

BIOLOGICAL SCIENCES
COMPREHENSIVE PROGRAM REVIEW 2018
AUGUST 1, 2018

## BIOLOGICAL SCIENCES COMPREHENSIVE PROGRAM REVIEW 2018

## INTRODUCTION

The goals of the biological sciences program at Cecil College align well with the College's strategic plan, especially strategic priorities one and three. Cecil College's strategic priority one is to drive academic achievement. The biological sciences program has two goals that directly relate to this priority. One goal of the department is to increase the number of biological science majors and the number who graduate with a concentration in biology or environmental science. The college has many students who never declare themselves as biological science majors, but still complete the coursework for the degree. There are several approaches to increase enrollment in the program. The college could increase their advertise ment of the program to attract students to it. This would hopefully appeal to high school students (and their parents) who are interested in the biological sciences. In addition, current students who are general studies majors might decide that declaring themselves as a biological sciences major prior to transferring to a 4 -year institution might be a benefit in the long run. Updated flyers in both admissions and advising that show careers that lend themselves to a biological sciences degree as well as transfer articulations available may boost enrollment in the program and steer general studies majors into the direction of biology/environmental science. The program would also benefit from a greater presence on social media. This would require a coordinated effort from marketing and the faculty, so that program highlights and events were showcased on social media.

Currently, microbiology and anatomy \& physiology I (both 200-level courses) have no general biology pre-requisite. This is a result of the state mandate for credit limits for 2-year programs including Cecil College's nursing program. General biology became a hidden pre-requisite, so it is no longer a prerequisite for these 200 -level courses, although it is still highly recommended. However, the burden is now on the 200 -level courses to teach the students the required background that would have been covered in general biology. The students who do take the general biology before these 200-level courses tend to earn at least one letter grade higher on average than those who leap directly into the 200 -level courses. A goal of the program is to develop a pre-assessment of biology knowledge for students who have no general biology background prior to entering into a $200-\mathrm{level}$ course. This meets the strategic priority one of driving academic achievement. Although they would not be required to take general biology, as it would then become a hidden pre-requisite for nursing students, the students would be notified of their score, indicating whether or not they had sufficient background to be successful in the 200 -level courses. With these scores, students could make an informed decision as to whether they would benefit from enrolling in general biology before taking the 200 -level courses.

Cecil College's strategic priority three is to expand and deepen community alliances. A biological sciences club would have the potential to bring guest speakers to the college from various industries in order to show the students the wide range of careers that would be available to someone earning a or environmental science degree. This would also give both students and potential employers a way of connecting, possibly leading to student internships, part-time jobs, and career placement following graduation. A club would also be a good vehicle for bringing in professors from 4-year institutions to speak about their degree offerings that a student with an AS in Biological Sciences might be interested in pursuing. In 2017, the department had a guest speaker from the University of Delaware's Department of Medical and Molecular Science come to campus to discuss their program and the majors that they offer. The presentation was well-received and the students were very interested in what the university's program had to offer. Most of the students in attendance stated that they never heard of any of the degrees in the
program before. As a result of this guest speaker, the program is currently working with the University of Delaware's Department of Medical and Molecular Science to develop an articulation between Cecil College's biological sciences program and three of their degrees: Medical Laboratory Science, Applied Molecular Biology \& Biotechnology, and Medical Diagnostics. This, too, will allow Cecil College to expand and deepen community alliances.

To sum up the goals and objectives of the program:
Biology program goals:

- To develop a pre-assessment of biology knowledge for students with no general biology background who plan to enter into a $200-$ level biology course. (strategic priority one)
- To increase the number of biological science majors and the number of biology/environmental science majors who graduate. (strategic priority one)
- To develop a biological sciences club and invite guest speakers from the community to discuss their field/industry. (strategic priority three)
- To complete articulation agreements with the University of Delaware Medical \& Molecular Science department's three majors - Medical Laboratory Science, Medical Diagnostics,and Applied Molecular Biology \& Biotechnology. (strategic priority three)

Biological Sciences program objectives:

- To ensure that students entering 200-level biology courses are prepared for the curriculum.
- Increase declared biological sciences majors through marketing to current and future students.
- To increase students' awareness of the diversity of careers that stem from biological sciences.
$\bullet$


## ENROLLMENT AND GRADUATION TRENDS

Enrollment

|  | $\mathbf{2 0 1 4}$ | $\mathbf{2 0 1 5}$ | $\mathbf{2 0 1 6}$ | $\mathbf{2 0 1 7}$ | $\mathbf{2 0 1 8}$ |
| :--- | :---: | :---: | :---: | :---: | :---: |
| Biology <br> concentration |  |  |  |  |  |
| ${ }^{1}$ | 72 | 72 | 73 | 72 | 72 |
| Environmental <br> science <br> concentration | 15 | 19 | 16 | 23 | 17 |

${ }^{1}$ This data was derived from the cumulative number of students enrolled in BIO 130 and BIO 132 fall and spring semesters. Not all students enrolled in these courses were Biology majors.
${ }^{2}$ This data was derived from the number of students enrolled in ENV 106 fall and spring semesters. Not all students enrolled in this course were Environmental Science majors.

Course Enrollment and Pass/Fail

|  | 2014 <br> P/F/O | 2015 <br> P/F/O | 2016 <br> P/F/O | 2017 <br> P/F/O | 2018* <br> P/F/O | Cumulative <br> Pass Rate** |
| :--- | :---: | :---: | :---: | :---: | :---: | :---: |
| BIO 101 | $236 / 101 / 40$ | $218 / 69 / 28$ | $173 / 50 / 26$ | $187 / 39 / 29$ | $160 / 40 / 23$ | $68.8 \%$ |
| BIO 103 | $15 / 2 / 0$ | $14 / 4 / 1$ | $11 / 2 / 0$ | $9 / 3 / 2$ | $12 / 1 / 2$ | $78.2 \%$ |
| BIO 104 | $9 / 0 / 0$ | $6 / 1 / 0$ | $7 / 0 / 0$ | $13 / 0 / 0$ | $5 / 0 / 0$ | $97.6 \%$ |
| BIO 111 | $286 / 26 / 29$ | $238 / 19 / 20$ | $192 / 20 / 15$ | $196 / 22 / 17$ | $184 / 12 / 14$ | $85.0 \%$ |
| BIO 113 | $15 / 1 / 0$ | $17 / 1 / 1$ | $11 / 1 / 0$ | $12 / 1 / 1$ | $12 / 0 / 2$ | $89.3 \%$ |
| BIO 114 | $9 / 0 / 0$ | $6 / 0 / 1$ | $7 / 0 / 0$ | $12 / 0 / 0$ | $6 / 0 / 0$ | $97.6 \%$ |
| BIO 123 | $23 / 9 / 2$ | $21 / 6 / 0$ | $15 / 10 / 2$ | $34 / 5 / 4$ | $31 / 6 / 2$ | $72.9 \%$ |
| BIO 130 | $39 / 10 / 7$ | $25 / 4 / 6$ | $35 / 10 / 7$ | $27 / 10 / 9$ | $29 / 9 / 10$ | $65.4 \%$ |
| BIO 131 | $46 / 0 / 6$ | $25 / 0 / 6$ | $37 / 6 / 8$ | $30 / 7 / 9$ | $33 / 2 / 11$ | $75.7 \%$ |
| BIO 132 | $15 / 1 / 0$ | $26 / 1 / 0$ | $17 / 2 / 2$ | $25 / 1 / 0$ | $18 / 6 / 0$ | $88.6 \%$ |
| BIO 133 | $17 / 0 / 0$ | $26 / 1 / 0$ | $19 / 2 / 2$ | $25 / 1 / 1$ | $21 / 3 / 0$ | $91.5 \%$ |
| BIO 200 | $109 / 10 / 17$ | $97 / 21 / 17$ | $98 / 16 / 20$ | $104 / 28 / 17$ | $76 / 19 / 10$ | $73.4 \%$ |
| BIO 203 | $23 / 8 / 9$ | $15 / 13 / 8$ | $23 / 18 / 12$ | $32 / 14 / 14$ | $33 / 10 / 11$ | $51.9 \%$ |
| BIO 208 | $121 / 38 / 42$ | $137 / 64 / 28$ | $136 / 64 / 34$ | $138 / 79 / 67$ | $149 / 60 / 33$ | $57.2 \%$ |
| BIO 209 | $85 / 25 / 25$ | $91 / 29 / 10$ | $124 / 30 / 28$ | $106 / 20 / 20$ | $106 / 37 / 21$ | $67.6 \%$ |
| BIO 210 | $119 / 1 / 8$ | $109 / 4 / 12$ | $102 / 5 / 8$ | $101 / 12 / 6$ | $80 / 9 / 5$ | $88.0 \%$ |
| BIO 218 | $131 / 28 / 42$ | $137 / 57 / 29$ | $135 / 56 / 36$ | $145 / 59 / 61$ | $144 / 52 / 38$ | $60.2 \%$ |
| BIO 219 | $104 / 16 / 16$ | $99 / 12 / 8$ | $123 / 11 / 18$ | $107 / 6 / 11$ | $111 / 18 / 17$ | $80.4 \%$ |
| BIO 222 | $0 / 0 / 0$ | $8 / 0 / 0$ | $6 / 0 / 1$ | $4 / 0 / 1$ | $0 / 0 / 0$ | $90.0 \%$ |
| BIO 232 | $0 / 0 / 0$ | $8 / 0 / 0$ | $6 / 0 / 1$ | $3 / 0 / 1$ | $0 / 0 / 0$ | $94.7 \%$ |
| ENV 106 | $15 / 0 / 2$ | $19 / 0 / 2$ | $16 / 0 / 2$ | $13 / 7 / 3$ | $13 / 3 / 1$ | $79.2 \%$ |
| ENV 116 | $13 / 0 / 2$ | $17 / 0 / 2$ | $16 / 0 / 2$ | $12 / 5 / 3$ | $15 / 1 / 1$ | $82.0 \%$ |

$\mathrm{P} / \mathrm{F} / \mathrm{O}=\operatorname{Pass}(\mathrm{A}, \mathrm{B}, \mathrm{C}) /$ Fail (D, F)/Other (K, W, NG, I, M, V, R)
*2018 data does not include summer session.
** Pass rate determined by Pass $\div$ Total Enrolled

## Graduates

|  | $\mathbf{2 0 1 4}$ | $\mathbf{2 0 1 5}$ | $\mathbf{2 0 1 6}$ | $\mathbf{2 0 1 7}$ | $\mathbf{2 0 1 8}$ |
| :--- | :---: | :---: | :---: | :---: | :---: |
| Biology <br> concentration | 1 | 8 | 8 | 2 | 4 |
| Environmental <br> science <br> concentration | 3 | 1 | 3 | 4 | 1 |

## ARTICULATION AGREEMENTS

Currently, we do not have any articulation agreements in place. The department is working with the University of Delaware to develop an articulation with the Department of Medical \& Molecular Sciences for their degree offerings of Medical Laboratory Science, Medical Diagnostics, and Applied Molecular Biology \& Biotechnology. We have many students who find while they are completing their AS degree here at Cecil College that they love working in the laboratory. Many have no idea that such a major exists that would qualify them to work in a wide range of clinical and research labs. In addition, for our students planning to use their biological sciences degree to work towards medical school, the Medical Diagnostics degree at University of Delaware is an excellent program geared towards students who want to either apply for medical school or for physicians' assistant school. Once these articulations have been finalized, the department would like to consider reaching out to Salisbury University and their Medical Laboratory Science program in order to develop an articulation with them as well.

## PLACEMENT/TRANSFER

Over the past five years, the biological sciences graduates from Cecil College have transferred to many different regional universities as well as some universities located outside the mid-Atlantic region. These universities include: Towson University, University of Maryland-University College, University of Maryland-Baltimore County, University of Maryland-College Park, University of Delaware, West Chester University, Temple University, and University of North Florida. During the past five years, Cecil College graduates who transferred to 4 -year institutions have earned baccalaureate degrees in the following programs: biology, emergency health services, geoscience, environmental science and technology, biotechnology, biosecurity, biodefense specialist, laboratory management, medical laboratory science, and wildlife ecology \& conservation. There has been no data, other than anecdotal, concerning employment of our biology graduates.

Biology -Placement/Transfer

|  | $\mathbf{2 0 1 4}$ | $\mathbf{2 0 1 5}$ | $\mathbf{2 0 1 6}$ | $\mathbf{2 0 1 7}$ | $\mathbf{2 0 1 8}$ |
| :--- | :---: | :---: | :---: | :---: | :---: |
| Total Graduates | 1 | 8 | 8 | 2 | 4 |
| Transferred | 2 | 4 | 4 | 5 | 2 |
| Unknown | 0 | 4 | 4 | 0 | 2 |

## Environmental Science -Placement/Transfer

|  | $\mathbf{2 0 1 4}$ | $\mathbf{2 0 1 5}$ | $\mathbf{2 0 1 6}$ | $\mathbf{2 0 1 7}$ | $\mathbf{2 0 1 8}$ |
| :--- | :---: | :---: | :---: | :---: | :---: |
| Total Graduates | 3 | 1 | 3 | 4 | 1 |
| Transferred | 2 | 1 | 2 | 1 | 1 |
| Unknown | 1 | 0 | 1 | 3 | 0 |

## LICENSURE EXAMS (if applicable)

This is not applicable to the biology degree program at Cecil College.

## MISSION AND GOALS

Cecil College's strategic priority one is to drive academic achievement. The biology faculty work very hard to ensure that the academic rigor is appropriate to prepare our students in the biological sciences for transfer to 4 -year institutions. The students are assessed using written and oral methods including quizzes, exams, formal papers and posters, and oral presentations.

The biological science program fosters a dynamic learning environment. Currently, we offer the option of taking nutrition and general biology online, and once, microbiology was offered as an online course and will likely be offered again in the future. Students in the program spend quite a bit of time on the $4^{\text {th }}$ floor of the Arts \& Sciences building, where all of the biology labs are located. This space is bright, modern, and has many areas set aside for students to study, collaborate with one another, and review lab information/results. The foot traffic on the floor is busy and students will generally spend more time on the floor than just for the 2-hour lab they are enrolled in.

The biological sciences program has been actively working to expand and deepen community alliances. Students in the program visit local businesses to help broaden their horizons, showing science in the 'real world'. Each year, students visit local zoos, including Plumpton Park Zoo and the Philadelphia Zoo, Longwood Gardens, the local water treatment facility, and the local landfill. The department plans to develop a biological sciences club, which may draw professionals from the region to come speak to our students. Many of our students are first generation college students and many have not traveled extensively from the county. Any opportunity to expand their world is a positive thing. Hopefully, some of the community connections that the students make during their time at Cecil College may lead to gainful employment in the future. The faculty have been working to develop an articulation with the University of Delaware and three degree options that they offer that fit well with our biological science program. Once this articulation is complete, the department would like to continue to reach out to other schools to develop formal articulations, especially with schools within the Maryland system.

The biological science program addresses the mission of the college. The faculty are dedicated to making sure that the students in the program leave Cecil with the skills that they will need in order to continue their study of the biological sciences at a 4 -year school. Students become proficient at microscopy, weighing and measuring of reagents, using lab equipment such as automatic pipets, PCR instrumentation, electrophoresis methods, genomic databases, and many other techniques and instrumentation that will prepare them for the next stage of their scientific education. The students are always encouraged to attend scientific lectures and workshops at local institutions as well as at Cecil College. Several years ago, about 10-15 students from the biological sciences program attended a full-day of lectures at the University of Delaware's Darwin Days. Last year, the students had the opportunity to attend a talk by a patent lawyer who spoke at the college. These opportunities are well-received by the students.

The program meets the general education core requirements. Students in the program meet these requirements in the following ways:

## A. critical and creative thinking skills and problem-solving strategies

- All students in the program are required to take many laboratory courses. The lab courses require the students to think critically and use creativity when designing experiments that pertain to the topic at hand. For example, students in Principles of Biology II develop an experiment based upon how certain chemicals affect the heart rate of microscopic crustaceans. The students must decide upon what chemical they will test, propose a hypothesis based upon their expectations, and design an
experiment that tests the hypothesis. The lab requires the students to think in terms of physiological processes as well as how certain drugs/chemicals affect these processes.


## B. writing

- Students in the program have many opportunities for formal writing. In Principles of Biology II, each exam contains a short essay section and the course also requires students to write a formal paper that relates to one of the topics covered in the course. All of the lab courses (Principles of Biology I and II and the Environmental Science course) require students to write formal lab reports that follow both course guidelines and the college's writing standards.


## C. oral communications

- The lab courses in the program require students to not only organize their experimental results in written form, but oral presentations of their work are routine. In addition, at the end of the semester, many students in these lab courses participate in the semi-annual Cecil College STEM night where they display their scientific posters and discuss their experiment and results to attendees. Many instructors make this event part of the student's grade.


## D. quantitative analysis

- Students in the biological sciences program are required to take math courses that fulfill the prerequisites for many of the biology, environmental science, physics, or chemistry courses that students will take in the program. Environmental science concentration students need 4 credits of math while the biology concentration students require 12 credits of math. The lab courses rely upon the students having a strong background in math in order to calculate statistical information from raw data as well as math that is needed for calculating Hardy-Weinberg equilibriums while studying population genetics. These are just a few examples of how quantitative analysis is essential for students in the program. The program relies upon the excellence of the math department to forge a strong foundation in math needed for the sciences.


## E. computer literacy and in the ability to work productively with information technology

- Students in the program are expected to be proficient at using software such as Word, Excel, and Powerpoint to convey information. In addition, students must be adept at using Blackboard (the college's learning management system), MyCecil, and email. In some classes, students actively use Blackboard to post discussions, take quizzes, etc.
F. awareness of ethics, cultural diversity, artistic expression, health and wellness issues, and the physical and social environment
- Although this seems like a core requirement that would be difficult to cover in a science program, these topics are included in the program. Topics such as genetic engineering (cloning, GMOs, gene therapy), vaccination protocols, climate change, and the history of human migration and how we adapted physically and

> physiologically to different climates are all topics that are discussed in the program. It is important that students learn the science behind these topics/issues and do not simply believe what they hear or read from popular, non-science based information. The biological sciences faculty are dedicated to making sure that our students understand that science and social sciences are not distinct and separate, but, instead, they are interwoven.

## G. information literacy including finding, evaluating and using information effectively

- This is an integral part of the program, essential for differentiating peer-reviewed scientific research from pseudoscience. Students in Principles of Biology I or II generally have a representative from the library come to class to discuss the difference between science and pseudoscience. The students also learn how to find peer-reviewed scientific research papers through the library's databases. They use this information as they write papers (research or lab-related) in which they are required to reference peer-reviewed journal articles. This is an important aspect of the program.


## STRENGTHS AND OPPORTUNITIES

One of the biggest strengths of the program relates to the renovated physical space of the science labs. The lab space was renovated during the summer of 2012, giving our students a bright modern space, with available technology and instrumentation, creating a positive learning environment. The lab space has open areas with seating and white boards that allow students to collaborate with one another. The student workrooms (microbiology and anatomy \& physiology) are well-utilized by the students and significantly improved the science labs. These workrooms give students the extra time that they may need to master the information that they learn in lab. This directly affects and increases student success. An adjunct office was placed in the faculty office suite on the fourth floor, resulting in a more collegiate environment for full-time and adjunct faculty to collaborate, improving courses and student success. Another strength to the program is the recent upgrade of our lab coordinator position from part-time to full-time. This has allowed the science labs to run very smoothly with consistent support in terms of lab preparation, purchasing of supplies, and general upkeep of the labs and equipment.

The program has several courses available in an online format including general biology, nutrition, and microbiology (only one time). We have a great diversity of courses including several levels of specific courses. We offer General Biology, Zoology, and Botany, which fulfill the general education science requirement. There are also two Principles of Biology courses that required for Biology/Environmental Science majors and students majoring in other fields of science. Two different Nutrition courses, designed to meet the needs of two different student populations, are also offered.

The biology/environmental science faculty are active in the community, helping to encourage students to enter STEM fields. STEM outreach programs at local schools and libraries along with college STEM events and recruitment nights are among just some of the ways in which faculty work to increase enrollment in STEM majors including the biological sciences. Many faculty members mentor high school STEM students with their science fair projects, promoting a good relationship between local high schools and the Cecil College biological sciences program.

In the past five years, faculty have also participated in improving the college websites and brochures, encouraged students to participate in Cecil College STEM nights, ran summer camps, participated in Pizza with a Professor events, and judged science fairs at local schools.

Academically, the program is rigorous, giving the students an excellent foundation in the biological sciences, especially in the laboratory. Students in the biology concentration actively utilize current biotechnology methods and inquiry-based labs. The students are encouraged to design and conduct experiments, write up formal lab reports, make oral presentations, and design and present formal posters. The environmental science students learn basic and current environmental impacts on the world and are required to reflect upon their contributions to environmental pollution and sustainabilities.

Although the biological sciences program is overall a strong, healthy program, there are opportunities for improvement. We have had an ongoing problem with poor retention of students going from Principles of Biology I to Principles of Biology II. Some of this can be attributed to students who are only required to take Principles I, but many students find that they do not wish to continue to Principles II as a result of either a change in their interests or difficulty with the rigors of a course heavily weighted in cellular/molecular biology. Currently, we are offering Principles I to a newer faculty member who generally has high rates of retention in their courses to see if a different approach to teaching might help increase retention. This is not to say that low retention is due to faculty, but sometimes change is needed for growth. In a lab course that relies upon the understanding of biotechnological methods, the department might benefit from a better correlation between lecture and lab. An idea has been proposed to develop a biological sciences club at the college which would create a sense of community for the biology/environmental science majors and perhaps allow for guest speakers to come to campus to discuss different career paths in the biological sciences. The college is working to develop an articulation with the University of Delaware's Department of Medical and Molecular Science, which would potentially increase the number of students who declare themselves biological sciences majors at Cecil College.

Environmental science is an introductory course that typically enrolls both majors and nonmajors. This can make getting all of the students 'on the same page' quite difficult as some have an extensive biology background and others do not. Because of this, faculty are recommending that an upper-level environmental science course be developed for students with the appropriate math and science background to explore more detailed concepts. Offering an upper-level course will better prepare students who choose this track for the workforce in the area of environmental science.

## MARKETING

Marketing has been very helpful with attracting students to the major. Over the past five years, marketing has created advertising pages for most of the biology and environmental science course options for faculty and advising to give to inquiring students, future students, and their parents. In addition, they have been very helpful in recruitment of current students to specialty courses such as zoology by creating cards, flyers, and announcements on MyCecil to increase enrollment. Marketing has been more than
willing to come to our lab courses, even upon somewhat short notice, to photograph interesting experiments that showcase the department, again, for recruitment and advertising purposes.

Internally, we have offered several special guest speakers for our students including the director of the University of Delaware's Department of Medical and Molecular Science, a lawyer from a law firm specializing in patent law, and the educational coordinator from Plumpton Park Zoo. The department has also sponsored several biological sciences pizza lunches to promote a sense of community for our biology/environmental science students and students who might be interested in the program.

## CURRICULUM CHANGES

In the past five years, minor changes have been made to the program to align with state-mandated credit limits. The biology program consisted of 66-68 credits prior to the change and the environmental science program consisted of 65-68 credits. Currently, the program has been designated as a degree in biological sciences with a concentration in either biology or environmental science. Both of these concentrations within the program are limited to 60 credits. Organic chemistry I and II are now required for the biology concentration, eliminating the option of taking physics; however, physics is still an option for the environmental science concentration. The activity credits were eliminated from the program in order to help reduce the number of credits, as required by the state. The number of math credits for the environmental science concentration were reduced, but they were increased for the biology concentration.

## Required Courses

## General Education Requirements

| Course Number | Course Title | Credits |
| :---: | :---: | :---: |
| ARTS/HUM | Arts and Humanities Electives [ $\underline{H}$ ] | 6 |
| $\frac{\underline{B I O ~} 130_{\text {BIO } 131}^{a n d}}{}$ | Principles of Biology I [S] and Principles of Biology I Lab | 4 |
| CHM 103 and CHM 113 | General Chemistry I [S] and General Chemistry I Lab | 4 |
| EGL 101 | Freshman Composition [E] | 3 |
| EGL 102 | Composition and Literature [ $\underline{\mathrm{H}}$ ] | 3 |
| MAT | Math Elective [M] (Select from MAT 121 or higher level math course) | 4 |
| $\underline{\text { SOC SCI }}$ | Social Science Electives ${ }^{2}$ [SS] | 6 |
| $\frac{\text { SPH } 121 \text { or }}{\underline{\text { SPH } 141}}$ | Interpersonal Communications [ H ] or Public Speaking [H] | 3 |

## Program Requirements

| Course Number | Course Title | Credits |
| :--- | :--- | :--- |
| $\underline{\text { BIO 132 }}$ and | Principles of Biology II $[\underline{S}]$ and <br> Principles of Biology II Lab | 4 |
| $\underline{\text { CHM 104 }}$ and | General Chemistry II $[\underline{S}]$ and <br> General Chemistry II Lab | 4 |

Biology Concentration Requirements (19 Credits)

| Course <br> Number | Course Title | Credits |
| :--- | :--- | :--- | :--- |
| $\underline{\text { CHM 203 }}$ | Organic Chemistry I with Lab | 4 |
| $\underline{\text { CHM 204 }}$ | Organic Chemistry II with Lab | 4 |
| $\underline{\text { MAT }}$ | Math Elective [品] (Select from $\underline{\text { MAT 127, MAT 128, 201, 202, or MAT }}$ <br> $\underline{203},)^{3}$ | 8 |
| $\underline{\underline{\text { BIO }} \text { or }}$ | Biology or Environmental Science Electives | 3 |

## Environmental Science Concentration Requirements (19 Credits)

| Course Number | Course Title | Credits |
| :---: | :---: | :---: |
| ECO 222 | Economics - Macro [SS] | 3 |
| ENV 106 and ENV 106 | Introduction to Environmental Science [ $\underline{S}$ ] and Introduction to Environmental Science Lab | 4 |
| GEO 101 | Physical Geography [SS] | 3 |
| BIO or <br> CHM or <br> PHY or <br> PSC |  |  |

## ASSESSMENT OF STUDENT LEARNING

In past years, assessment was based upon the learning outcomes of each course. This academic year (2017-2018), this has been changed to instead assess program learning. All students in the program, whether in the biology concentration or the environmental science concentration, must take the Principles of Biology 2-semester biology sequence. The assessment of the Biological Sciences program was carried out in both the Principles of Biology I and II laboratory courses. Several members of the faculty met to discuss how the department would assess student success in the program. A decision was made that there would be some assessment based upon success in the Principles of Biology I lab course, while most of the assessment would be from the Principles of Biology II lab course. The group also worked to develop appropriate goals for the program. Students that meet or exceed these goals are, according to the department, well prepared to graduate with an A.S. in Biological Sciences and be able to transfer successfully into a baccalaureate program in the biological sciences. The Principles of Biology II Lab experiments culminate in two capstone projects that illustrate the skills and knowledge that the students should have mastered in the Biological Sciences program at Cecil College.

As of the 2017-2018 academic year, the program assessment is based upon scientific papers, posters, and presentations that address the following program goals:

- Accurately select, identify, and describe appropriate/relevant principles of Biology for their project
- Display accurate, relevant data measurement and analysis.
- Effectively use both oral and written media.
- Use critical thinking and the scientific method in design and execution of their project.
- Use appropriate laboratory instrumentation and technology in a professional skilled manner.

The department created rubrics to communicate expectations for these capstone projects to the students. The rubrics created were to assess scientific lab reports, poster presentations, and oral presentations. Although the rubrics were helpful for this round of assessment, upon reflection, it has been determined that they should be revised. Although the rubrics highlighted important aspects of each project, they were still somewhat limiting and did not allow for as precise of an assessment as had been expected. It is likely that the revised rubrics will contain more categories with additional point-value columns for each. The revision of these rubrics will be an ongoing process to improve assessment as well as improving the students' understanding of what is expected of their work. Another consideration for future assessments might be to increase the threshold of success to $75 \%$, instead of the $70 \%$ currently used in this assessment.

## NON-MAJORS

In the past, non-majors were assessed every three years with the college's course assessment program. Beginning in the 2017-2018 academic year, assessment shifted to program assessment, not course assessment. The department continues to assess student learning in each course in many ways. Student critical thinking is assessed by using problem-based learning, which includes development of experimental methods to test the problem, analysis of data, and the drawing of conclusions. Written communication in the form of written reports is assessed by how well research papers and lab reports meet rubric guidelines. Oral communication is assessed as students present their experiment results, also following rubrics designed for the specific assignment. Other methods of assessment include assessing
mastery of subject matter through exams and quizzes. Many instructors will utilize pre and post quizzes to assess learning as well.

## STUDENT FEEDBACK

Students provide formal feedback each semester. This feedback is viewed by the instructor and by administration. These evaluations are taken quite seriously and provide a means for students to constructively provide feedback on what they liked/disliked and any concerns or praises they might have. Depending upon this feedback, courses may be adjusted, remain the same, concerns may result in discussions with faculty members or possible re-assignment of teaching responsibilities.

Informally, many instructors ask students to evaluate the course in terms of most interesting topic, what labs were most beneficial, what students would like to see added/deleted from the course, etc. This informal student feedback helps to guide instructors into what works and what does not work in terms of how course material is presented to best meet learning outcomes and improve student success.

## TEACHING ASSIGNMENTS

The teaching assignments for faculty in the department are decided based upon several factors. Each fulltime faculty member teaches courses based upon their strengths and their academic background. There is also the factor of departmental needs. In some cases, although a faculty member might be an expert in one field, there is a need in another less-represented field that needs to be considered. Generally, there is a discussion on faculty teaching assignments either at department meetings or in one-on-one meetings with the department chair. Adjunct teaching assignments are based upon what time-slots and courses have not been filled by full-time faculty. There is some consideration to adjunct faculty schedules in terms of making their schedule appealing to them. For example, for an adjunct that is teaching several lab courses ( 1 credit courses), the department tries to schedule several of them back-to-back so that the adjunct faculty does not have to drive to campus on multiple days for a 2 -hour lab. Instead, they might be scheduled for 3 labs on one day, so that they would only drive to campus once and stay for at least 6 hours.

## ADJUNCT FACULTY

The biological sciences program has retained many of its adjuncts long-term. Adjunct faculty are consulted on many issues related to the program. Some adjuncts actively participate department-wide planning events including assessment review development and curriculum changes. Adjunct faculty are encouraged to attend the bi-annual All College Day activities as well as the fall semester Welcome Back dinner. These are great activities that allow the opportunity for adjunct faculty to interact with other instructors and exchange ideas and information. The full-time faculty supports the adjunct faculty by providing syllabi, schedules, and course materials from previous instructors to help guide them as they develop their own style for the course.

## RESOURCES

The biological sciences program has made great strides in keeping current with technology. Our biology/environmental science majors, along with other students taking chemistry, have been able to run an NMR (nuclear magnetic resonance) thanks to the recent purchase of this instrument through chemistry funds. The equipment that is used for the Principles of Biology I and II labs is also current and sufficient for the number of students in the class. In microbiology, a biological sciences program elective that sees high enrollment primarily from nursing students, the microscopes are in need of replacement. These microscopes get heavily used and the usage includes immersion oil, which, over time, damages the scopes. The current scopes have not held up well to the needs of the course.

The biology-related library holdings are adequate for the needs of the program. Administrative support of the biological sciences program are also adequate. There are no concerns or issues associated with these two areas; the program is very well-supported.

It has been about seven years since the science labs on the $4^{\text {th }}$ floor of the Arts \& Sciences building were renovated. These renovations have greatly improved the laboratories in terms of space, instrumentation, IT equipment, and prep lab function. The microbiology and A\&P workspaces are heavily used by students as are the open spaces that include benches, swivel chairs, white boards, etc. The conference room has been converted primarily to a science tutor room, making tutors more visible to students. These tutors keep very busy with one-time visits from students as well as students who consistently meet with the tutors each week.

## RECOMMENDATIONS

As a result of this program review, the department recommends:

- That the faculty continues to engage with marketing concerning photo opportunities in the biological sciences to bolster advertisement of the program by increasing the program's visibility on social media.
- The faculty need to develop an assessment test of biology knowledge that students with no general biology background need to take prior to enrollment in a 200-level biology course. Poor results on this assessment will not require students to take general biology, but will allow students to make an informed decision about taking the course.
- That articulations with University of Delaware as well as universities in the Maryland system are developed.
- That the faculty and students should develop an active biological sciences club that develops a sense of community for the students and increases awareness of academic and career opportunities.
- That faculty brainstorm on ways to improve the pass rate in some of the lower pass rate biology courses. (see data on page 4)
- That faculty develop a plan to increase the retention of students that go into the Principles of Biology II course after completing the Principles of Biology I course.
- That faculty work to develop a higher level Environmental Science course that is geared towards the students majoring in the biological sciences/environmental science concentration. This would allow students to delve into the topics and concepts in greater detail.

