



DEPARTMENT OF  
HIGHER EDUCATION &  
WORKFORCE DEVELOPMENT

## New Program Report

**Date Submitted:**

08/30/2021

**Institution**

Missouri Southern State University

**Site Information**

**Implementation Date:**

8/1/2022 12:00:00 AM

**Added Site(s):**

**Selected Site(s):**

Missouri Southern State University, 3950 E. Newman Road, Joplin, MO, 64801-1595

**CIP Information**

**CIP Code:**

260102

**CIP Description:**

A general, program that focuses on the integrative scientific study of biological issues related to health and medicine, or a program in one or more of the biomedical sciences that is undifferentiated as to title. Includes instruction in any of the basic medical sciences at the research level; biological science research in biomedical faculties; and general studies encompassing a variety of the biomedical disciplines.

**CIP Program Title:**

Biomedical Sciences, General

**Institution Program Title:**

Biomedical Sciences

**Degree Level/Type**

**Degree Level:**

Bachelor's Degree

**Degree Type:**

Bachelor of Science

**Options Added:**

**Collaborative Program:**

N

**Mode of Delivery**

**Current Mode of Delivery**

Classroom

**Student Preparation**

**Special Admissions Procedure or Student Qualifications required:**

Admissions and student qualifications for this program follow institutional requirements. There are no special preparation requirements for this program.



DEPARTMENT OF  
HIGHER EDUCATION &  
WORKFORCE DEVELOPMENT

**New Program Report**

Specific Population Characteristics to be served:

n/a

**Faculty Characteristics**

Special Requirements for Assignment of Teaching for this Degree/Certificate:

Consistent with HLC Faculty Qualifications, faculty must hold a master's or doctoral degree in a field applicable to the courses being taught.

Estimate Percentage of Credit Hours that will be assigned to full time faculty:

100% of credit hours will be delivered by full-time faculty.

Expectations for professional activities, special student contact, teaching/learning innovation:

Standard faculty teaching, service, and scholarship requirements.

**Student Enrollment Projections Year One-Five**

Year 1	Full Time: 120	Part Time: 5	
Year 2	Full Time: 125	Part Time: 5	
Year 3	Full Time: 135	Part Time: 5	Number of Graduates: 40
Year 4	Full Time: 140	Part Time: 5	
Year 5	Full Time: 145	Part Time: 5	Number of Graduates: 45

**Percentage Statement:**

n/a

**Program Accreditation**

Institutional Plans for Accreditation:

This program does not have a specific accreditation available; it will be regionally accredited with other university programs by the Higher Learning Commission.

**Program Structure**

**Total Credits:**

120

**Residency Requirements:**

The last 30 of 36 credit hours will be completed as MSSU courses. In addition, one-half of the credit required for the major will be completed within the major and the major department. Finally, one-half of upper division (300+ level courses) will be completed within the major and within the major department. These are institutional requirements.

**General Education Total Credits:**

42

**Major Requirements Total Credits:**

81

**Course(s) Added**

COURSE NUMBER	CREDITS	COURSE TITLE
BIO 231	5	General and Medical Microbiology



DEPARTMENT OF  
HIGHER EDUCATION &  
WORKFORCE DEVELOPMENT

### New Program Report

CHEM 301	5	Organic Chemistry I
MATH 140 or MATH 150	5	Algebra & Trigonometry or Calculus w/Analytic Geometry
CHEM 142	5	General Chemistry II
BIO 389	3	Fundamentals of Experimental Design and Statistics
PHYS 160	4	Elementary College Physics I
BIO 201 or BIO 331	5	Human Anatomy or Comparative Vertebrate Anatomy
BIO 301	4	Human Physiology
CHEM 140/141	5	General Chemistry I/Lab
BIO 108/109	4	Principles of Biology I/Lab
BIO	11	Electives w/BIO prefix
CHEM 302	5	Organic Chemistry II
BIO 305	4	Genetics
BIO 111	4	Principles of Biology II
BIO 210	4	Molecular Cell Biology
CHEM 350	3	Biochemistry I
PHYS 162	4	Elementary College Physics II
BIO 400	1	Biology Capstone

**Free Elective Credits:**

6

**Internship or other Capstone Experience:**

Students must complete a 1 credit hour capstone course during their senior year.

**Assurances**

I certify that the program is clearly within the institution's CBHE-approved mission. The proposed new program must be consistent with the institutional mission, as well as the principal planning priorities of the public institution, as set forth in the public institution's approved plan or plan update.

I certify that the program will be offered within the proposing institution's main campus or CBHE-approved off-site location.

I certify that the program will not unnecessarily duplicate an existing program of another Missouri institution in accordance with 6 CSR 10-4.010, subsection (9)(C) Submission of Academic Information, Data and New Programs.

I certify that the program will build upon existing programs and faculty expertise.

I certify that the program can be launched with minimal expense and falls within the institution's current operating budget.

I certify that the institution has conducted research on the feasibility of the proposal and it is likely the program will be successful. Institutions' decision to implement a program shall be based upon demand and/or need for the program in terms of meeting present and future needs of the locale, state, and nation based upon societal needs, and/or student needs.



DEPARTMENT OF  
HIGHER EDUCATION &  
WORKFORCE DEVELOPMENT

**New Program Report**

Contact Information

First and Last Name: WENDY  
MCGRANE

Email: [mcgrane-w@mssu.edu](mailto:mcgrane-w@mssu.edu)

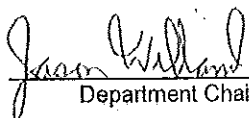
Phone: 417-625-9801

MISSOURI SOUTHERN STATE UNIVERSITY  
School Curriculum Oversight Committee/Academic Policies Committee

Proposal for a NEW MAJOR or CERTIFICATE

1. School: Arts and Sciences Department: Biology and EH Date: 4/6/2021
2. Title: Bachelor of Science in Biomedical Sciences Course #: N/A  
CIP Code: 26.0102
3. New Major or Certificate: B.S. in Biomedical Sciences and New Option: Tracks under the B.S. in Biology
4. Date first offered: August 2022  
Attach information for items 5-12 as needed.
5. Describe the need for this new major including evidence of student demand for the program and market or societal need for the skills being developed. See attached.
6. Is the major interdisciplinary? Yes , No . If so, has it been approved by all departments concerned? Yes , No . If Interdisciplinary, how will coordination between the departments be accomplished? N/A
7. Are there similar programs offered at other Missouri institutions? Yes , No . If so, how is this program unique or different from existing programs? See attached.
8. Describe the curriculum requirements for the major. See attached.
9. What are the student learning objectives for the program? See attached.
10. How will the objectives be assessed? See attached.
11. If this major is approved –
  - a. Will additional staff be needed? Yes , No . If yes, describe.
  - b. Will additional space, equipment, special library materials, or any major expense be involved? Yes , No . If yes, specify program needs.
12. Include any additional information about the program that would be helpful.

APPROVED

  
Department Chair

Date: 4/6/2021

School Dean

Date: \_\_\_\_\_

For office use only. Dates Approved:

School Curriculum Oversight Committee \_\_\_\_\_

Academic Policies \_\_\_\_\_

Faculty Senate \_\_\_\_\_

Board of Governors \_\_\_\_\_

**Form 5 - Proposal for New Major or Certificate  
Attachment**

Proposal No. \_\_\_\_\_

**5. Describe the need for this new major including evidence of student demand for the program and market or societal need for the skills being developed.**

Currently, 210 out of 334 students (62.9 % of students enrolled for spring 2021) seeking a B.S. in Biology at MSSU are pursuing their degree in pre-professional areas (pre-dental, pre-medical/physician assistant, pre-optometry, pre-pharmacy, and pre-veterinary medicine). Students with an emphasis in pre-physical therapy/pre-occupational therapy were excluded from this grouping because of a difference in prerequisites for their professional programs. The pre-professional emphases have been the most sought areas under our current B.S. in Biology. We anticipate that the current interest in these pre-professional areas will continue at about the same level or greater in the future.

**Table 1.** The data below shows enrollment of students with a pre-professional emphasis over the last five years at MSSU. The percentage of pre-professional students seeking a B.S. degree in Biology over the last five years have comprised nearly 60% of our total student enrollment within the department. The numbers provided represent enrollment at the beginning of the academic year (fall semester).

Academic Year	Pre-professional students	Departmental Total	Percentage Pre-Professional
2016-2017	249	417	59.7%
2017-2018	272	467	58.2%
2018-2019	290	484	59.9%
2019-2020	265	448	59.2%
2020-2021	229	355	64.5%

The Bureau of Labor Statistics (BLS) noted in their Occupational Outlook Handbook that the projected growth rate (2019-2029) for veterinarians is much faster than average, with > 50,000 projected new jobs over the next ten years. This is a 16% projected growth rate by 2029 which is currently much higher than all other occupations. According to Today's Veterinary Practice (TVP), some of the factors that are leading to this increase in demand for veterinarians are the growing pet population and new advanced treatments available for aging pets. In 2018, nearly two-thirds of all households in the United States owned a pet, compared to half of all U.S. households in 1988. While cats and dogs comprise the greatest number of veterinary visits, large-animal veterinarians are also in high demand. The American Veterinary Medical Association (AVMA) reported that Missouri and other nearby states (Kansas, Nebraska, Oklahoma, Texas) need large-animal veterinarians, and that at least five counties in each state with high livestock numbers do not have access to a large-animal veterinarian. Of the estimated 70,500 practicing veterinarians in the United States, only about 5,000 practice large-animal medicine. In the mostly rural areas of southwest Missouri and the surrounding four-state region, there is a demand for large-animal veterinarians. The projected demand for veterinarians may be complicated, however, by the limited number of accredited veterinary programs in the United States (currently there are 30 accredited programs). The University of Missouri College of Veterinary Medicine typically receives about 1,250 applications for their veterinary program each year, but only accept 125 new students (about a 10% acceptance rate; AAVMC, 2019). To put this into a larger perspective, approximately 2,700 seats are available each year for all the veterinary programs in the United States but there are >5,000 applicants for these seats. The Biology department at

MSSU is in a unique position because we currently have two faculty that hold a Doctor of Veterinary Medicine from the University of Missouri-Columbia. Both of these faculty have not only completed a D.V.M., but have also practiced veterinary medicine in the past and offer pre-veterinary students a unique insight into the requirements for veterinary school.

Before the COVID-19 pandemic started in 2020, the federal Health Resources and Services Administration estimated that there was already a shortage of at least 20,000 physicians in the United States, particularly in rural communities. The American Association of Medical Colleges (AAMC) projects that by 2033 there will be a shortage of 50,000-140,000 physicians in the United States. This projected shortage of physicians is due to the aging U.S. population which requires more care and future physician retirements. It is estimated that one-third of the U.S.'s physicians are 60 years or older, and that over half are 50 years or older. These physician shortages will be in both *primary* and *specialty* care, with estimated shortages of 21,000 primary care physicians, 10,000 medical specialists, 17,000 surgical specialists, and 17,000 physicians in other specialties such as anesthesiology, pathology, and neurology. Southwest Missouri and the surrounding regions represent the typical rural communities that will be affected by these projected shortages of physicians. The Biology department at MSSU currently has two faculty that hold a Doctorate in Medicine. One of these faculty has a clinical background, and with this she is able to offer real-world experience both in and out of the classroom. She teaches our Advanced Human Dissection course which gives students hands on experience with human cadavers. Anatomy courses at other universities typically use a simulation or model approach to dissections instead of a hands-on approach. With the increased competition to get into medical programs, our students are well-prepared for the rigors of these programs after graduating from MSSU because of courses like the Advanced Human Dissection class.

The Bureau of Labor Statistics (BLS) stated that the projected demand for optometrists and dentists over the next ten years (2019-2029) is as fast as the average for other occupations with an expected creation of 5,000-10,000 new jobs. The projected demand for optometrists is anticipated to create ~10,000 new jobs by 2029, mainly due to the aging population of Baby Boomers and Gen-Xers and optometrists nearing retirement age. One of our two faculty with a Doctor of Medicine is trained in ophthalmology. This provides real-world experience to our students in the classroom and outside of the classroom, primarily through advising students interested in optometry. Similarly, the demand for dentists has grown over the past decade because of the aging population of the United States. In 2018, the Health Resources and Services Administration (HRSA) ranked Missouri #9 in the top 10 states with the highest number of people living in dental health professional shortage areas (HPSA's). The HRSA identifies areas as underserved if a population falls below one dentist per 5,000 people. The HRSA estimates that two-thirds of the designated areas for dentist shortages are in rural areas such as southwestern Missouri.

The Bureau of Labor Statistics (BLS) projects in the Occupational Outlook Handbook that the demand for pharmacists will decline slightly (~3%) of the next ten years (2019-2029). Much of this projected decline is based on prescriptions being filled through mail order or online rather than in pharmacies and drug stores. Also, pharmacy technicians continue to perform more of the tasks that pharmacists would do such as collecting patient information and preparing some medications for patients. The previously mentioned factors for decline may balance out, though, with an increased demand for pharmacists in hospitals and clinics. It is expected that pharmacists will be needed to prescribe medications and perform regular tasks such as blood sugar and cholesterol testing.

While we would not have the only Biomedical Sciences program within the state of Missouri, our program would benefit the rural communities of southwestern Missouri and the surrounding regions by offering a curriculum that prepares students for professional programs in dentistry, medical sciences, optometry, pharmacy, and veterinary medicine.

We project that we will have at least 15 graduates with the B.S. in Biomedical Sciences annually based on the number of students that have graduated with a pre-professional emphasis in Biology.

Academic Year	Number of Graduates
2015-2016	24
2016-2017	36
2017-2018	21
2018-2019	40
2019-2020	56

**7. Are there similar programs offered at other Missouri institutions? If so, how is this program unique or different from existing programs?**

There are five similar Biomedical Sciences programs offered at the following Missouri institutions:

1. The University of Missouri-Columbia
2. Missouri State University
3. Northwest Missouri State University
4. Southeast Missouri State University
5. Cottey College

Our program is different from these existing programs because it broadly encompasses all pre-professional areas (pre-dental, pre-medicine/physician's assistant, pre-optometry, pre-pharmacy, and pre-veterinary medicine) excluding pre-physical therapy/pre-occupational therapy. 1) The Biomedical Sciences program at the **University of Missouri-Columbia** is only offered at the graduate level (Comparative Veterinary Medicine with a Pathobiology emphasis or Veterinary Medicine/Surgery emphasis) while our program is only available to undergraduate students seeking a bachelor's of science degree. 2) **Missouri State University** offers a biomedical sciences minor under their Cell and Molecular Biology B.S. or Clinical Laboratory Sciences-Medical Technology B.S. This differs from our program because we are offering a bachelor of science degree. 3) **Northwest Missouri State University** has a similar curriculum to our program with the exception of pre-pharmacy (they offer pre-chiropractic in place of pre-pharmacy). 4) The Biomedical Sciences program at **Southeast Missouri State University** offers preparation for allopathic medicine, osteopathic medicine, chiropractic medicine, optometry, or dentistry. The curriculum for Biomedical Sciences at Southeastern Missouri State University is similar to MSSU's, but it differs because there is no concentration in pre-pharmacy or pre-veterinary medicine. 5) The Health and Biomedical Sciences program at **Cottey College** is specific in preparing students for entry into Doctor of Medicine (M.D.), Doctor of Osteopathic Medicine (D.O.), Doctor of Podiatric Medicine (D.P.M.), Doctor of Optometry (O.D.), Doctor of Dental Medicine (D.D.M.), Physician Assistant (P.A.) and Doctor of Pharmacy (Pharm.D.) programs after completing a bachelor's degree. Our curriculum includes these areas and pre-veterinary medicine.



The following Missouri universities offer a concentration or emphasis in biomedical sciences under a B.S. in Biology:

- Central Missouri University
- University of Missouri-Kansas City
- Maryville University

While the curriculum for these concentrations may be similar to our program, they are part of a Biology degree and are not independent programs.

### 8. Describe the curriculum requirements for the major.

#### Bachelor of Science (B.S.) in Biomedical Sciences

The B.S. in Biomedical Sciences requires upper and lower division coursework from the Biomedical Sciences core and electives chosen in consultation with an academic advisor that would be applicable to the professional program the student seeks after graduating from MSSU. The pre-professional areas this degree would serve include pre-dental (BI06), pre-medical/physician's assistant (BI07), pre-optometry (BI08), pre-pharmacy (BI09), and pre-veterinary medicine (BI10). The curriculum requirements are described below.

<b>General Education (CORE 42) and Institutional Requirements (excludes duplicate science/math courses)</b>			<b>33</b>
<b>Required Courses – Biomedical Sciences Core</b>			<b>70</b>
BIO 108/109	Principles of Biology I/Lab	4	
BIO 111	Principles of Biology II	4	
BIO 201 OR* <sup>†</sup> BIO 331	Human Anatomy OR Comparative Vertebrate Anatomy	5	
BIO 210	Molecular Cell Biology	4	
BIO 231	General and Medical Microbiology	5	
BIO 301 <sup>†</sup>	Human Physiology	4	
BIO 305	Genetics	4	
BIO 389	Fundamentals of Experimental Design and Statistics	3	
BIO 400	Biology Capstone	1	
MATH 140 OR MATH 150	Algebra & Trigonometry (or MATH 130/135) OR Calculus with Analytic Geometry I	5	
CHEM 140/141	General Chemistry I/Lab	5	
CHEM 142	General Chemistry II	5	
CHEM 301	Organic Chemistry I	5	
CHEM 302	Organic Chemistry II	5	
CHEM 350	Biochemistry I	3	
PHYS 160	Elementary College Physics I	4	
PHYS 162	Elementary College Physics II	4	
BIO	Electives (200 level or higher) – Applicable Electives Below		<b>11</b>
	BIO 201 OR*	Human Anatomy OR Comparative Vertebrate Anatomy	5

	BIO 331		
	BIO 220	CURE (Classroom-Based Undergraduate Research Experience)	1-5
	BIO 240	Radiation Biology	3
	BIO 297	Independent Research in Biology**	1-3
	BIO 298	Topics in Biology	1-5
	BIO 299	Independent Study in Biology**	1-5
	BIO 308	Pathophysiology	3
	BIO 350	Techniques in Microbiology	2
	BIO 352	Biomes	1-3
	BIO 361	Parasitology	4
	BIO 362	Virology	3
	BIO 370	Environmental Health and Safety	3
	BIO 375	Disease Vector Control	1
	BIO 380	Epidemiology	3
	BIO 390	Research and Statistical Methods in Biology	3
	BIO 412	Mammalogy	4
	BIO 415	Herpetology	4
	BIO 420	Advanced CURE (Classroom-Based Undergraduate Research Experience)	1-5
	BIO 433	Histology	4
	BIO 442	Pathogenic Bacteriology	5
	BIO 445	Reproductive Physiology	4
	BIO 455	Lab Assistant Practicum**	1-2
	BIO 456	Immunology	4
	BIO 464	Advanced Cell Biology	3
	BIO 475	Advanced Human Dissection	4
	BIO 491	Internship in Biology**	1-4
	BIO 492	Service Learning in Biology**	1-3
	BIO 495	Roots of Science	2-3
	BIO 497	Advanced Independent Research in Biology**	1-3
	BIO 498	Advanced Topics in Biology	1-5
	BIO 499	Advanced Independent Study in Biology**	1-5
<b>Electives</b>			<b>6</b>
<b>Total Hours</b>	<i>Must meet all other baccalaureate degree requirements.</i>		<b>120</b>

Students must complete 39 upper division credit hours (300-level courses or above).

Students must consult with their academic advisor for suggestions on related elective courses or other elective courses that will assist the student in attaining acceptance into a professional program.

\*If both BIO 201 and BIO 331 are taken, one course will count as a requirement and the other course will count as a Biology elective.

\*\*Combined hours from BIO 297, 299, 455, 491, 492, 497, and 499 courses may not exceed 4 hours toward the B.S. in Biomedical Sciences degree.

†BIO 121 and BIO 221 will not fulfill these requirements.

### Bachelor of Science (B.S.) in Biology

We propose to change the current B.S. in Biology degree to be comprised of the following three tracks: Ecology, Evolution, and Conservation (EEC), General Biology, and Pre-Physical Therapy/Pre-Occupational Therapy. The EEC track would include our current Ecology/Marine Biology/Conservation degree code (BIO2). The General Biology track would include our current Biotechnology/Microbiology/Genetics (BIO1) and General Biology or Undecided (BIO4) degree codes. The Pre-Physical Therapy/Pre-Occupational Therapy track would include our current Phys-Occup Therapy (BIO5) degree code. The curriculum requirements for the three tracks are described below. It should also be noted that current Biology degree codes BIO6-BIO10 and BIO20 will be included in the B.S. in Biomedical Sciences.

<b>B.S. in Biology (Ecology, Evolution and Conservation Track, BIO2)</b>			
<b>General Education CORE 42 Requirements (excludes duplicate science/math courses)</b>			<b>33</b>
<b>Biology Requirements</b>			<b>48-49</b>
BIO 108/109	Principles of Biology I and lab	4	
BIO 111	Principles of Biology II	4	
BIO 210 OR* BIO 231	Molecular Cell Biology OR General and Medical Microbiology	4-5	
BIO 300	Evolution	3	
BIO 302	Conservation Biology	3	
BIO 304	Introduction to Geographic Information Systems	3	
BIO 390 OR BIO 498	Research and Statistical Methods in Biology OR Fundamentals of Experimental Design and Statistics	3	
BIO 400	Biology Capstone	1	
BIO 402 OR BIO 481	General Ecology OR Aquatic Ecology	4	
<b>Pick 2 field based elective courses (1 animal-based and 1 plant-based)</b>			<b>8</b>
BIO 322	Taxonomy of Flowering Plants	4	
BIO 332	Introduction to Entomology	4	
BIO 361	Parasitology	4	
BIO 412	Mammalogy	4	
BIO 415	Herpetology	4	
<b>Electives (200 level or higher) – See below</b>			<b>13</b>
BIO 220	CURE (Classroom-Based Undergraduate Research Experience)	1-5	
BIO 297	Independent Research in Biology**	1-3	
BIO 298	Topics in Biology	1-5	
BIO 299	Independent Study in Biology**	1-5	
BIO 305	Genetics***	4	
BIO 312	Environmental Biology	3	
BIO 316	Economic Botany	3	
BIO 331	Comparative Vertebrate Anatomy	5	
BIO 350	Techniques in Microbiology	2	
BIO 352	Biomes	1-3	
BIO 362	Virology	3	
BIO 370	Environmental Health and Safety	3	

BIO 375	Disease Vector Control	1	
BIO 380	Epidemiology	3	
BIO 404	Applications in Geographic Information Systems	3	
BIO 406	Restoration Ecology	3	
BIO 420	Advanced CURE (Classroom-Based Undergraduate Research Experience)	1-5	
BIO 440	Plant Pathology	4	
BIO 442	Pathogenic Bacteriology	5	
BIO 455	Lab Assistant Practicum**	1-2	
BIO 491	Internship in Biology**	1-4	
BIO 492	Service Learning in Biology**	1-3	
BIO 497	Advanced Independent Research in Biology**	1-3	
BIO 498	Advanced Topics in Biology	1-5	
BIO 499	Advanced Independent Study in Biology**	1-5	
<b>Supporting Requirements</b>			<b>18</b>
MATH 130	College Algebra	3	
CHEM 140/141	General Chemistry I and lab	5	
CHEM 142	General Chemistry II	5	
CHEM 201 OR CHEM 301	Analytical Chemistry OR Organic Chemistry I	5	
<b>Electives</b>			<b>22</b>
<b>Total Hours</b>	Must include at least 39 upper division (300-400 level) hrs		<b>120</b>

\*If both Bio 210 and Bio 231 are taken, one course will count as a requirement and the other course will count as a Biology elective.

\*\*Combined hours from BIO 297, 299, 455, 491, 492, 497, and 499 courses may not exceed 4 hours toward the B.S. in Biology degree.

\*\*\*This course is highly recommended.

<b>B.S. in Biology (General Biology Track, BI01 and BI04)</b>			
<b>General Education CORE 42 Requirements (excludes duplicate science/math courses)</b>			<b>33</b>
<b>Biology Requirements</b>			<b>44</b>
BIO 108/109	Principles of Biology I and lab	4	
BIO 111	Principles of Biology II	4	
BIO 210	Molecular Cell Biology	4	
BIO 231	General and Medical Microbiology	5	
BIO 305	Genetics	4	
BIO 390 OR BIO 498	Research and Statistical Methods in Biology OR Fundamentals of Experimental Design and Statistics	3	
BIO 400	Biology Capstone	1	
BIO 402 or 481	General Ecology OR Aquatic Ecology	4	
<b>Biology Electives (200 level or higher) – See below</b>			<b>14</b>
BIO 201	Human Anatomy	5	
BIO 220	CURE (Classroom-Based Undergraduate Research Experience)	1-5	
BIO 221	Human Anatomy and Physiology II	5	
BIO 240	Radiation Biology	3	
BIO 297	Independent Research in Biology*	1-3	

BIO 298	Topics in Biology	1-5	
BIO 299	Independent Study in Biology*	1-5	
BIO 300	Evolution	3	
BIO 301	Human Physiology	4	
BIO 302	Conservation Biology	3	
BIO 304	Introduction to Geographic Information Systems	3	
BIO 308	Pathophysiology	3	
BIO 312	Environmental Biology	3	
BIO 316	Economic Botany	3	
BIO 322	Taxonomy of Flowering Plants	4	
BIO 331	Comparative Vertebrate Anatomy	5	
BIO 332	Introduction to Entomology	4	
BIO 350	Techniques in Microbiology	2	
BIO 352	Biomes	1-3	
BIO 361	Parasitology	4	
BIO 362	Virology	3	
BIO 370	Environmental Health and Safety	3	
BIO 375	Disease Vector Control	1	
BIO 380	Epidemiology	3	
BIO 404	Applications in Geographic Information Systems	3	
BIO 406	Restoration Ecology	3	
BIO 412	Mammalogy	4	
BIO 415	Herpetology	4	
BIO 420	Advanced CURE (Classroom-Based Undergraduate Research Experience)	1-5	
BIO 433	Histology	4	
BIO 440	Plant Pathology	4	
BIO 442	Pathogenic Bacteriology	5	
BIO 455	Lab Assistant Practicum*	1-2	
BIO 456	Immunology	4	
BIO 460	Techniques in Biotechnology	3	
BIO 464	Advanced Cell Biology	3	
BIO 475	Advanced Human Dissection	4	
BIO 491	Internship in Biology*	1-4	
BIO 492	Service Learning in Biology*	1-3	
BIO 497	Advanced Independent Research in Biology*	1-3	
BIO 498	Advanced Topics in Biology	1-5	
BIO 499	Advanced Independent Study in Biology*	1-5	
<b>Supporting Requirements</b>			<b>21-24</b>
MATH 130 OR MATH 150	College Algebra OR Calculus with Analytic Geometry I	3-5	
CHEM 140/141	General Chemistry I and lab	5	
CHEM 142	General Chemistry II	5	
CHEM 201 OR CHEM 301	Analytical Chemistry OR Organic Chemistry I	5	

PHYS 150 OR PHYS 160	Environmental Physics OR Elementary College Physics I	3-4	
<b>Electives</b>			<b>19-23</b>
<b>Total Hours</b>	Must include at least 39 upper division (300-400 level) hrs		<b>120</b>

\*Combined hours from BIO 297, 299, 455, 491, 492, 497, and 499 courses may not exceed 4 hours toward the B.S. in Biology degree.

<b>B.S. in Biology (Pre-Physical Therapy/Occupational Therapy Track, BI05)</b>			
<b>General Education CORE 42 Requirements (excludes duplicate science/math courses)</b>			<b>33</b>
<b>Required Courses</b>			<b>74</b>
BIO 108/109	Principles of Biology I and lab	4	
BIO 111	Principles of Biology II	4	
BIO 201	Human Anatomy	5	
BIO 231	General and Medical Microbiology	5	
BIO 301	Human Physiology	4	
BIO 390 OR PSY 320	Research and Statistical Methods in Biology OR Applied Statistics for the Behavioral and Natural Sciences	3	
BIO 400	Biology Capstone	1	
CHEM 140/141	General Chemistry I and lab	5	
CHEM 142	General Chemistry II	5	
HS 111	Medical Terminology	3	
MATH 130	College Algebra	3	
MATH 135	Trigonometry	3	
PHYS 160	Elementary College Physics I	4	
PHYS 162	Elementary College Physics II	4	
PSY 200 OR 201 OR 205	Child Development OR Adolescent Development OR Child and Adolescent Development	3	
PSY 432	Abnormal Psychology	3	
<b>Biology Electives (200 level or higher) – See below</b>			<b>9</b>
<b>BIO 308</b>	<b>Pathophysiology*</b>	<b>3</b>	
<b>BIO 331</b>	<b>Comparative Vertebrate Anatomy*</b>	<b>5</b>	
<b>BIO 456</b>	<b>Immunology*</b>	<b>3</b>	
BIO 210	Molecular Cell Biology	4	
BIO 220	CURE (Classroom-Based Undergraduate Research Experience)	1-5	
BIO 240	Radiation Biology	3	
BIO 297	Independent Research in Biology**	1-3	
BIO 298	Topics in Biology	1-5	
BIO 299	Independent Study in Biology**	1-5	
BIO 305	Genetics	4	
BIO 350	Techniques in Microbiology	2	
BIO 352	Biomes	1-3	
BIO 362	Virology	3	
BIO 420	Advanced CURE (Classroom-Based Undergraduate Research Experience)	1-5	
BIO 433	Histology	4	
BIO 442	Pathogenic Bacteriology	5	
BIO 455	Lab Assistant Practicum**	1-2	

BIO 460	Techniques in Biotechnology	3	
BIO 464	Advanced Cell Biology	3	
BIO 475	Advanced Human Dissection	4	
BIO 491	Internship in Biology**	1-4	
BIO 492	Service Learning in Biology**	1-3	
BIO 497	Advanced Independent Research in Biology**	1-3	
BIO 498	Advanced Topics in Biology	1-5	
BIO 499	Advanced Independent Study in Biology**	1-5	
BH 378	Occupational Health and Safety	3	
<b>Electives</b>	<i>Choose from the Courses Below:</i> CHEM 301 Organic Chemistry I (5) COMM 215 Interpersonal Communication (3) COMM 304 Small Group Communication (3) KINE 220 First Aid and Sport Safety (2) KINE 305 Aging and Health (2) KINE 342 Biomechanical Analysis of Movement (3) KINE 385 Nutrition for Development (3) KINE 431 Physiology of Exercise (3) KINE 450 Prevention and Care of Injuries (3)		<b>5</b>
<b>Total Hours</b>	Must include at least 39 upper division (300-400 level) hrs		<b>120</b>

\*Recommended electives

\*\*Combined hours from BIO 297, 299, 455, 491, 492, 497, and 499 courses may not exceed 4 hours toward the B.S. in Biology degree.

## 9. What are the student learning objectives for the program?

### a) Program goals for the B.S. in Biomedical Sciences:

**Goal 1: The student will be well prepared to enter a professional or graduate program upon completion of a B.S. in Biomedical Sciences.**

- 1.1 The student will develop a strong foundation in the biological sciences, chemistry, and physics to prepare for a career post-baccalaureate.
- 1.2 The student will be able to communicate effectively in writing and speech.
- 1.3 The student will demonstrate satisfactory laboratory skills.
- 1.4 The student, working with their academic advisor, will choose the appropriate elective courses to succeed after completion of a bachelor's degree in Biomedical Sciences.
- 1.5 The student will pursue various opportunities which will make them competitive when applying to professional programs. These opportunities include internships, independent research, service learning projects, and/or participation in registered student organizations (RSO's).

**Goal 2: Should a student choose to pursue a different career path other than a professional or graduate program, students will be prepared for employment in various biomedical fields.**

- 2.1 The student, working with their academic advisor, will identify an alternate career path other than the original professional track.
- 2.2 The student will be able to communicate effectively in writing and speech.
- 2.3 The student will demonstrate satisfactory laboratory skills.

*b) Student learning objectives for the B.S. degree in Biomedical Sciences:*

The learning objectives include:

1. Demonstrate scientific literacy through discussion, summary, and writing of peer-reviewed literature.
2. Understand statistics, such that a student can independently interpret results from various kinds of scientific studies.
3. Be proficient in a wide range of laboratory skills to include: microscopy, dissection, pipetting, taking measurements and making conversions using the metric system, biochemical testing/staining procedures, sterile technique, PCR, electrophoresis, and basic lab safety.

\*The program goals will remain unchanged for the B.S. in Biology.

**10. How will objectives be assessed?**

For the specific B.S. in Biomedical Sciences goals and student learning objectives, assessment will occur within the Biomedical Core courses where each goal and learning objectives have been identified. Assessment includes student attainment of a grade of 'C' or better.

For learning objectives covered in other aspects of the degree program, those will be assessed at a course level and within the context of general education goals and competencies. Additionally, students will be required to pass an exit exam before meeting the requirements for graduation.

\*The learning objectives will remain unchanged for the B.S. in Biology.