities requirement.

\* The Biology department recommends MAT 145 (Calculus for the Life Sciences; 3 credits) or MAT 161 (Calculus I; 4 credits). MAT 143 (Brief Calculus; 3 credits) is also acceptable. You must meet the necessary pre-requisites or obtain a minimum score on the Math Placement Exam to enroll in a calculus class. Visit the Math Department website to take the exam. If you receive a score of 3 or lower on the placement exam, you must take MAT 115 (Algebra, Functions, and Trigonometry) or MAT 131 (Precalculus) as preparation for Calculus (MAT 143 or MAT 145). If you receive a score of 4 or above, you can enroll directly into MAT 143 or MAT 145. You must score a 5 to enroll into MAT 161 or take the pre-requisite of MAT 131.

\*\* The recommended Physics sequence is PHY 130 & PHY 140. Students may substitute the PHY 170 & PHY 180 sequence, but PHY 130 may not be used as a prerequisite for PHY 180 and PHY 170 may not be used as a prerequisite for PHY 140.

\*\*\* Course must be passed with a "C-" or better.

△ Students using BIO 409 to fill this requirement must be aware that using three credits in a required Biology course (section V - A) will not also count as three credits towards a Biology elective (section V - B). Check with your academic advisor if you are unsure of credit usage. A maximum of 8 combined credits from BIO 409 & 491 may be applied to the total BIO elective credits.

## Suggested Sequence for B.S. Biology Majors

### Integrative Biology Concentration

Fall 2019 – Spring 2020

	<b>Semester #1 (17 credits)</b>		<b>Semester #2 (16 credits)</b>
_____	FYE 100 (4)	_____	WRT 2__ (3)
_____	WRT 120 (3)	_____	BIO 215 or 217 (3)
_____	BIO 110 (3)	_____	CHE 104/CRL 104 (3)/(1)
_____	CHE 103/CRL 103 (3)/(1)	_____	MAT 145 (3) or MAT 143/161
_____	MAT 121 or MAT 125 (3)	_____	Gen Ed Distributive: Behavioral & Social Science (3)
	<b>Semester #3 (15 credits)</b>		<b>Semester #4 (15 credits)</b>
_____	BIO 215 or 217 (3)	_____	BIO 220 (3) (W)
_____	CHE 231/CRL 231 (4)/(2)	_____	BIO 230 (3)
_____	Math (if still needed) (3)	_____	CHE 232 (3)
_____	Gen Ed Distributive: Humanities & Ethics (ET) course (3)	_____	Gen Ed Distributive Behavioral & Social Science (3)
_____		_____	Gen Ed Distributive: Arts (3)
	<b>Semester #5 (16 credits)</b>		<b>Semester #6 (13 credits)</b>
_____	BIO 270 (3)	_____	BIO Elective (3)
_____	BIO Elective (3)	_____	BIO Elective (3)
_____	PHY 130/170 (4)	_____	PHY 140/180 (4)
_____	Diversity (J) Course (3)	_____	Interdisciplinary (I) Course (3)
_____	Directed Elective (3)	_____	
	<b>Semester #7 (15 credits)</b>		<b>Semester #8 (15 credits)</b>
_____	BIO Elective (3)	_____	BIO Elective (3)
_____	BIO Elective (3)	_____	BIO Elective (3)
_____	Directed Elective (3)	_____	Directed Elective (3)
_____	Directed Elective (3)	_____	Directed Elective (3) (if needed)
_____	Gen Ed Distributive: Humanities (3)	_____	BIO 490/409/491 (3)

All required 200 level Biology courses should be completed by the end of Semester #5.

Students should take Statistics (MAT 121 or 125) in the first year.

All students must take at least 9 credits of Writing Emphasis courses and 9 credits of Speaking Emphasis courses. Students who enter WCU with 40-70 transfer credits only need 6 credits of each; students who enter with >70 transfer credits only need 3 credits of each. **All students must take at least 3 credits of Writing Emphasis and 3 credits of Speaking Emphasis at the 300-400 level.**

**ACCELERATED PROGRAM - B. S. IN BIOLOGY: INTEGRATIVE BIOLOGY  
+ M. S. IN BIOLOGY**  
Fall 2019 – Spring 2020

**I. ACADEMIC FOUNDATIONS & DEGREE REQUIREMENTS**

<i>Requirement</i>	<i>Course</i>	<i>Credits</i>	<i>Term</i>	<i>Year</i>	<i>Grade</i>
First Year Experience	FYE 100	4	_____	_____	_____
Effective Writing I	WRT 120	3	_____	_____	_____
Effective Writing II	WRT 2__ <sup>▲</sup>	3	_____	_____	_____
Mathematics: Statistics	MAT 121 or 125	3	_____	_____	_____
Interdisciplinary (“I”)	_____	3	_____	_____	_____
Diverse Communities (“J”)	_____♥	3	_____	_____	_____
Ethics (“ET”)	_____♥	3	_____	_____	_____

**Writing Emphasis** *Nine credits\**, integrated across General Education & Major courses.

<u>BIO 220</u>	_____	_____	_____	_____	_____
<i>One at 300/400-level:</i>	_____	_____	_____	_____	_____

**Speaking Emphasis** *Nine credits\**, integrated across General Education & Major courses.

_____	_____	_____	_____	_____	_____
<i>One at 300/400-level:</i>	_____	_____	_____	_____	_____

**II. GENERAL EDUCATION DISTRIBUTIVE REQUIREMENTS**

- Courses must be selected from the approved General Education list (see the [catalog](#)).
- Interdisciplinary (“I”) courses cannot also be a General Education distributive course.
- Biology majors fulfill their science requirements with CHE 103 and PHY 130/170.
- Distributive requirements can be simultaneously satisfied with other degree requirements, see some examples♦.

**A. Humanities** (6 credits): E.g., Literature (LIT/CLS), History (HIS), Philosophy (PHI)  
*Courses must be selected from two different subject areas.*

_____	3	_____	_____	_____
_____	3	_____	_____	_____

**B. Behavioral and Social Sciences** (6 credits): E.g., Psychology (PSY), Sociology (SOC), Anthropology (ANT), Political Science (PSC), Geography (GEO), Economics (ECO)  
*Courses must be selected from two different subject areas.*

*Note: Students taking the MCAT should take PSY 100 and SOC 200.*

_____	3	_____	_____	_____
_____	3	_____	_____	_____

**C. Arts** (3 credits): E.g., Art (ART), Art History (ARH), Dance (DAN), Film (FLM), Music (MHL, MTC), Theater (THA)

_____	3	_____	_____	_____
-------	---	-------	-------	-------

**III. DIRECTED ELECTIVES – 17 credits (to reach 120 total credits for the B.S. degree)**

_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

**IV. SUPPORTING COURSES (28 credits)**

Calculus *	MAT 145	3	_____	_____	_____
General Chemistry I	CHE 103	3	_____	_____	_____
General Chemistry I Lab	CRL 103	1	_____	_____	_____
General Chemistry II	CHE 104	3	_____	_____	_____
General Chemistry II Lab	CRL 104	1	_____	_____	_____
Organic Chemistry I	CHE 231	4	_____	_____	_____
Organic Chemistry I Lab	CRL 231	2	_____	_____	_____
Organic Chemistry II	CHE 232	3	_____	_____	_____
General Physics I **	PHY 130	4	_____	_____	_____
General Physics II	PHY 140	4	_____	_____	_____

**V. BIOLOGY COURSES (42 credits; 30 credits taken at the undergraduate level, 12 credits taken at graduate level are applied to the B.S.) Must have 3.00 GPA for graduate admission.**

*A. Required courses (18 credits)*

General Biology ***	BIO 110	3	_____	_____	_____
General Botany ***	BIO 215	3	_____	_____	_____
General Zoology ***	BIO 217	3	_____	_____	_____
Cell Physiology ***	BIO 220	3	_____	_____	_____
Genetics ***	BIO 230	3	_____	_____	_____
General Ecology ***	BIO 270	3	_____	_____	_____

*B. Biology Electives <sup>Ω</sup> (12 credits; 12 additional credits completed at graduate level)*

_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

**VI. GRADUATE COURSES <sup>Δ</sup>**

*A. Core courses (12 credits)*

Graduate Seminar in Biology	BIO 510	3	_____	_____	_____
Experimental Design and Analysis	BIO 511	3	_____	_____	_____
Topics & Methods in Cellular, Microbial, and Molecular Biology	BIO 520	3	_____	_____	_____
Topics & Methods in Ecology, Evolution, and Organismal Biology	BIO 521	3	_____	_____	_____

B. *Electives* <sup>ξ</sup> (9 credits)

_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

C. *Research and Capstone* <sup>Σ</sup> (9 credits)

Thesis Proposal	BIO 608	3	_____	_____	_____
Thesis Research	BIO 609	3	_____	_____	_____
Thesis and Defense	BIO 610	3	_____	_____	_____

**Notes and Requirements**

The Accelerated B.S. + M.S. program is only open to thesis students. Students should begin discussing research topics with prospective faculty advisors during the 2<sup>nd</sup> year in preparation for application to the accelerated program during their 3<sup>rd</sup> year.

Credit requirements: B.S.: 120 credits; M.S.: 30 credits. Twelve credits taken at the graduate level are also applied to the B.S. degree. Therefore the total for both degrees is 138 credits.

♠ The second (200-level) WRT course is chosen from WRT 200, 204, 205, 206, 208, or 220.

♥ The Diverse Communities (“J”) course and the Ethics (“ET”) courses can be satisfied through another requirement (e.g., Interdisciplinary or Distributive) as long as the course carries the appropriate attribute(s). *Note:* Credits are not duplicated such that if a course satisfies two requirements, those credits must be made up via directed electives (the minimum total credits for a B.S. degree is 120).

♣ All students must take at least 9 credits of Writing Emphasis courses and 9 credits of Speaking Emphasis courses. Students who enter WCU with 40-70 transfer credits only need 6 credits of each; students who enter with >70 transfer credits only need 3 credits of each. **All students must take at least 3 credits of Writing Emphasis and 3 credits of Speaking Emphasis at the 300-400 level.**

♦ Students should think about how requirements can be simultaneously satisfied. As examples: LNC 110 is a Humanities distributive that satisfies the Ethics requirement; PHI 180 is a Humanities distributive that satisfies the Diverse Communities & Ethics requirements; LIT 165 is a Humanities distributive that is also Writing Emphasis; PSC 101 is a Behavioral & Social Science distributive that satisfies the Diverse Communities requirement.

\* The Biology department recommends MAT 145 (Calculus for the Life Sciences; 3 credits) or MAT 161 (Calculus I; 4 credits). MAT 143 (Brief Calculus; 3 credits) is also acceptable. You must meet the necessary pre-requisites or obtain a minimum score on the Math Placement Exam to enroll in a calculus class. Visit the Math Department website to take the exam. If you receive a score of 3 or lower on the placement exam, you must take MAT 115 (Algebra, Functions, and Trigonometry) or MAT 131 (Precalculus) as preparation for Calculus (MAT 143 or MAT 145). If you receive a score of 4 or above, you can enroll directly into MAT 143 or MAT 145. You must score a 5 to enroll into MAT 161 or take the pre-requisite of MAT 131.

\*\* The recommended Physics sequence is PHY 130 & PHY 140. Students may substitute the PHY 170 & PHY 180 sequence, but PHY 130 may not be used as a prerequisite for PHY 180 and PHY 170 may not be used as a prerequisite for PHY 140.

\*\*\* Course must be passed with a "C-" or better.

Ω - Biology electives are selected from BIO 214, 275, 277, or BIO courses at or above the 300 level, except BIO 307 and BIO 469.

Δ - To be considered for the accelerated program and enroll in BIO 608 (Thesis Proposal), students must have attained (completed) 75 credits with a minimum of 18 biology credits. Students must have a minimum cumulative GPA of 3.00 including a minimum GPA of 3.00 for biology courses. BIO 608 requires departmental permission to enroll; students must arrange a committee meeting prior to enrolling in BIO 608 (e.g., during their third year). The accelerated program in biology is only open to thesis students. Any student wishing to switch out of the thesis option will be required to complete all requirements of the B.S. degree. Once admitted to the graduate program, graduate policies apply, including minimum GPA (3.00). *See the Graduate Catalog for further details.*

ξ – Any other 500-level BIO course except BIO 591. If a course is offered at both the 400 and 500 levels, the student must take the 500-level course. No more than 6 credits of 400-level courses may be counted toward the M.S. degree. With prior departmental approval, up to 6 credits of graduate course work from another department or university may be applied toward the M.S. degree. BIO 535, 536, and 537 may be repeated for credit provided the topic is different.

Σ - A letter grade must be obtained for BIO 608 before the student can enroll in BIO 609. Likewise, a letter grade must be obtained for BIO 609 before the student can enroll in BIO 610.

# Suggested Sequence for Accelerated B.S. + M.S. Biology Majors

## Integrative Biology Concentration

Fall 2019 – Spring 2020

	<b>Semester #1 (17 credits)</b>		<b>Semester #2 (16 credits)</b>
_____	FYE 100 (4)	_____	WRT 2__ (3)
_____	WRT 120 (3)	_____	BIO 215 or 217 (3)
_____	BIO 110 (3)	_____	CHE 104/CRL 104 (3)/(1)
_____	CHE 103/CRL 103 (3)/(1)	_____	MAT 145 (3) or MAT 143/161
_____	MAT 121 or MAT 125 (3)	_____	Gen Ed Distributive: Behavioral & Social Science (3)
	<b>Semester #3 (15 credits)</b>		<b>Semester #4 (15 credits)</b>
_____	BIO 215 or 217 (3)	_____	BIO 220 (3)
_____	CHE 231 (4)	_____	BIO 230 (3)
_____	CRL 231 (2)	_____	CHE 232 (3)
_____	Gen Ed distributive: Humanities & Ethics (ET) course (3)	_____	Gen Ed distributive: Arts (3)
_____	Diversity (J) elective (3)	_____	Gen Ed distributive: Behavioral & Social Science (3)
	<b>Semester #5 (16 credits)</b>		<b>Semester #6 (16 credits)</b>
_____	BIO 270 (3)	_____	BIO elective (3)
_____	BIO elective (3)	_____	BIO elective (3)
_____	PHY 130/170 (4)	_____	PHY 140/180 (4)
_____	Gen Ed distributive: Humanities (3)	_____	Interdisciplinary (I) elective (3)
_____	Directed elective (3)	_____	Directed elective (3)
	<b>Semester #7 <sup>^</sup> (14 credits)</b>		<b>Semester #8 (12 credits)</b>
_____	BIO 510 (3)	_____	BIO 511 (3)
_____	BIO 520 (3)	_____	BIO 521 (3)
_____	Directed elective (3)	_____	Directed elective (3)
_____	Directed elective (2)	_____	Directed elective (3)
_____	BIO 608 <sup>^</sup> (3)		
	<b>Semester #9 (9 credits)</b>		<b>Semester #10 (9 credits)</b>
_____	BIO elective (3)	_____	BIO elective (3) (Graduate)
_____	BIO elective (3) (Graduate)	_____	BIO elective (3) (Graduate)
_____	BIO 609 (3)	_____	BIO 610 (3)

All required 200 level Biology courses should be completed by the end of Semester #5.

Students should take Statistics (MAT 121 or 125) in the first year.

All students must take at least 9 credits of Writing Emphasis courses and 9 credits of Speaking Emphasis courses. Students who enter WCU with 40-70 transfer credits only need 6 credits of each; students who enter with >70 transfer credits only need 3 credits of each. **All students must take at least 3 credits of Writing Emphasis and 3 credits of Speaking Emphasis at the 300-400 level.**

## B. S. IN BIOLOGY: CELL AND MOLECULAR CONCENTRATION

Fall 2019 – Spring 2020

### I. ACADEMIC FOUNDATIONS & DEGREE REQUIREMENTS

<i>Requirement</i>	<i>Course</i>	<i>Credits</i>	<i>Term</i>	<i>Year</i>	<i>Grade</i>
First Year Experience	FYE 100	4	_____	_____	_____
Effective Writing I	WRT 120	3	_____	_____	_____
Effective Writing II	WRT 2__ <sup>▲</sup>	3	_____	_____	_____
Mathematics: Statistics	MAT 121 or 125	3	_____	_____	_____
Interdisciplinary (“I”)	_____	3	_____	_____	_____
Diverse Communities (“J”)	_____♥	3	_____	_____	_____
Ethics (“ET”)	_____♥	3	_____	_____	_____

**Writing Emphasis** *Nine credits\**, integrated across General Education & Major courses.

<u>BIO 220</u>	_____	_____	_____	_____
<i>One at 300/400-level:</i>	_____	_____	_____	_____

**Speaking Emphasis** *Nine credits\**, integrated across General Education & Major courses.

_____	_____	_____	_____	_____
<i>One at 300/400-level:</i>	_____	_____	_____	_____

### II. GENERAL EDUCATION DISTRIBUTIVE REQUIREMENTS

- Courses must be selected from the approved General Education list (see the [catalog](#)).
- Interdisciplinary (“I”) courses cannot also be a General Education distributive course.
- Biology majors fulfill their science requirements with CHE 103 and PHY 130/170.
- Distributive requirements can be simultaneously satisfied with other degree requirements, see some examples<sup>♦</sup>.

**A. Humanities** (6 credits): E.g., Literature (LIT/CLS), History (HIS), Philosophy (PHI)

*Courses must be selected from two different subject areas.*

_____	3	_____	_____	_____
_____	3	_____	_____	_____

**B. Behavioral and Social Sciences** (6 credits): E.g., Psychology (PSY), Sociology (SOC), Anthropology (ANT), Political Science (PSC), Geography (GEO), Economics (ECO)

*Courses must be selected from two different subject areas.*

*Note: Students taking the MCAT should take PSY 100 and SOC 200.*

_____	3	_____	_____	_____
_____	3	_____	_____	_____

**C. Arts** (3 credits): E.g., Art (ART), Art History (ARH), Dance (DAN), Film (FLM), Music (MHL, MTC), Theater (THA)

_____	3	_____	_____	_____
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**III. DIRECTED ELECTIVES** – 13-14 credits (as many as needed to reach 120 total credits)

_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

**IV. SUPPORTING COURSES** (31-32 credits)

Calculus *	MAT	3/4	_____	_____	_____
General Chemistry I	CHE 103	3	_____	_____	_____
General Chemistry I Lab	CRL 103	1	_____	_____	_____
General Chemistry II	CHE 104	3	_____	_____	_____
General Chemistry II Lab	CRL 104	1	_____	_____	_____
Organic Chemistry I	CHE 231	4	_____	_____	_____
Organic Chemistry I Lab	CRL 231	2	_____	_____	_____
Organic Chemistry II	CHE 232	3	_____	_____	_____
Biochemistry 1	CHE 476	3	_____	_____	_____
General Physics I **	PHY 130	4	_____	_____	_____
General Physics II	PHY 140	4	_____	_____	_____

**V. BIOLOGY COURSES** (42 credits) -- GPA must be 2.0 or higher to graduate.

*A. Required courses* (28 credits)

General Biology ***	BIO 110	3	_____	_____	_____
General Microbiology ***	BIO 214	4	_____	_____	_____
Botany or Zoology ***	BIO 215/217	3	_____	_____	_____
Cell Physiology ***	BIO 220	3	_____	_____	_____
Genetics ***	BIO 230	3	_____	_____	_____
Molec. Biol. Techniques	BIO 333	2	_____	_____	_____
Cellular and Molecular ***	BIO 421	4	_____	_____	_____
Molecular Genetics	BIO 431	3	_____	_____	_____
Seminar or Internship or Independent Study or CHE 491*** <sup>Δ</sup>	BIO 490/409/491	3	_____	_____	_____

*B. Biology or Chemistry electives* (14 credits)

Select 14 semester hours from courses in BIO or CHE at or above the 300 level (except BIO 307 and 469). Courses should be chosen in consultation with the student's advisor.

_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

## Notes and Requirements

Total degree program: 120 credits.

♠ The second (200-level) WRT course is chosen from WRT 200, 204, 205, 206, 208, or 220.

♥ The Diverse Communities (“J”) course and the Ethics (“ET”) courses can be satisfied through another requirement (e.g., Interdisciplinary or Distributive) as long as the course carries the appropriate attribute(s). *Note:* Credits are not duplicated such that if a course satisfies two requirements, those credits must be made up via directed electives (the minimum total credits for a B.S. degree is 120).

♣ All students must take at least 9 credits of Writing Emphasis courses and 9 credits of Speaking Emphasis courses. Students who enter WCU with 40-70 transfer credits only need 6 credits of each; students who enter with >70 transfer credits only need 3 credits of each. **All students must take at least 3 credits of Writing Emphasis and 3 credits of Speaking Emphasis at the 300-400 level.**

♦ Students should think about how requirements can be simultaneously satisfied. As examples: LNC 110 is a Humanities distributive that satisfies the Ethics requirement; PHI 180 is a Humanities distributive that satisfies the Diverse Communities & Ethics requirements; LIT 165 is a Humanities distributive that is also Writing Emphasis; PSC 101 is a Behavioral & Social Science distributive that satisfies the Diverse Communities requirement.

\* The Biology department recommends MAT 145 (Calculus for the Life Sciences; 3 credits) or MAT 161 (Calculus I; 4 credits). MAT 143 (Brief Calculus; 3 credits) is also acceptable. You must meet the necessary pre-requisites or obtain a minimum score on the Math Placement Exam to enroll in a calculus class. Visit the Math Department website to take the exam. If you receive a score of 3 or lower on the placement exam, you must take MAT 115 (Algebra, Functions, and Trigonometry) or MAT 131 (Precalculus) as preparation for Calculus (MAT 143 or MAT 145). If you receive a score of 4 or above, you can enroll directly into MAT 143 or MAT 145. You must score a 5 to enroll into MAT 161 or take the pre-requisite of MAT 131.

\*\* The recommended Physics sequence is PHY 130 & PHY 140. Students may substitute the PHY 170 & PHY 180 sequence, but PHY 130 may not be used as a prerequisite for PHY 180 and PHY 170 may not be used as a prerequisite for PHY 140.

\*\*\* Course must be passed with a "C-" or better.

△ Students using BIO 409 to fill this requirement must be aware that using three credits in a required Biology course (section V - A) will not also count as three credits towards a Biology elective (section V - B). Check with your academic advisor if you are unsure of credit usage. Students who take CHE 491 instead of BIO 490/491/ 409 must take 14 credits of upper level CHE or BIO courses. A maximum of 8 combined credits from BIO 409 & 491 may be applied to the total BIO elective credits.

## Suggested Sequence for B.S. Biology Majors Cell & Molecular Concentration

Fall 2019 – Spring 2020

	<b>Semester #1 (17 credits)</b>		<b>Semester #2 (16 credits)</b>
_____	FYE 100 (4)	_____	WRT 2__ (3)
_____	WRT 120 (3)	_____	BIO 215 or 217 (3)
_____	BIO 110 (3)	_____	CHE 104/CRL 104 (3)/(1)
_____	CHE 103/CRL 103 (3)/(1)	_____	MAT 145 (3) or MAT 143/161
_____	MAT 121 or MAT 125 (3)	_____	Gen Ed Distributive: Behavioral & Social Science (3)
	<b>Semester #3 (16 credits)</b>		<b>Semester #4 (12 credits)</b>
_____	CHE 231/CRL 231 (4)/(2)	_____	BIO 230 (3)
_____	BIO 214 (4)	_____	BIO 220 (3) (W)
_____	Gen Ed Distributive: Humanities & Ethics (ET) course (3)	_____	CHE 232 (3)
_____	Gen Ed Distributive: Arts (3)	_____	Gen Ed Distributive: Behavioral & Social Science (3)
	<b>Semester #5 (15 credits)</b>		<b>Semester #6 (16 credits)</b>
_____	BIO 333 (2)	_____	CHE 476 (3)
_____	PHY 130/170 (4)	_____	PHY 140/180 (4)
_____	Diversity (J) Course (3)	_____	Interdisciplinary (I) Course (3)
_____	Directed Elective (3)	_____	Directed Elective (3)
_____	Directed Elective (3)	_____	BIO/CHE Elective (3)
	<b>Semester #7 (15 credits)</b>		<b>Semester #8 (16 credits)</b>
_____	BIO 431 (3)	_____	BIO 421 (4)
_____	BIO/CHE Elective (3)	_____	BIO/CHE Elective (3)
_____	BIO/CHE Elective (3)	_____	BIO/CHE Elective (3)
_____	Directed Elective (3)	_____	Directed Elective (3) (if needed)
_____	Gen Ed Distributive: Humanities (3)	_____	BIO 490/409/491 (3)

All required 200 level Biology courses should be completed by the end of Semester #5.

Students should take Statistics (MAT 121 or 125) in the first year.

CRL 232 is strongly recommended for any student considering Professional or Graduate training following completion of their degree.

All students must take at least 9 credits of Writing Emphasis courses and 9 credits of Speaking Emphasis courses. Students who enter WCU with 40-70 transfer credits only need 6 credits of each; students who enter with >70 transfer credits only need 3 credits of each. **All students must take at least 3 credits of Writing Emphasis and 3 credits of Speaking Emphasis at the 300-400 level.**

## B. S. IN BIOLOGY: MICROBIOLOGY CONCENTRATION

Fall 2019 – Spring 2020

### I. ACADEMIC FOUNDATIONS & DEGREE REQUIREMENTS

<i>Requirement</i>	<i>Course</i>	<i>Credits</i>	<i>Term</i>	<i>Year</i>	<i>Grade</i>
First Year Experience	FYE 100	4	_____	_____	_____
Effective Writing I	WRT 120	3	_____	_____	_____
Effective Writing II	WRT 2 <sup>▲</sup>	3	_____	_____	_____
Mathematics: Statistics	MAT 121 or 125	3	_____	_____	_____
Interdisciplinary (“I”)	_____	3	_____	_____	_____
Diverse Communities (“J”)	_____ <sup>▼</sup>	3	_____	_____	_____
Ethics (“ET”)	_____ <sup>♥</sup>	3	_____	_____	_____

**Writing Emphasis** *Nine credits\**, integrated across General Education & Major courses.

BIO 220

*One at 300/400-level:*

**Speaking Emphasis** *Nine credits\**, integrated across General Education & Major courses.

*One at 300/400-level:*

### II. GENERAL EDUCATION DISTRIBUTIVE REQUIREMENTS

- Courses must be selected from the approved General Education list (see the [catalog](#)).
- Interdisciplinary (“I”) courses cannot also be a General Education distributive course.
- Biology majors fulfill their science requirements with CHE 103 and PHY 130/170.
- Distributive requirements can be simultaneously satisfied with other degree requirements, see some examples\*.

**A. Humanities** (6 credits): E.g., Literature (LIT/CLS), History (HIS), Philosophy (PHI)  
*Courses must be selected from two different subject areas.*

_____	3	_____	_____	_____
_____	3	_____	_____	_____

**B. Behavioral and Social Sciences** (6 credits): E.g., Psychology (PSY), Sociology (SOC), Anthropology (ANT), Political Science (PSC), Geography (GEO), Economics (ECO)  
*Courses must be selected from two different subject areas.*

*Note: Students taking the MCAT should take PSY 100 and SOC 200.*

_____	3	_____	_____	_____
_____	3	_____	_____	_____

**C. Arts** (3 credits): E.g., Art (ART), Art History (ARH), Dance (DAN), Film (FLM), Music (MHL, MTC), Theater (THA)

_____	3	_____	_____	_____
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**III. DIRECTED ELECTIVES – 18 credits (as many as needed to reach 120 total credits)**

_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

**IV. SUPPORTING COURSES (28 credits)**

Calculus *	MAT __	3/4	_____	_____	_____
General Chemistry I	CHE 103	3	_____	_____	_____
General Chemistry I Lab	CRL 103	1	_____	_____	_____
General Chemistry II	CHE 104	3	_____	_____	_____
General Chemistry II Lab	CRL 104	1	_____	_____	_____
Organic Chemistry I	CHE 231	4	_____	_____	_____
Organic Chemistry I Lab	CRL 231	2	_____	_____	_____
Organic Chemistry II	CHE 232	3	_____	_____	_____
General Physics I **	PHY 130	4	_____	_____	_____
General Physics II	PHY 140	4	_____	_____	_____

**V. BIOLOGY COURSES (41 credits) -- GPA must be 2.0 or higher to graduate.**

*A. Required courses (30 credits)*

General Biology ***	BIO 110	3	_____	_____	_____
General Microbiology ***	BIO 214	4	_____	_____	_____
Botany or Zoology ***	BIO 215/217	3	_____	_____	_____
Cell Physiology ***	BIO 220	3	_____	_____	_____
Genetics ***	BIO 230	3	_____	_____	_____
General Ecology ***	BIO 270	3	_____	_____	_____
Microbial Physiology***	BIO 464	4	_____	_____	_____
Immunology***	BIO 465	4	_____	_____	_____
Seminar or Internship or Independent Study***△	BIO 490/409/491	3	_____	_____	_____

*B. Biology electives (11 credits) to be chosen from the following:*

Pathogenic Microbiology	BIO 314	4	_____	_____	_____
Molec. Biol. Techniques	BIO 333	2	_____	_____	_____
Microbial Genetics	BIO 334	4	_____	_____	_____
Applied & Industrial Micro.	BIO 414	3	_____	_____	_____
Molecular Genetics	BIO 431	3	_____	_____	_____
Parasitology	BIO 452	3	_____	_____	_____
Mycology	BIO 454	3	_____	_____	_____
Virology	BIO 456	3	_____	_____	_____
Microbial Ecology	BIO 474	4	_____	_____	_____
Epidemiology	BIO 484	3	_____	_____	_____
Light Microscopy	BIO 480	3	_____	_____	_____

## Notes and Requirements

Total degree program: 120 credits.

♠ The second (200-level) WRT course is chosen from WRT 200, 204, 205, 206, 208, or 220.

♥ The Diverse Communities (“J”) course and the Ethics (“ET”) courses can be satisfied through another requirement (e.g., Interdisciplinary or Distributive) as long as the course carries the appropriate attribute(s). *Note:* Credits are not duplicated such that if a course satisfies two requirements, those credits must be made up via directed electives (the minimum total credits for a B.S. degree is 120).

♣ All students must take at least 9 credits of Writing Emphasis courses and 9 credits of Speaking Emphasis courses. Students who enter WCU with 40-70 transfer credits only need 6 credits of each; students who enter with >70 transfer credits only need 3 credits of each. **All students must take at least 3 credits of Writing Emphasis and 3 credits of Speaking Emphasis at the 300-400 level.**

♦ Students should think about how requirements can be simultaneously satisfied. As examples: LNC 110 is a Humanities distributive that satisfies the Ethics requirement; PHI 180 is a Humanities distributive that satisfies the Diverse Communities & Ethics requirements; LIT 165 is a Humanities distributive that is also Writing Emphasis; PSC 101 is a Behavioral & Social Science distributive that satisfies the Diverse Communities requirement.

\* The Biology department recommends MAT 145 (Calculus for the Life Sciences; 3 credits) or MAT 161 (Calculus I; 4 credits). MAT 143 (Brief Calculus; 3 credits) is also acceptable. You must meet the necessary pre-requisites or obtain a minimum score on the Math Placement Exam to enroll in a calculus class. Visit the Math Department website to take the exam. If you receive a score of 3 or lower on the placement exam, you must take MAT 115 (Algebra, Functions, and Trigonometry) or MAT 131 (Precalculus) as preparation for Calculus (MAT 143 or MAT 145). If you receive a score of 4 or above, you can enroll directly into MAT 143 or MAT 145. You must score a 5 to enroll into MAT 161 or take the pre-requisite of MAT 131.

\*\* The recommended Physics sequence is PHY 130 & PHY 140. Students may substitute the PHY 170 & PHY 180 sequence, but PHY 130 may not be used as a prerequisite for PHY 180 and PHY 170 may not be used as a prerequisite for PHY 140.

\*\*\* Course must be passed with a "C-" or better.

△ Students using BIO 409 to fill this requirement must be aware that using three credits in a required Biology course (section V - A) will not also count as three credits towards a Biology elective (section V - B). Check with your academic advisor if you are unsure of credit usage. A maximum of 8 combined credits from BIO 409 & 491 may be applied to the total BIO elective credits.

# Suggested Sequence for B.S. Biology Majors

## Microbiology Concentration

Fall 2019 – Spring 2020

_____	<b>Semester #1 (17 credits)</b>	_____	<b>Semester #2 (16 credits)</b>
_____	FYE 100 (4)	_____	WRT 2__ (3)
_____	WRT 120 (3)	_____	BIO 215 or 217 (3)
_____	BIO 110 (3)	_____	CHE 104/CRL 104 (3)/(1)
_____	CHE 103/CRL 103 (3)/(1)	_____	MAT 145 (3) or MAT 143/161
_____	MAT 121 or MAT 125 (3)	_____	Gen Ed Distributive: Behavioral & Social Science (3)
_____	<b>Semester #3 (16 credits)</b>	_____	<b>Semester #4 (15 credits)</b>
_____	BIO 214 (4)	_____	BIO 220 (3) (W)
_____	CHE 231/CRL 231 (4)/(2)	_____	BIO 230 (3)
_____	Math (if still needed) (3)	_____	CHE 232 (3)
_____	Gen Ed Distributive: Humanities & Ethics (ET) course (3)	_____	Gen Ed Distributive: Arts (3)
_____		_____	Gen Ed Distributive: Behavioral & Social Science (3)
_____	<b>Semester #5 (16 credits)</b>	_____	<b>Semester #6 (13 credits)</b>
_____	BIO 270 (3)	_____	BIO Elective (3)
_____	PHY 130/170 (4)	_____	PHY 140/180 (4)
_____	Diversity (J) Course (3)	_____	Interdisciplinary (I) Course (3)
_____	Directed Elective (3)	_____	Directed Elective (3)
_____	Directed Elective (3)	_____	
_____	<b>Semester #7 (16 credits)</b>	_____	<b>Semester #8 (16 credits)</b>
_____	BIO 465 (4)	_____	BIO 464 (4)
_____	BIO Elective (3)	_____	BIO Elective (3)
_____	BIO Elective (3)	_____	BIO Elective (3)
_____	Directed Elective (3)	_____	Directed Elective (3) (if needed)
_____	Gen Ed Distributive: Humanities (3)	_____	BIO 490/409/491 (3)

All required 200 level Biology courses should be completed by the end of Semester #5.

Students should take Statistics (MAT 121 or 125) in the first year.

All students must take at least 9 credits of Writing Emphasis courses and 9 credits of Speaking Emphasis courses. Students who enter WCU with 40-70 transfer credits only need 6 credits of each; students who enter with >70 transfer credits only need 3 credits of each. **All students must take at least 3 credits of Writing Emphasis and 3 credits of Speaking Emphasis at the 300-400 level.**

## B. S. IN BIOLOGY: ECOLOGY AND CONSERVATION CONCENTRATION

Fall 2019 – Spring 2020

### I. ACADEMIC FOUNDATIONS & DEGREE REQUIREMENTS

<i>Requirement</i>	<i>Course</i>	<i>Credits</i>	<i>Term</i>	<i>Year</i>	<i>Grade</i>
First Year Experience	FYE 100	4	_____	_____	_____
Effective Writing I	WRT 120	3	_____	_____	_____
Effective Writing II	WRT 2__ <sup>▲</sup>	3	_____	_____	_____
Mathematics: Statistics	MAT 121 or 125	3	_____	_____	_____
Interdisciplinary (“I”)	_____	3	_____	_____	_____
Diverse Communities (“J”)	_____♥	3	_____	_____	_____
Ethics (“ET”)	_____♥	3	_____	_____	_____

**Writing Emphasis** *Nine credits\**, integrated across General Education & Major courses.

BIO 220

*One at 300/400-level:*

**Speaking Emphasis** *Nine credits\**, integrated across General Education & Major courses.

*One at 300/400-level:*

### II. GENERAL EDUCATION DISTRIBUTIVE REQUIREMENTS

- Courses must be selected from the approved General Education list (see the [catalog](#)).
- Interdisciplinary (“I”) courses cannot also be a General Education distributive course.
- Biology majors fulfill their science requirements with CHE 103 and PHY 130/170.
- Distributive requirements can be simultaneously satisfied with other degree requirements, see some examples<sup>♦</sup>.

**A. Humanities** (6 credits): E.g., Literature (LIT/CLS), History (HIS), Philosophy (PHI)

*Courses must be selected from two different subject areas.*

_____	3	_____	_____	_____
_____	3	_____	_____	_____

**B. Behavioral and Social Sciences** (6 credits): E.g., Psychology (PSY), Sociology (SOC), Anthropology (ANT), Political Science (PSC), Geography (GEO), Economics (ECO)

*Courses must be selected from two different subject areas.*

*Note: Students taking the MCAT should take PSY 100 and SOC 200.*

_____	3	_____	_____	_____
_____	3	_____	_____	_____

**C. Arts** (3 credits): E.g., Art (ART), Art History (ARH), Dance (DAN), Film (FLM), Music (MHL, MTC), Theater (THA)

_____	3	_____	_____	_____
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**III. DIRECTED ELECTIVES – 14-15 credits (as many as needed to reach 120 total credits)**

_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

**IV. SUPPORTING COURSES (28-29 credits)**

Calculus *	MAT	3/4	_____	_____	_____
General Chemistry I	CHE 103	3	_____	_____	_____
General Chemistry I Lab	CRL 103	1	_____	_____	_____
General Chemistry II	CHE 104	3	_____	_____	_____
General Chemistry II Lab	CRL 104	1	_____	_____	_____
Organic Chemistry I	CHE 231	4	_____	_____	_____
Organic Chemistry I Lab	CRL 231	2	_____	_____	_____
Organic Chemistry II	CHE 232	3	_____	_____	_____
General Physics I **	PHY 130	4	_____	_____	_____
General Physics II	PHY 140	4	_____	_____	_____

**V. BIOLOGY COURSES (39 credits) -- GPA must be 2.0 or higher to graduate.**

*A. Required courses (24 credits)*

General Biology ***	BIO 110	3	_____	_____	_____
General Botany ***	BIO 215	3	_____	_____	_____
General Zoology ***	BIO 217	3	_____	_____	_____
Cell Physiology ***	BIO 220	3	_____	_____	_____
Genetics ***	BIO 230	3	_____	_____	_____
General Ecology ***	BIO 270	3	_____	_____	_____
Biostatistical Applications	BIO 310	3	_____	_____	_____
Seminar or Internship or Independent Study*** <sup>△</sup>	BIO 490/409/491	3	_____	_____	_____

*B. Biology Electives (15 credits)*

_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

*Biology Electives to be selected from:*

BIO214	General Microbiology	BIO453	Marine Mammals
BIO275	Field Botany	BIO454	Mycology
BIO277	Vertebrate Ecology	BIO466	Plant Physiology
BIO312	Marine Botany	BIO470	Population Biology
BIO313	Marine Biology	BIO471	Wetlands
BIO315	Terrestrial Ecosystem Ecology	BIO473	Conservation Biology
BIO377	Entomology	BIO474	Microbial Ecology
BIO387	Invertebrate Zoology	BIO475	Plant Communities
BIO409	Internship in Biological Sciences	BIO476	Freshwater Ecology
BIO412	Organic Evolution	BIO478	Plant Evolution
BIO415	Tropical Ecology and Conservation	BIO485	Systematic Botany
BIO435	Global Climate Change	BIO491	Special Problems in Biology

## VI. OTHER ECOLOGY-RELATED ELECTIVES (6-7 credits)

To be chosen under advisement from Biology Department approved list below. Student-originated requests to use a course not on the list to fulfill this requirement must be signed by their Advisor, then by the Department Chair.

\_\_\_\_\_

Department of Biology		Department of Earth & Space Science	
Any Biology Ecology Electives (above)		ESS 330	Introduction to Oceanography
BIO 457	Functional Animal Morphology	ESS 332	Advanced Oceanography
BIO 464	Microbial Physiology	ESS 336	Environmental Geology
BIO 468	Comparative Vertebrate Physiology	ESS 343	Geomorphology
		ESS 435	Remote Sensing
<b>Department of Chemistry</b>		ESS 439	Hydrogeology
CHE 321	Analytical Chemistry I	ESS 490	Fundamental of Soil
CHE 403	Chemistry of the Environment		
CHE 424	Advanced Analytical Chemistry	<b>Department of Geography &amp; Planning</b>	
CRL 321	Experimental Analytical Chemistry I	GEO 214	Introduction to Planning
CRL 424	Advanced Analytical Chemistry Lab	GEO 225	Introduction to Maps & Remote Sensing
		GEO 230	Environmental Conservation & Sustainability
<b>Department of Health</b>		GEO 320	Land Use Planning
ENV 451	Environmental Toxicology	GEO 324	Introduction to GIS
ENV 462	Water Quality and Health	GEO 332	Environmental Crises
		GEO 336	Environmental Planning
<b>Department of Psychology</b>		GEO 338	Environmental Applications of GIS
PSY 335	Animal Behavior	GEO 341	Landscape Analysis
PSY 336	Animal Behavior Lab	GEO 401	Internet Mapping
PSY 490	Course Topics: Primate Behavior & Culture	GEO 402	Field Methods in Environmental Geography
ANT/PSY 230	Introduction to Primatology	GEO 424	GIS Applications

### Notes and Requirements

Total degree program: 120 credits.

♣ The second (200-level) WRT course is chosen from WRT 200, 204, 205, 206, 208, or 220.

♥ The Diverse Communities (“J”) course and the Ethics (“ET”) courses can be satisfied through another requirement (e.g., Interdisciplinary or Distributive) as long as the course carries the appropriate attribute(s). *Note:* Credits are not duplicated such that if a course satisfies two requirements, those credits must be made up via directed electives (the minimum total credits for a B.S. degree is 120).

♣ All students must take at least 9 credits of Writing Emphasis courses and 9 credits of Speaking Emphasis courses. Students who enter WCU with 40-70 transfer credits only need 6 credits of each; students who enter with >70 transfer credits only need 3 credits of each. **All students must take at least 3 credits of Writing Emphasis and 3 credits of Speaking Emphasis at the 300-400 level.**

♦ Students should think about how requirements can be simultaneously satisfied. As examples: LNC 110 is a Humanities distributive that satisfies the Ethics requirement; PHI 180 is a Humanities distributive that satisfies the Diverse Communities & Ethics requirements; LIT 165 is a Humanities distributive that is also Writing Emphasis; PSC 101 is a Behavioral & Social Science distributive that satisfies the Diverse Communities requirement.

\* The Biology department recommends MAT 145 (Calculus for the Life Sciences; 3 credits) or MAT 161 (Calculus I; 4 credits). MAT 143 (Brief Calculus; 3 credits) is also acceptable. You must meet the necessary pre-requisites or obtain a minimum score on the Math Placement Exam to enroll in a calculus class. Visit the Math Department website to take the exam. If you receive a score of 3 or lower on the placement exam, you must take MAT 115 (Algebra, Functions,

and Trigonometry) or MAT 131 (Precalculus) as preparation for Calculus (MAT 143 or MAT 145). If you receive a score of 4 or above, you can enroll directly into MAT 143 or MAT 145. You must score a 5 to enroll into MAT 161 or take the pre-requisite of MAT 131.

\*\* The recommended Physics sequence is PHY 130 & PHY 140. Students may substitute the PHY 170 & PHY 180 sequence, but PHY 130 may not be used as a prerequisite for PHY 180 and PHY 170 may not be used as a prerequisite for PHY 140.

\*\*\* Course must be passed with a "C-" or better.

△ Students using BIO 409 to fill this requirement must be aware that using three credits in a required Biology course (section V - A) will not also count as three credits towards a Biology elective (section V - B). Check with your academic advisor if you are unsure of credit usage. A maximum of 8 combined credits from BIO 409 & 491 may be applied to the total BIO elective credits.

## Suggested Sequence for B.S. Biology Majors Ecology and Conservation Concentration

Fall 2019 – Spring 2020

	<b>Semester #1 (17 credits)</b>		<b>Semester #2 (16 credits)</b>
_____	FYE 100 (4)	_____	WRT 2____ (3)
_____	WRT 120 (3)	_____	BIO 215 or 217 (3)
_____	BIO 110 (3)	_____	CHE 104/CRL 104 (3)/(1)
_____	CHE 103/CRL 103 (3)/(1)	_____	MAT 145 (3) or MAT 143/161
_____	MAT 121 or MAT 125 (3)	_____	Gen Ed Distributive: Behavioral & Social Science (3)
	<b>Semester #3 (15 credits)</b>		<b>Semester #4 (15 credits)</b>
_____	BIO 215 or 217 (3)	_____	BIO 220 (3) (W)
_____	CHE 231/CRL 231 (4)/(2)	_____	BIO 270 (3)
_____	Math (if still needed) (3)	_____	CHE 232 (3)
_____	Gen Ed Distributive: Humanities & Ethics (ET) course (3)	_____	Gen Ed Distributive: Arts (3)
_____		_____	Gen Ed Distributive: Behavioral & Social Science (3)
	<b>Semester #5 (16 credits)</b>		<b>Semester #6 (16 credits)</b>
_____	BIO 230 (3)	_____	BIO 310 (3)
_____	PHY 130/170 (4)	_____	BIO ECOLOGY Elective (3)
_____	Diversity (J) Course (3)	_____	PHY 140/180 (4)
_____	BIO ECOLOGY Elective (3)	_____	Interdisciplinary (I) Course (3)
_____	Directed Elective (3)	_____	Directed Elective (3)
	<b>Semester #7 (15 credits)</b>		<b>Semester #8 (15 credits)</b>
_____	BIO ECOLOGY Elective (3)	_____	BIO ECOLOGY Elective (3)
_____	BIO ECOLOGY Elective (3)	_____	BIO ECOLOGY Elective (3)
_____	Ecology-related Elective (3)	_____	Ecology-related Elective (3)
_____	Directed Elective (3)	_____	Directed Elective (3) (if needed)
_____	Gen Ed Distributive: Humanities (3)	_____	BIO 490/409/491 (3)

All required 200 level Biology courses should be completed by the end of Semester #5. Students should take Statistics (MAT 121 or 125) in the first year.

All students must take at least 9 credits of Writing Emphasis courses and 9 credits of Speaking Emphasis courses. Students who enter WCU with 40-70 transfer credits only need 6 credits of each; students who enter with >70 transfer credits only need 3 credits of each. **All students must take at least 3 credits of Writing Emphasis and 3 credits of Speaking Emphasis at the 300-400 level.**

# ACCELERATED PROGRAM - B. S. IN BIOLOGY: ECOLOGY AND CONSERVATION CONCENTRATION + M. S. IN BIOLOGY

Fall 2019 – Spring 2020

## I. ACADEMIC FOUNDATIONS & DEGREE REQUIREMENTS

<i>Requirement</i>	<i>Course</i>	<i>Credits</i>	<i>Term</i>	<i>Year</i>	<i>Grade</i>
First Year Experience	FYE 100	4	_____	_____	_____
Effective Writing I	WRT 120	3	_____	_____	_____
Effective Writing II	WRT 2__ <sup>▲</sup>	3	_____	_____	_____
Mathematics: Statistics	MAT 121 or 125	3	_____	_____	_____
Interdisciplinary (“I”)	_____	3	_____	_____	_____
Diverse Communities (“J”)	_____♥	3	_____	_____	_____
Ethics (“ET”)	_____♥	3	_____	_____	_____

**Writing Emphasis** *Nine credits\**, integrated across General Education & Major courses.

BIO 220

*One at 300/400-level:*

\_\_\_\_\_

**Speaking Emphasis** *Nine credits\**, integrated across General Education & Major courses.

*One at 300/400-level:*

\_\_\_\_\_

## II. GENERAL EDUCATION DISTRIBUTIVE REQUIREMENTS

- Courses must be selected from the approved General Education list (see the [catalog](#)).
- Interdisciplinary (“I”) courses cannot also be a General Education distributive course.
- Biology majors fulfill their science requirements with CHE 103 and PHY 130/170.
- Distributive requirements can be simultaneously satisfied with other degree requirements, see some examples♦.

**A. Humanities** (6 credits): E.g., Literature (LIT/CLS), History (HIS), Philosophy (PHI)

*Courses must be selected from two different subject areas.*

	3	
	3	

**B. Behavioral and Social Sciences** (6 credits): E.g., Psychology (PSY), Sociology (SOC), Anthropology (ANT), Political Science (PSC), Geography (GEO), Economics (ECO)

*Courses must be selected from two different subject areas.*

*Note: Students taking the MCAT should take PSY 100 and SOC 200.*

	3	
	3	

**C. Arts** (3 credits): E.g., Art (ART), Art History (ARH), Dance (DAN), Film (FLM), Music (MHL, MTC), Theater (THA)

	3	
--	---	--

**III. DIRECTED ELECTIVES – 17 credits (to reach 120 total credits for the B.S. degree)**

_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

**IV. SUPPORTING COURSES (28 credits)**

Calculus *	MAT 145	3	_____	_____	_____
General Chemistry I	CHE 103	3	_____	_____	_____
General Chemistry I Lab	CRL 103	1	_____	_____	_____
General Chemistry II	CHE 104	3	_____	_____	_____
General Chemistry II Lab	CRL 104	1	_____	_____	_____
Organic Chemistry I	CHE 231	4	_____	_____	_____
Organic Chemistry I Lab	CRL 231	2	_____	_____	_____
Organic Chemistry II	CHE 232	3	_____	_____	_____
General Physics I **	PHY 130	4	_____	_____	_____
General Physics II	PHY 140	4	_____	_____	_____

**V. BIOLOGY COURSES (42 credits; 30 credits taken at the undergraduate level, 12 credits taken at graduate level are applied to the B.S.) Must have 3.00 GPA for graduate admission.**

**A. Required courses (21 credits)**

General Biology ***	BIO 110	3	_____	_____	_____
General Botany ***	BIO 215	3	_____	_____	_____
General Zoology ***	BIO 217	3	_____	_____	_____
Cell Physiology ***	BIO 220	3	_____	_____	_____
Genetics ***	BIO 230	3	_____	_____	_____
General Ecology ***	BIO 270	3	_____	_____	_____
Biostatistical Applications	BIO 310	3	_____	_____	_____

**B. Biology Ecology Electives (3 credits; must be selected from list below)**

BIO214	General Microbiology	BIO453	Marine Mammals
BIO275	Field Botany	BIO454	Mycology
BIO277	Vertebrate Ecology	BIO466	Plant Physiology
BIO312	Marine Botany	BIO470	Population Biology
BIO313	Marine Biology	BIO471	Wetlands
BIO315	Terrestrial Ecosystem Ecology	BIO473	Conservation Biology
BIO377	Entomology	BIO474	Microbial Ecology
BIO387	Invertebrate Zoology	BIO475	Plant Communities
BIO409	Internship in Biological Sciences	BIO476	Freshwater Ecology
BIO412	Organic Evolution	BIO478	Plant Evolution
BIO415	Tropical Ecology and Conservation	BIO485	Systematic Botany
BIO435	Global Climate Change	BIO491	Special Problems in Biology

C. Ecology-related Electives (6 credits; must be selected under advisement from list below)

Subscript		Department of Earth & Space Science	
<b>Department of Biology</b>		<b>Department of Earth &amp; Space Science</b>	
Any Biology Ecology Electives (above)		ESS 330	Introduction to Oceanography
BIO 457	Functional Animal Morphology	ESS 332	Advanced Oceanography
BIO 464	Microbial Physiology	ESS 336	Environmental Geology
BIO 468	Comparative Vertebrate Physiology	ESS 343	Geomorphology
		ESS 435	Remote Sensing
<b>Department of Chemistry</b>		ESS 439	Hydrogeology
CHE 321	Analytical Chemistry I	ESS 490	Fundamental of Soil
CHE 403	Chemistry of the Environment		
CHE 424	Advanced Analytical Chemistry	<b>Department of Geography &amp; Planning</b>	
CRL 321	Experimental Analytical Chemistry I	GEO 214	Introduction to Planning
CRL 424	Advanced Analytical Chemistry Lab	GEO 225	Introduction to Maps & Remote Sensing
		GEO 230	Environmental Conservation & Sustainability
<b>Department of Health</b>		GEO 320	Land Use Planning
ENV 451	Environmental Toxicology	GEO 324	Introduction to GIS
ENV 462	Water Quality and Health	GEO 332	Environmental Crises
		GEO 336	Environmental Planning
<b>Department of Psychology</b>		GEO 338	Environmental Applications of GIS
PSY 335	Animal Behavior	GEO 341	Landscape Analysis
PSY 336	Animal Behavior Lab	GEO 401	Internet Mapping
PSY 490	Course Topics: Primate Behavior & Culture	GEO 402	Field Methods in Environmental Geography
ANT/PSY 230	Introduction to Primatology	GEO 424	GIS Applications

VI. GRADUATE COURSES <sup>Δ</sup>

A. Core courses (12 credits)

Graduate Seminar in Biology	BIO 510	3	_____	_____	_____
Experimental Design and Analysis	BIO 511	3	_____	_____	_____
Topics & Methods in Cellular, Microbial, and Molecular Biology	BIO 520	3	_____	_____	_____
Topics & Methods in Ecology, Evolution, and Organismal Biology	BIO 521	3	_____	_____	_____

B. Electives <sup>§</sup> (9 credits)

_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

C. Research and Capstone <sup>Σ</sup> (9 credits)

Thesis Proposal	BIO 608	3	_____	_____	_____
Thesis Research	BIO 609	3	_____	_____	_____
Thesis and Defense	BIO 610	3	_____	_____	_____

**Notes and Requirements**

The Accelerated B.S. + M.S. program is only open to thesis students. Students should begin discussing research topics with prospective faculty advisors during the 2<sup>nd</sup> year in preparation for application to the accelerated program during their 3<sup>rd</sup> year.

Credit requirements: B.S.: 120 credits; M.S.: 30 credits. Twelve credits taken at the graduate level are also applied to the B.S. degree. Therefore the total for both degrees is 138 credits.

♠ The second (200-level) WRT course is chosen from WRT 200, 204, 205, 206, 208, or 220.

♥ The Diverse Communities (“J”) course and the Ethics (“ET”) courses can be satisfied through another requirement (e.g., Interdisciplinary or Distributive) as long as the course carries the appropriate attribute(s). *Note:* Credits are not duplicated such that if a course satisfies two requirements, those credits must be made up via directed electives (the minimum total credits for a B.S. degree is 120).

♣ All students must take at least 9 credits of Writing Emphasis courses and 9 credits of Speaking Emphasis courses. Students who enter WCU with 40-70 transfer credits only need 6 credits of each; students who enter with >70 transfer credits only need 3 credits of each. **All students must take at least 3 credits of Writing Emphasis and 3 credits of Speaking Emphasis at the 300-400 level.**

♦ Students should think about how requirements can be simultaneously satisfied. As examples: LNC 110 is a Humanities distributive that satisfies the Ethics requirement; PHI 180 is a Humanities distributive that satisfies the Diverse Communities & Ethics requirements; LIT 165 is a Humanities distributive that is also Writing Emphasis; PSC 101 is a Behavioral & Social Science distributive that satisfies the Diverse Communities requirement.

\* The Biology department recommends MAT 145 (Calculus for the Life Sciences; 3 credits) or MAT 161 (Calculus I; 4 credits). MAT 143 (Brief Calculus; 3 credits) is also acceptable. You must meet the necessary pre-requisites or obtain a minimum score on the Math Placement Exam to enroll in a calculus class. Visit the Math Department website to take the exam. If you receive a score of 3 or lower on the placement exam, you must take MAT 115 (Algebra, Functions, and Trigonometry) or MAT 131 (Precalculus) as preparation for Calculus (MAT 143 or MAT 145). If you receive a score of 4 or above, you can enroll directly into MAT 143 or MAT 145. You must score a 5 to enroll into MAT 161 or take the pre-requisite of MAT 131.

\*\* The recommended Physics sequence is PHY 130 & PHY 140. Students may substitute the PHY 170 & PHY 180 sequence, but PHY 130 may not be used as a prerequisite for PHY 180 and PHY 170 may not be used as a prerequisite for PHY 140.

\*\*\* Course must be passed with a "C-" or better.

Δ - To be considered for the accelerated program and enroll in BIO 608 (Thesis Proposal), students must have attained (completed) 75 credits with a minimum of 18 biology credits. Students must have a minimum cumulative GPA of 3.00 including a minimum GPA of 3.00 for biology courses. BIO 608 requires departmental permission to enroll; students must arrange a committee meeting prior to enrolling in BIO 608 (e.g., during their third year). The accelerated program in biology is only open to thesis students. Any student wishing to switch out of the thesis option will be required to complete all requirements of the B.S. degree. Once admitted to the graduate program, graduate policies apply, including minimum GPA (3.00). *See the Graduate Catalog for further details.*

ξ – Any other 500-level BIO course except BIO 591. If a course is offered at both the 400 and 500 levels, the student must take the 500-level course. No more than 6 credits of 400-level courses may be counted toward the M.S. degree. With prior departmental approval, up to 6 credits of graduate course work from another department or university may be applied toward the M.S. degree. BIO 535, 536, and 537 may be repeated for credit provided the topic is different.

Σ - A letter grade must be obtained for BIO 608 before the student can enroll in BIO 609. Likewise, a letter grade must be obtained for BIO 609 before the student can enroll in BIO 610.

## Suggested Sequence for Accelerated B.S. + M.S. Biology Majors Ecology & Conservation Concentration

Fall 2019 – Spring 2020

_____ _____ _____ _____ _____	<b>Semester #1 (17 credits)</b>	_____ _____ _____ _____ _____	<b>Semester #2 (16 credits)</b>
	FYE 100 (4) WRT 120 (3) BIO 110 (3) CHE 103/CRL 103 (3)/(1) MAT 121 or MAT 125 (3)		WRT 2__ (3) BIO 215 or 217 (3) CHE 104/CRL 104 (3)/(1) MAT 145 (3) or MAT 143/161 Gen Ed Distributive: Behavioral & Social Science (3)
_____ _____ _____ _____ _____	<b>Semester #3 (15 credits)</b>	_____ _____ _____ _____ _____	<b>Semester #4 (15 credits)</b>
	BIO 215 or 217 (3) CHE 231 (4) CRL 231 (2) Gen Ed distributive: Humanities & Ethics (ET) course (3) Diversity (J) elective (3)		BIO 220 (3) (W) BIO 270 (3) CHE 232 (3) Gen Ed distributive: Arts (3) Gen Ed distributive: Behavioral & Social Science (3)
_____ _____ _____ _____ _____	<b>Semester #5 (16 credits)</b>	_____ _____ _____ _____ _____	<b>Semester #6 (16 credits)</b>
	BIO 230 (3) BIO Ecology elective (3) PHY 130/170 (4) Gen Ed distributive: Humanities (3) Directed elective (3)		BIO 310 (3) Ecology-related elective (3) PHY 140/180 (4) Interdisciplinary (I) elective (3) Directed elective (3)
_____ _____ _____ _____ _____	<b>Semester #7 <sup>^</sup> (14 credits)</b>	_____ _____ _____ _____ _____	<b>Semester #8 (15 credits)</b>
	BIO 510 (3) BIO 520 (3) Directed elective (3) Directed elective (2) BIO 608 <sup>^</sup> (3)		Ecology-related elective (3) BIO 511 (3) BIO 521 (3) Directed elective (3) Directed elective (3)
_____ _____ _____	<b>Semester #9 (9 credits)</b>	_____ _____	<b>Semester #10 (6 credits)</b>
	BIO elective (3) (Graduate) BIO elective (3) (Graduate) BIO 609 (3)		BIO elective (3) (Graduate) BIO 610 (3)

All required 200 level Biology courses should be completed by the end of Semester #5.

Students should take Statistics (MAT 121 or 125) in the first year.

All students must take at least 9 credits of Writing Emphasis courses and 9 credits of Speaking Emphasis courses. Students who enter WCU with 40-70 transfer credits only need 6 credits of each; students who enter with >70 transfer credits only need 3 credits of each. **All students must take at least 3 credits of Writing Emphasis and 3 credits of Speaking Emphasis at the 300-400 level.**



## B. S. IN BIOLOGY: MARINE SCIENCE CONCENTRATION

Fall 2019 – Spring 2020

### I. ACADEMIC FOUNDATIONS & DEGREE REQUIREMENTS

<i>Requirement</i>	<i>Course</i>	<i>Credits</i>	<i>Term</i>	<i>Year</i>	<i>Grade</i>
First Year Experience	FYE 100	4	_____	_____	_____
Effective Writing I	WRT 120	3	_____	_____	_____
Effective Writing II	WRT 2__ <sup>▲</sup>	3	_____	_____	_____
Mathematics: Statistics	MAT 121 or 125	3	_____	_____	_____
Interdisciplinary (“I”)	_____	3	_____	_____	_____
Diverse Communities (“J”)	_____♥	3	_____	_____	_____
Ethics (“ET”)	_____♥	3	_____	_____	_____

**Writing Emphasis** *Nine credits\**, integrated across General Education & Major courses.

<u>BIO 220</u>	_____	_____	_____	_____
<i>One at 300/400-level:</i>	_____	_____	_____	_____

**Speaking Emphasis** *Nine credits\**, integrated across General Education & Major courses.

_____	_____	_____	_____	_____
<i>One at 300/400-level:</i>	_____	_____	_____	_____

### II. GENERAL EDUCATION DISTRIBUTIVE REQUIREMENTS

- Courses must be selected from the approved General Education list (see the [catalog](#)).
- Interdisciplinary (“I”) courses cannot also be a General Education distributive course.
- Biology majors fulfill their science requirements with CHE 103 and PHY 130/170.
- Distributive requirements can be simultaneously satisfied with other degree requirements, see some examples<sup>♦</sup>.

**A. Humanities** (6 credits): E.g., Literature (LIT/CLS), History (HIS), Philosophy (PHI)

*Courses must be selected from two different subject areas.*

_____	3	_____	_____	_____
_____	3	_____	_____	_____

**B. Behavioral and Social Sciences** (6 credits): E.g., Psychology (PSY), Sociology (SOC), Anthropology (ANT), Political Science (PSC), Geography (GEO), Economics (ECO)

*Courses must be selected from two different subject areas.*

*Note: Students taking the MCAT should take PSY 100 and SOC 200.*

_____	3	_____	_____	_____
_____	3	_____	_____	_____

**C. Arts** (3 credits): E.g., Art (ART), Art History (ARH), Dance (DAN), Film (FLM), Music (MHL, MTC), Theater (THA)

_____	3	_____	_____	_____
-------	---	-------	-------	-------

**III. DIRECTED ELECTIVES – 16-17 credits (as many as needed to reach 120 total credits)**

_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

**IV. SUPPORTING COURSES (31-32 credits)**

Calculus *	MAT	3/4	_____	_____	_____
General Chemistry I	CHE 103	3	_____	_____	_____
General Chemistry I Lab	CRL 103	1	_____	_____	_____
General Chemistry II	CHE 104	3	_____	_____	_____
General Chemistry II Lab	CRL 104	1	_____	_____	_____
Organic Chemistry I	CHE 231	4	_____	_____	_____
Organic Chemistry I Lab	CRL 231	2	_____	_____	_____
Organic Chemistry II	CHE 232	3	_____	_____	_____
General Physics I **	PHY 130	4	_____	_____	_____
General Physics II	PHY 140	4	_____	_____	_____
Intro to Oceanography*** ΦΩ	ESS 330	3	_____	_____	_____

**V. BIOLOGY COURSES (39 credits) -- GPA must be 2.0 or higher to graduate.**

**A. Required courses (30 credits)**

General Biology ***	BIO 110	3	_____	_____	_____
General Botany ***	BIO 215	3	_____	_____	_____
General Zoology ***	BIO 217	3	_____	_____	_____
Cell Physiology ***	BIO 220	3	_____	_____	_____
Genetics ***	BIO 230	3	_____	_____	_____
General Ecology ***	BIO 270	3	_____	_____	_____
Biostatistical Applications	BIO 310	3	_____	_____	_____
Marine Biology*** Φ	BIO 313	3	_____	_____	_____
Marine Botany*** Φ	BIO 312	3	_____	_____	_____
Seminar or Internship or	BIO 490/409/491		_____	_____	_____
Independent Study***Δ		3	_____	_____	_____

**B. Marine Science Electives (9 credits) – 6 credits are to be chosen at the 300 or 400 level from the Biology Department approved list.**

_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

West Chester Courses:

- BIO 387 Invertebrate Zoology
- ESS 332 Advanced Oceanography
- BIO 453 Marine Mammals
- GEO 324 Introduction to GIS

Cheyney Courses:

- Marine Invertebrates SLF330
- Ichthyology SLF332

### Wallops Island/Marine Field Station Courses: (all 3 credit courses):

Courses are to be chosen from two or more topics including but not limited to marine or wetlands ecology, ichthyology, invertebrate zoology, marine mammals, ornithology, marine molecular biology and biotechnology.

Courses to be completed at the Wallops Island Marine Science Consortium and other marine field stations (summer and winter semesters) will be approved on an individual basis and will require advisor and departmental approval.

### Notes and Requirements

Total degree program: 120 credits.

♠ The second (200-level) WRT course is chosen from WRT 200, 204, 205, 206, 208, or 220.

♥ The Diverse Communities (“J”) course and the Ethics (“ET”) courses can be satisfied through another requirement (e.g., Interdisciplinary or Distributive) as long as the course carries the appropriate attribute(s). *Note:* Credits are not duplicated such that if a course satisfies two requirements, those credits must be made up via directed electives (the minimum total credits for a B.S. degree is 120).

♣ All students must take at least 9 credits of Writing Emphasis courses and 9 credits of Speaking Emphasis courses. Students who enter WCU with 40-70 transfer credits only need 6 credits of each; students who enter with >70 transfer credits only need 3 credits of each. **All students must take at least 3 credits of Writing Emphasis and 3 credits of Speaking Emphasis at the 300-400 level.**

♦ Students should think about how requirements can be simultaneously satisfied. As examples: LNC 110 is a Humanities distributive that satisfies the Ethics requirement; PHI 180 is a Humanities distributive that satisfies the Diverse Communities & Ethics requirements; LIT 165 is a Humanities distributive that is also Writing Emphasis; PSC 101 is a Behavioral & Social Science distributive that satisfies the Diverse Communities requirement.

\* The Biology department recommends MAT 145 (Calculus for the Life Sciences; 3 credits) or MAT 161 (Calculus I; 4 credits). MAT 143 (Brief Calculus; 3 credits) is also acceptable. You must meet the necessary pre-requisites or obtain a minimum score on the Math Placement Exam to enroll in a calculus class. Visit the Math Department website to take the exam. If you receive a score of 3 or lower on the placement exam, you must take MAT 115 (Algebra, Functions, and Trigonometry) or MAT 131 (Precalculus) as preparation for Calculus (MAT 143 or MAT 145). If you receive a score of 4 or above, you can enroll directly into MAT 143 or MAT 145. You must score a 5 to enroll into MAT 161 or take the pre-requisite of MAT 131.

\*\* The recommended Physics sequence is PHY 130 & PHY 140. Students may substitute the PHY 170 & PHY 180 sequence, but PHY 130 may not be used as a prerequisite for PHY 180 and PHY 170 may not be used as a prerequisite for PHY 140.

\*\*\* Course must be passed with a "C-" or better.

△ Students using BIO 409 to fill this requirement must be aware that using three credits in a required Biology course (section V - A) will not also count as three credits towards a Biology elective (section V - B). Check with your academic advisor if you are unsure of credit usage. A maximum of 8 combined credits from BIO 409 & 491 may be applied to the total BIO elective credits.

Φ Core Courses of the Marine Science Program Concentration.

Ω Marine Science majors are exempt from the pre-requisite of ESS 101 for ESS 330 (Introduction to Oceanography).

# Suggested Sequence for B.S. Biology Majors

## Marine Science Concentration

Fall 2019 – Spring 2020

	<b>Semester #1 (17 credits)</b>		<b>Semester #2 (16 credits)</b>
_____	FYE 100 (4)	_____	WRT 2__ (3)
_____	WRT 120 (3)	_____	BIO 215 or 217 (3)
_____	BIO 110 (3)	_____	CHE 104/CRL 104 (3)/(1)
_____	CHE 103/CRL 103 (3)/(1)	_____	MAT 145 (3) or MAT 143/161
_____	MAT 121 or MAT 125 (3)	_____	Gen Ed Distributive: Behavioral & Social Science (3)
	<b>Semester #3 (15 credits)</b>		<b>Semester #4 (15 credits)</b>
_____	BIO 215 or 217 (3)	_____	BIO 220 (3) (W)
_____	CHE 231/CRL 231 (4)/(2)	_____	BIO 270 (3)
_____	Gen Ed Distributive: Arts (3)	_____	CHE 232 (3)
_____	Gen Ed Distributive: Humanities & Ethics (ET) course (3)	_____	BIO 313 (3)
		_____	Gen Ed Distributive: Behavioral & Social Science (3)
	<b>Semester #5 (16 credits)</b>		<b>Semester #6 (16 credits)</b>
_____	BIO 230 (3)	_____	BIO 310 (3)
_____	PHY 130/170 (4)	_____	BIO 312 (3)
_____	Diversity (J) Course (3)	_____	PHY 140/180 (4)
_____	ESS 330 (3)	_____	Interdisciplinary (I) Course (3)
_____	Directed Elective (3)	_____	Directed Elective (3)
	<b>Semester #7 (13 credits)</b>		<b>Semester #8 (13 credits)</b>
_____	Marine Science Elective (3)	_____	Marine Science Elective (3)
_____	Marine Science Elective (3)	_____	Directed Elective (3)
_____	Directed Elective (4)	_____	BIO 490/409/491 (3)
_____	Gen Ed Distributive: Humanities (3)	_____	Directed Elective (4)

All required 200 level Biology courses should be completed by the end of Semester #5.

Students should take Statistics (MAT 121 or 125) in the first year.

Marine Science relevant electives (noted in semesters 7&8) may need to be taken during the summer or winter terms, when taken off campus, i.e. at a Marine Science Field Station.

All students must take at least 9 credits of Writing Emphasis courses and 9 credits of Speaking Emphasis courses. Students who enter WCU with 40-70 transfer credits only need 6 credits of each; students who enter with >70 transfer credits only need 3 credits of each. **All students must take at least 3 credits of Writing Emphasis and 3 credits of Speaking Emphasis at the 300-400 level.**

## B. S. IN BIOLOGY: MEDICAL LABORATORY SCIENCE CONCENTRATION

Fall 2019 – Spring 2020

### I. ACADEMIC FOUNDATIONS & DEGREE REQUIREMENTS

<i>Requirement</i>	<i>Course</i>	<i>Credits</i>	<i>Term</i>	<i>Year</i>	<i>Grade</i>
First Year Experience	FYE 100	4	_____	_____	_____
Effective Writing I	WRT 120	3	_____	_____	_____
Effective Writing II	WRT 2__ <sup>▲</sup>	3	_____	_____	_____
Mathematics: Statistics	MAT 121 or 125	3	_____	_____	_____
Interdisciplinary (“I”)	_____	3	_____	_____	_____
Diverse Communities (“J”)	_____ <sup>♥</sup>	3	_____	_____	_____
Ethics (“ET”)	_____ <sup>♥</sup>	3	_____	_____	_____

**Writing Emphasis** *Nine credits\**, integrated across General Education & Major courses.

BIO 220

*One at 300/400-level:*

_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

**Speaking Emphasis** *Nine credits\**, integrated across General Education & Major courses.

*One at 300/400-level:*

_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

### II. GENERAL EDUCATION DISTRIBUTIVE REQUIREMENTS

- Courses must be selected from the approved General Education list (see the [catalog](#)).
- Interdisciplinary (“I”) courses cannot also be a General Education distributive course.
- Biology majors fulfill their science requirements with CHE 103 and PHY 130/170.
- Distributive requirements can be simultaneously satisfied with other degree requirements, see some examples<sup>♦</sup>.

**A. Humanities** (6 credits): E.g., Literature (LIT/CLS), History (HIS), Philosophy (PHI)

*Courses must be selected from two different subject areas.*

_____	3	_____	_____	_____
_____	3	_____	_____	_____

**B. Behavioral and Social Sciences** (6 credits): E.g., Psychology (PSY), Sociology (SOC), Anthropology (ANT), Political Science (PSC), Geography (GEO), Economics (ECO)

*Courses must be selected from two different subject areas.*

*Note: Students taking the MCAT should take PSY 100 and SOC 200.*

_____	3	_____	_____	_____
_____	3	_____	_____	_____

**C. Arts** (3 credits): E.g., Art (ART), Art History (ARH), Dance (DAN), Film (FLM), Music (MHL, MTC), Theater (THA)

_____	3	_____	_____	_____
-------	---	-------	-------	-------

**III. DIRECTED ELECTIVES – 9-10 credits (as many as needed to reach 120 total credits)**

_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

**IV. SUPPORTING COURSES (28-29 credits)**

Calculus *	MAT	__	3/4	_____	_____	_____
General Chemistry I	CHE	103	3	_____	_____	_____
General Chemistry I Lab	CRL	103	1	_____	_____	_____
General Chemistry II	CHE	104	3	_____	_____	_____
General Chemistry II Lab	CRL	104	1	_____	_____	_____
Organic Chemistry I	CHE	231	4	_____	_____	_____
Organic Chemistry I Lab	CRL	231	2	_____	_____	_____
Organic Chemistry II	CHE	232	3	_____	_____	_____
General Physics I **	PHY	130	4	_____	_____	_____
General Physics II	PHY	140	4	_____	_____	_____

**V. BIOLOGY COURSES (49 credits) -- GPA must be 2.0 or higher to graduate.**

**A. Required courses (27 credits)**

General Biology ***	BIO	110	3	_____	_____	_____
General Microbiology ***	BIO	214	4	_____	_____	_____
Botany or Zoology ***	BIO	215/217	3	_____	_____	_____
Cell Physiology ***	BIO	220	3	_____	_____	_____
Genetics ***	BIO	230	3	_____	_____	_____
Immunology ***	BIO	465	4	_____	_____	_____
Seminar ***	BIO	490	3	_____	_____	_____

❖ Internship in Medical Laboratory Science \*\*\*  
 BIO 407-408 26 \_\_\_\_\_

**Notes and Requirements**

Total degree program: 120 credits.

♠ The second (200-level) WRT course is chosen from WRT 200, 204, 205, 206, 208, or 220.

♥ The Diverse Communities (“J”) course and the Ethics (“ET”) courses can be satisfied through another requirement (e.g., Interdisciplinary or Distributive) as long as the course carries the appropriate attribute(s).  
*Note:* Credits are not duplicated such that if a course satisfies two requirements, those credits must be made up via directed electives (the minimum total credits for a B.S. degree is 120).

♣ All students must take at least 9 credits of Writing Emphasis courses and 9 credits of Speaking Emphasis courses. Students who enter WCU with 40-70 transfer credits only need 6 credits of each; students who enter with >70 transfer credits only need 3 credits of each. **All students must take at least 3 credits of Writing Emphasis and 3 credits of Speaking Emphasis at the 300-400 level.**

◆ Students should think about how requirements can be simultaneously satisfied. As examples: LNC 110 is a Humanities distributive that satisfies the Ethics requirement; PHI 180 is a Humanities distributive that satisfies the Diverse Communities & Ethics requirements; LIT 165 is a Humanities distributive that is also Writing Emphasis; PSC 101 is a Behavioral & Social Science distributive that satisfies the Diverse Communities requirement.

\* The Biology department recommends MAT 145 (Calculus for the Life Sciences; 3 credits) or MAT 161 (Calculus I; 4 credits). MAT 143 (Brief Calculus; 3 credits) is also acceptable. You must meet the necessary pre-requisites or obtain a minimum score on the Math Placement Exam to enroll in a calculus class. Visit the Math Department website to take the exam. If you receive a score of 3 or lower on the placement exam, you must take MAT 115 (Algebra, Functions, and Trigonometry) or MAT 131 (Precalculus) as preparation for Calculus (MAT 143 or MAT 145). If you receive a score of 4 or above, you can enroll directly into MAT 143 or MAT 145. You must score a 5 to enroll into MAT 161 or take the pre-requisite of MAT 131.

\*\* The recommended Physics sequence is PHY 130 & PHY 140. Students may substitute the PHY 170 & PHY 180 sequence, but PHY 130 may not be used as a prerequisite for PHY 180 and PHY 170 may not be used as a prerequisite for PHY 140.

\*\*\* Course must be passed with a "C-" or better.

❖ To qualify for the internship, students must have a minimum 2.75 GPA and be accepted by an accredited hospital Medical Laboratory Science program. Applications should be submitted by the summer of the junior year (60 credits completed). Internships are very competitive and acceptance depends on the cumulative GPA, excellent letters of recommendation and successful completion of an on site interview. Please note that some programs require computer science or Anatomy and Physiology courses. Please see **Dr. Pisciotta** for any questions about applying for this internship.

A maximum of 8 combined credits from BIO 409 & 491 may be applied to total Biology credits.

Some Medical Laboratory Science programs require a course in computer science. Consult with **Dr. Pisciotta**.

# Suggested Sequence for B.S. Biology Majors

## Medical Laboratory Science Concentration

Fall 2019 – Spring 2020

	<b>Semester #1 (17 credits)</b>		<b>Semester #2 (16 credits)</b>
_____	FYE 100 (4)	_____	WRT 2__ (3)
_____	WRT 120 (3)	_____	BIO 215 or 217 (3)
_____	BIO 110 (3)	_____	CHE 104/CRL 104 (3)/(1)
_____	CHE 103/CRL 103 (3)/(1)	_____	MAT 145 (3) or MAT 143/161
_____	MAT 121 or MAT 125 (3)	_____	Gen Ed Distributive: Behavioral & Social Science (3)
	<b>Semester #3 (16 credits)</b>		<b>Semester #4 (15 credits)</b>
_____	BIO 214 (4)	_____	BIO 220 (3) (W)
_____	CHE 231/CRL 231 (4)/(2)	_____	BIO 230 (3)
_____	Gen Ed Distributive: Arts (3)	_____	CHE 232 (3)
_____	Gen Ed Distributive: Humanities & Ethics (ET) course (3)	_____	Gen Ed Distributive: Humanities (3)
		_____	Gen Ed Distributive: Behavioral & Social Science (3)
	<b>Semester #5 (14 credits)</b>		<b>Semester #6 (16 credits)</b>
_____	PHY 130/170 (4)	_____	PHY 140/180 (4)
_____	BIO 465 (4)	_____	BIO 490 (3)
_____	Diversity (J) Course (3)	_____	Directed Elective (3)
_____	Interdisciplinary (I) Course (3)	_____	Directed Elective (3)
		_____	Directed Elective (3)
	<b>Semester #7 (13 credits)</b>		<b>Semester #8 (13 credits)</b>
_____	BIO 407	_____	BIO 408

An average of 16 credits per semester must be completed to enter the Medical Laboratory Science training in the 4<sup>th</sup> year. If a student follows the proposed outline of courses, a total of 94 credits will be earned at WCU. The additional 26 credits necessary for graduation will be earned at the affiliated hospital.

All required 200 level Biology courses should be completed by the end of Semester #5.

Students should take Statistics (MAT 121 or 125) in the first year.

All students must take at least 9 credits of Writing Emphasis courses and 9 credits of Speaking Emphasis courses. Students who enter WCU with 40-70 transfer credits only need 6 credits of each; students who enter with >70 transfer credits only need 3 credits of each. **All students must take at least 3 credits of Writing Emphasis and 3 credits of Speaking Emphasis at the 300-400 level.**



## MINOR IN BIOLOGY

Student \_\_\_\_\_ WCU ID: \_\_\_\_\_  
 Major: \_\_\_\_\_ Major Advisor: \_\_\_\_\_

REQUIRED PREREQUISITE (must be completed before admission into minor; does not count toward 18 required credits and is not calculated into minor GPA)

BIO 110 (3) \_\_\_\_\_ (requires C- or better)

or

BIO 100 (3) \_\_\_\_\_ (requires A- or better)

**18 additional credits of Biology courses** are required for the minor in Biology. You may choose any courses with a BIO prefix at the 200 level or higher. They must be completed with C- or better AND at least 3 credits must be in addition to BIO courses required for student's major AND at least 9 of these credits MUST be taken at WCU.

Course	Credits	Semester earned	Letter grade	Numerical value of grade	Numerical value X credits
BIO					
BIO					
BIO					
BIO					
BIO					
BIO					
Total # of credits earned					
				Minor GPA	

For the minor to be earned, the minor GPA must be 2.00 or better.

To calculate your minor GPA, use the chart above to fill in the *Numerical value of grades* column. Each letter grade corresponds to a number. Multiply this number by the number of credits earned for that grade and enter it in the last column. Add the column on the right together then divide that total by the total number of credits you have earned toward the major. This number will be your minor GPA.

	A 4	A- 3.67
B+ 3.33	B 3	B- 2.67
C+ 2.33	C 2	C- 1.67
D+ 1.33	D 1	D- 0.67
	F 0	

**Pre-Physical Therapy Guidance sheet**  
**Suggested Sequence for B.S. Biology Majors, Integrative Concentration**

_____ _____ _____ _____ _____	<b>Semester #1 (16 credits)</b> WRT 120 (3) BIO 110 (3) CHE 103/CRL 103 (3)/(1) MAT 121 (3) or MAT 143, 145, 161 Gen Ed Distributive Requirement (3)	_____ _____ _____ _____ _____	<b>Semester #2 (16 credits)</b> WRT 2 ____ (3) BIO 217 (3) CHE 104/CRL 104 (3)/(1) MAT 121 (3) or MAT 143, 145, 161 Gen Ed Distributive Requirement (3)
_____ _____ _____ _____	<b>Semester #3 (16 credits)</b> BIO 230 (3) BIO 259 <sup>1</sup> (4) CHE 231/CRL 231 (4)/(2) HEA 110 (J)(3)	_____ _____ _____ _____ _____	<b>Semester #4 (16 credits)</b> BIO 220 (3) BIO 269 <sup>1</sup> (4) CHE 232 (3) SPK 208 or 230 (3) PSY 100(3)
_____ _____ _____ _____	<b>Semester #5 (15 credits)</b> BIO 357 (4) BIO core course (4) BIO Elective (3) PHY 130 (4)	_____ _____ _____ _____	<b>Semester #6 (14 credits)</b> BIO 468 (4) BIO core course (4) (3) BIO Elective (3) PHY 140 (4)
_____ _____ _____ _____	<b>Semester #7 (15 credits)</b> BIO Elective (3) BIO Elective (3) BIO PPT Elective * (3) Directed Elective (3) PSY (as directed by school you are going to attend) (3)	_____ _____ _____ _____ _____	<b>Semester #8 (15 credits)</b> BIO Elective (3) BIO Elective (3) BIO PPT Elective * (3) PHI 374 (I)(3) BIO 490/409/491 (3)

*\*BIO electives (13 credits total):*

BIO 214 General Microbiology (4)

BIO 428 Animal Histology

BIO 457 Functional Morphology

BIO 367 Physiology of Drug Interactions

BIO 448 Animal Development (4)

BIO 467 Endocrinology

<sup>1</sup> Bio 259 & 269 count as Directed Electives and *not* Bio Electives

All required 200-level Biology courses should be completed by the end of Semester #5.

Students should take MAT 121 (Statistics) in the first year.

## Pre-MBA Guidance sheet

### Suggested Sequence for B.S. Biology Majors, Integrative Concentration

_____	<b>Semester #1 (16 credits)</b>	_____	<b>Semester #2 (16 credits)</b>
_____	WRT 120 (3)	_____	WRT 2____ <sup>5</sup> (3)
_____	BIO 110 <sup>1</sup> (3)	_____	BIO 215 <sup>1</sup> or 217 <sup>1</sup> (3)
_____	CHE 103/CRL 103 (3)/(1)	_____	CHE 104/CRL 104 (3)/(1)
_____	MAT 121 <sup>2</sup> (3) or Calculus <sup>3</sup> (3-4)	_____	MAT 121 <sup>2</sup> (3) or Calculus <sup>3</sup> (3-4)
_____	Gen Ed Distributive <sup>4</sup> (3)	_____	Gen Ed Distributive <sup>4</sup> (3)
_____	<b>Semester #3 (12-15 credits)</b>	_____	<b>Semester #4 (15 credits)</b>
_____	BIO 215 <sup>1</sup> or 217 <sup>1</sup> (3)	_____	BIO 220 <sup>1</sup> (3)
_____	CHE 231/CRL 231 (4)/(2)	_____	BIO 230 <sup>1</sup> (3)
_____	Math (if still needed) (3)	_____	CHE 232 (3)
_____	ECO 111 or 112 <sup>2</sup> (3)	_____	SPK 208 or 230 (3)
_____		_____	Gen Ed Distributive <sup>4</sup> (3)
_____	<b>Semester #5 (16 credits)</b>	_____	<b>Semester #6 (16 credits)</b>
_____	BIO 270 <sup>1</sup> (3)	_____	BIO elective <sup>6</sup> (3)
_____	BIO elective <sup>6</sup> (3)	_____	BIO elective <sup>6</sup> (3)
_____	PHY 130 (4)	_____	PHY 140 (4)
_____	ACC elective <sup>2</sup> (3)	_____	MGT elective <sup>2</sup> (3)
_____	FIN elective <sup>2</sup> (3)	_____	MKT elective <sup>2</sup> (3)
_____	<b>Semester #7 (15 credits)</b>	_____	<b>Semester #8 (12-15 credits)</b>
_____	BIO elective <sup>6</sup> (3)	_____	BIO elective <sup>6</sup> (3)
_____	BIO elective <sup>6</sup> (3)	_____	BIO elective <sup>6</sup> (3)
_____	Interdisciplinary (I) Course (3)	_____	Diversity (J) Course (3)
_____	Directed elective (3)	_____	Directed elective (if still needed) (3)
_____	Gen Ed Distributive <sup>4</sup> (3)	_____	BIO 490/409/491 <sup>1,7</sup> (3)

- A GMAT score of 460 (or its equivalent GRE score) is required for admission to the M.B.A. program. The GMAT requirement will be waived if your overall GPA is 3.3 (or higher), and you earn a B or better in each of the following courses<sup>2</sup>: Management, Accounting, Marketing, Economics, Finance, and Statistics.
  - Students must take at least 9 credits of approved Writing Emphasis courses. Students with 40-70 transfer credits need a minimum of 6 credits; students with >70 transfer credits need a minimum of 3 credits. **At least 1 Writing Emphasis course must be taken at the 300 or 400 level for all students.**
1. Course must be passed with a "C-" or better. All required 200 level Biology courses should be completed by the end of Semester #5.
  2. Course must be passed with a "B" or better. Students should take MAT 121 in the first year.
  3. The Biology Department recommends MAT 145 (Calculus for the Life Sciences; 3 credits) or MAT 161 (Calculus I; 4 credits). MAT 143 (Brief Calculus; 3 credits) is also acceptable. You must meet the necessary pre-requisites or obtain a minimum score on the Math Placement Exam to enroll in a calculus class. Visit the Math Department website to take the exam. If you receive a score of 3 or lower on the placement exam, you must take MAT 115 (Algebra, Functions, and Trigonometry) or MAT 131 (Precalculus) as preparation for Calculus (MAT 143 or MAT 145). If you receive a score of 4 or above, you can enroll directly into MAT 143 or MAT 145. You must score a 5 to enroll into MAT 161 or take the pre-requisite of MAT 131.
  4. Choose courses from the approved list: 2 from the Humanities, 1 from the Behavioral and Social Sciences, and 1 from the Arts.
  5. Approved WRT courses are 200, 204, 205, 206, 208, or 220.
  6. Selected from BIO 214, 275, 277, or BIO courses at or above the 300 level except BIO 307 and BIO 469.
  7. A maximum of 8 combined credits from BIO 409 & BIO 491 may be applied to total BIO credits.