ACADEMIC POLICIES COMMITTEE
LONG FORM PROPOSAL TEMPLATE

- Proposals should use this long form if they:
  - Need faculty and/or WASC approval;
  - Request elimination, addition or revision of multiple courses and/or courses impacting other departments or schools.
  - Request elimination, addition or revision of a major, minor, concentration or credential program.
- All submitted proposals need to adhere to the following template in order to facilitate the work of the Academic Policies Committee.
- **Please read the attached "APC Proposal Reference Information" before completing this form.**
- **For ease of APC Committee reading, please submit your responses in BLUE text.**

SECTION ONE: WHO

1. **Academic Unit Name:** Biology
2. **Recorded Department/School Vote** (Please provide the number and percentage of department/school faculty who voted in approval for this proposal):
   12 for approval, which is 100% of our full-time faculty.
3. **Impact on Other Department(s)/School(s)** (Are there other departments/schools impacted by this proposal? If so, how did the other department[s]/school[s] vote on this proposal?): Chemistry due to the joint Biology-Chemistry and Environmental Science majors, and 5/5 Chemistry approved the proposal.
4. **Impact on Services:**
   a. Ryan Library:
      i. What new library acquisitions, if any, will be needed to support the proposed changes (if none, please state that):
         None
      ii. Person and Date of Contact: NA
   b. Instructional Technology:
      i. How many new online/hybrid courses does this proposal include:
         None
      ii. How many instructors will need online training or course development assistance over the first two sessions if this proposal is approved:

NA

iii. Person and Date of Contact: NA

SECTION TWO: WHAT

1. **Overall Proposal Description (**In one sentence, describe the nature of the proposed changes or the proposed new academic offering): We are proposing minor changes to the Biology-BA major and the Biology-Chemistry major, and we are proposing a revision of one course that is relevant to Biology-BA/BS majors, Biology-Chemistry majors, and some minors. We are also adding some courses to the catalog at the request of Records.
2. **Items** (Please describe each item of the proposal with a phrase or one-sentence abstract. Examples might be, "Item 1: To drop XXX course from XX program. Item 2: To add XX course as a requirement", etc. Some proposals will only have 1 item. Add item lines as needed.):
    a. Item 1: To add BIO490 – Internships in Biology (1-3 units) as an upper-division elective for Biology-BA majors.
    b. Item 2: To replace BIO420 (Vertebrate Physiology) with BIO423 (Advanced Human Physiology) as an elective for Biology-BA/BS majors, Biology-Chemistry majors, Cell & Molecular Biology minors, Organismal Biology minors, and Science Business/Marketing minors.
    c. Item 3: To add more upper-division Biology electives to the options for the Biology-Chemistry major (BIO312, BIO323, BIO325, BIO333, BIO340, BIO363, BIO410, BIO430, BIO470, BIO473) and require at least 5 units of this coursework.
    d. Item 4: To add the courses EVS396 (Advanced Biology), EVS397 (Advanced Ecology), EVS398 (Advanced Ecological Applications) and EVS399 (Public Policy and Stewardship) to the Environmental Science major and to the Science Business/Marketing minors with an Ecology emphasis in order to serve as placeholder courses for transfer units for off-campus field experiences (as requested by Records).
    e. Item 5: To remove the co-requisite of MTH363 from BIO301.
    f. Item 6: To add the pre-requisite of BIO345 to BIO301 and consequently renumber BIO301 to BIO352.

SECTION THREE: WHY

1. **General** Rationale (Please provide a one-sentence rationale for this proposal.):
   These changes are driven by program review, student requests, experience teaching the affected courses, and Records.
2. **Mission (**How do the proposed changes support the mission of the university?):

The proposed changes support the mission and learning outcomes of the Biology Department and therefore the mission of PLNU because we previously aligned the Biology mission with the PLNU mission.

3. **Internal Factors (**Please provide additional rationale by answering the following questions as applicable: How does the proposal(s) …address the PLNU strategic plan? …address factors arising from assessment data or program review findings? …accommodate the department or school's learning outcomes for the major, minor, concentration, etc.? …increase departmental effectiveness/efficiency? …enhance enrollment or generate new revenue? What impact will it have on the size of the major, minor, etc.? Other internal rationale?): These changes are driven by program review (Items 1 & 2), student requests (Item 3), a request from Records (Item 4), and experience teaching the course (Items 5 & 6). **First,** in the Biology-BA program review we recognized that internship opportunities are a crucially important path for students to be able to explore their vocation. Thus we propose in Item 1 to allow BIO490 (Internships in Biology) to count for up to 3 units of the Biology-BA students' total of 12 units of upper-division electives. (Note that this is already the case for the Biology-BS and Environmental Science majors.) **Second**, as a part of ongoing Biology assessment, we conduct senior exit interviews and alumni surveys. Over the past few years we have had many requests from both populations for a human physiology course, since many of our students are headed to careers in the health professions. Thus, we propose to replace BIO420 (Vertebrate Physiology) with BIO423 (Advanced Human Physiology). Human physiology is already addressed in BIO420, but this will now be the focus of the new course. Additionally, this will help students distinguish this course from BIO410 (Vertebrate Biology), which had some overlapping content with BIO420 (Vertebrate Physiology). **Third**, although many Biology-Chemistry majors start as freshmen with a career goal of entering the health professions, some change their career goals as they transit through this major. Thus, by the time they become juniors or seniors they may be interested in more aspects of Biology than the limited options that are currently listed in the catalog. Since we see no reason to limit students' choices for their upper-division Biology electives, we would like to add ALL of the electives that are already available to Biology-BA/BS majors as options for the Biology-Chemistry majors. Importantly, these majors currently take 5-6 units of these electives with the menu of options available to them, and we will keep the requirement for at least 5 units of these electives with the new options. Thus, the size of the major will not change, nor will Chemistry courses be affected. If anything, students will have an easier time transiting through this large major and scheduling their classes since they will have more options. This change may also have the effect of retaining students in the joint major (as opposed to them switching to the Biology-BS major), if they can take the Biology courses that align with their interests. **Fourth**, Environmental Science majors are required to take 8 units of upper-division electives from approved environmental off-campus programs (e.g. Au Sable, School for Field Studies, etc.). In order to standardize transfer of these courses from these programs, Records has requested that we add the placeholder courses listed in Item 4. These courses can similarly be used for Science Business/Marketing minors with an Ecology emphasis that also choose to take courses from these approved environmental off-campus programs. **Fifth**, the changes requested to BIO301 come from several years of experience in teaching this course, which is

Research Methodology. This course has significantly evolved from its original conception as a combined statistics/biology course. We now separate the advanced statistics into MTH363 (Calculus-Based Statistics with R), which is required for Biology-BA/BS and Environmental Science majors. We do basic statistics in BIO301, which can also be taken by Biology-Chemistry majors who are not required to take MTH363. Thus we propose to remove the MTH363 co-requisite from BIO301. On the other hand, we propose to add the pre-requisite of BIO345 (Genetics) to BIO301. BIO301 involves a significant amount of bioinformatics, and we have discovered that students who have not had Genetics struggle with that content. In adding this pre-requisite, we also propose to renumber BIO301 to BIO352, so that the numbering sequence makes sense with the new pre-requisite.

4. **External Factors (** Please provide additional rationale by answering the following questions as applicable: To what extent have external factors motivated this proposal, for example what comparable colleges and universities are doing? …improvements suggested by alumni or outside reviewers? …stipulations imposed by outside accrediting agencies? …other external rationale?.)**:** As mentioned above, Item 2 was prompted in part by a recent alumni survey that was conducted for program review.

SECTION FOUR: HOW

A. Course Learning Outcomes – For each new course, please provide the course learning outcomes. (If not needed, please state as such.)

These are the CLOs for BIO423 (Advanced Human Physiology):

Students will be able to:

1. **define and apply the concepts of homeostasis and structural dynamism in different organ systems,**
2. **understand and explain the basic physiology of the human body's systems (metabolic, digestive, nervous, endocrine, muscular, respiratory, cardiovascular, excretory),**
3. **articulate how a disruption in one body system can adversely affect the function of another body system, and**
4. **read, analyze and report on papers from the primary literature.**

These are the CLOs for EVS396 (Advanced Biology):

Students will be able to:

1. **understand the biological concepts and field techniques used in the course, and**
2. **apply concepts and techniques to a fundamental biological question.**

These are the CLOs for EVS397 (Advanced Ecology):

Students will be able to:

1. **understand interrelationships between organisms and their biotic environments,**
2. **understand interrelationships between organisms and their physical environments, and**
3. **apply skills and knowledge learned in ecology to a field situation.**

These are the CLOs for EVS398 (Advanced Ecological Applications):

Students will be able to:

1. **understand the theory behind technological and/or computational tools presented in the course,**
2. **develop experience using these tools to conduct field experiments and/or monitor the environment, and**
3. **apply technological and/or computational techniques to specific field situations.**

These are the CLOs for EVS399 (Public Policy and Stewardship):

Students will be able to:

1. **understand the public policy, conservation practice, and/or sustainable development approaches presented in the course, and**
2. **apply these policies to specific real-world situations.**

B. Assessment Plan – For new programs, please provide an assessment plan. (If not needed, please state as such.)NA

C. Teach-Out – Provide a plan detailing how students who begin this program will be able to finish if the institution determines that the program is to be closed. (If not needed, please state as such.)NA

D. **Catalog Copy** – In this section, please demonstrate in a two-step process how the department/school would like the change to be made. Keep in mind academic policies with regard to number of units for major, minors, certificates, etc. See Academic Proposal Resource Information at the end of this template.

- **Step 1:** In the applicable set of boxes below:
    - For revision, addition or elimination of courses only, complete Section 1-A, entering current and/or proposed catalog text as indicated in the section instructions.

- For revision, addition or elimination of majors, minors, concentrations or certificates, complete Section 1-B, entering current and/or proposed catalog text as indicated in the section instructions.

Section 1-A--Courses Only: Proposals for course elimination should complete the shaded (left) side only, proposals for course addition should complete the unshaded (right) side only, and proposals for course revision should complete both sides of Section 1-A.	
Current course code and description (including units, prerequisites and grade type): Click here to enter text.	Proposed new course code and description (including units, prerequisites and grade type): Differences from current course are indicated in red.
Course 1: BIO420 – Vertebrate Physiology (3) This course examines homeostasis and structural dynamism in different systems and in different vertebrate classes. The course specifically examines metabolism, the digestive system, the nervous system, the endocrine system, locomotion, respiration, the cardiovascular system, and the urinary system. Lecture and lab. Offered every year. Prerequisite(s): BIO212 and CHE294, or instructor consent (Cell and Molecular Biology or Organismal minors). MTH203 or MTH363 recommended.	Course 1: BIO423 – Advanced Human Physiology (3) This course examines how different organ systems work and interact with each other to maintain homeostasis in the human body. The course specifically examines metabolism, the digestion, the nervous system, endocrinology, the muscular system, respiration, the cardiovascular system, and the urinary system. Lecture and lab. Offered every year. Prerequisite(s): BIO212 and CHE294, or instructor consent (Cell and Molecular Biology or Organismal minors). MTH203 or MTH363 recommended.
Course 2: BIO301 – Research Methodology (2) This course builds upon the basis of the scientific method that students are exposed to as freshmen. It focuses on teaching students how to develop biological questions, search databases to obtain background information, design scientific experiments, and analyze data. The course will focus more specifically on how research data is obtained, how experimental knowledge and data are dispersed amongst the scientific community, and how these data are used as a base for correlating new data and upon which new experimentation is based. Lecture and laboratory. Corequisite(s): MTH 363 or consent of instructor.	Course 2: BIO352 – Research Methodology (2) This course builds upon the basis of the scientific method that students are exposed to as freshmen. It focuses on teaching students how to develop biological questions, search databases to obtain background information, design scientific experiments, and analyze data. The course will focus more specifically on how research data is obtained, how experimental knowledge and data are dispersed amongst the

	scientific community, and how these data are used as a base for correlating new data and upon which new experimentation is based. Lecture and laboratory. Prerequisite(s): BIO345.
Course 3: Click here to enter text.	Course 3: EVS396 - Advanced Biology (3) Field-intensive course that explores the field biology of various organisms and ecosystems in order to understand fundamental principles of life. Applies to off-campus field immersion programs such as Au Sable, Quetzal Educational Research Center, Creation Care Study Program, and School for Field Studies.
Course 4: Click here to enter text.	Course 4: EVS397 - Advanced Ecology (3) Field-intensive course that examines the interrelationships between organisms and their biotic and physical environments. Applies to off-campus field immersion programs such as Au Sable, Quetzal Educational Research Center, Creation Care Study Program, and School for Field Studies.
Course 5: Click here to enter text.	Course 5: EVS398 - Advanced Ecological Applications (3) Field- intensive course that applies technological and/or computational tools to increase scientific understanding, monitor environments, restore damaged ecosystems, and/or solve human and environmental problems. Applies to off-campus field immersion programs such as Au Sable, Quetzal Educational Research Center, Creation Care Study Program, and School for Field Studies.
Course 6: Click here to enter text.	Course 6: EVS399 – Public Policy and Stewardship (3) Course that explores public

	policy, conservation practice, and/or sustainable development under various real-world contexts to manage and/or restore ecosystems and improve human well-being. Applies to off-campus field immersion programs such as Au Sable, Quetzal Educational Research Center, Creation Care Study Program, and School for Field Studies.
Section 1-B--All Other Proposals: Proposals for elimination of a major, minor, concentration or certificate should complete the shaded (left) side of this section only, proposals for addition of any of these should complete the unshaded (right) side only, and proposals for revision of any of these should complete both sides of Section 1-B.	
Current Program (or major, minor, concentration, certificate) Name and Introductory Text: Biology-BA	Proposed Revised or New Program (or major, minor, concentration, certificate) Name and Introductory Text: Biology-BA
Current Program Learning Outcome: No changes	Proposed Revised or New Program Learning Outcomes (needed for new majors only): No changes
Current Lower Division Requirements and Unit Numbers for Majors. All requirements for minors, concentrations or certificates: No changes	Proposed Revised or New Lower Division Requirements and Unit Numbers for Majors. All requirements for minors, concentrations or certificates: No changes
Current Total Lower Division Units: 27-28	**Proposed Total Lower Division Units:** 27-28
Current Upper Division Requirements and Unit Numbers for Majors. (Highlight new or revised classes in red.) 16	Proposed Upper Division Requirements and Unit Numbers for Majors. (Highlight new or revised classes in red.) 16
Current Total Upper Division Units: 28	**Proposed Total Upper Division Units:** 28

Current Elective Options (Highlight new or revised classes in red.): BIO 312 - Applied Plant Biology (2) BIO 315 - Microbiology (3) BIO 323 - Introduction to Oceanography (3) BIO 325 - Insect Biology (3) BIO 333 - Marine Biology (3) BIO 340 - Field Biology: Neotropical Ecology (2) BIO 350 - Advanced Cell Biology (3) BIO 390 - Immunology (3)** BIO 400 - Developmental Biology (3)** BIO 410 - Vertebrate Biology (3) BIO 420 - Vertebrate Physiology (3) BIO 430 - Animal Behavior (3) BIO 450 - Advanced Biochemistry (4) BIO 470 - Neuroscience (3) BIO 473 - Experimental Marine Ecology (3)	Proposed Elective Options (Highlight new or revised classes in red.): BIO 312 - Applied Plant Biology (2) BIO 315 - Microbiology (3) BIO 323 - Introduction to Oceanography (3) BIO 325 - Insect Biology (3) BIO 333 - Marine Biology (3) BIO 340 - Field Biology: Neotropical Ecology (2) BIO 350 - Advanced Cell Biology (3) BIO 390 - Immunology (3)** BIO 400 - Developmental Biology (3)** BIO 410 - Vertebrate Biology (3) BIO 423 – Advanced Human Physiology (3) BIO 430 - Animal Behavior (3) BIO 450 - Advanced Biochemistry (4) BIO 470 - Neuroscience (3) BIO 473 - Experimental Marine Ecology (3) BIO490 - Internship in Biology (1-3)
Current Total Required Elective Units: 12	**Proposed Total Required Elective Units:** 12
Current Names and Course Titles of Concentration #1 (if any—use additional boxes for each concentration.): NA	Proposed Names and Course Titles of Concentration #1 (if any—use additional boxes for each concentration.): NA
Current Total Program Units: 55-56	**Proposed Total Program Units:** 55-56
Current Notes (if any) at the bottom of program catalog copy: Click here to enter text.	Proposed Notes (if any) at the bottom of program catalog copy: Click here to enter text.

Section 1-B--All Other Proposals: Proposals for elimination of a major, minor, concentration or certificate should complete the shaded (left) side of this section only, proposals for addition of any of these should complete the unshaded (right) side only, and proposals for revision of any of these should complete both sides of Section 1-B.	
Current Program (or major, minor, concentration, certificate) Name and Introductory Text: Biology-Chemistry BS	Proposed Revised or New Program (or major, minor, concentration, certificate) Name and Introductory Text: Biology-Chemistry BS
Current Program Learning Outcome: No changes	Proposed Revised or New Program Learning Outcomes (needed for new majors only): No changes
Current Lower Division Requirements and Unit Numbers for Majors. All requirements for minors, concentrations or certificates: No changes	Proposed Revised or New Lower Division Requirements and Unit Numbers for Majors. All requirements for minors, concentrations or certificates: No changes
Current Total Lower Division Units: 38-39	**Proposed Total Lower Division Units:** 38-39
Current Upper Division Requirements and Unit Numbers for Majors. (Highlight new or revised classes in red.) 22	Proposed Upper Division Requirements and Unit Numbers for Majors. (Highlight new or revised classes in red.) 22
Current Total Upper Division Units: 29-31	**Proposed Total Upper Division Units:** 29-31
Current Elective Options (Highlight new or revised classes in red.): Two courses from: BIO 301 - Research Methodology (2) BIO 315 - Microbiology (3) BIO 350 - Advanced Cell Biology (3) BIO 390 - Immunology (3) BIO 400 - Developmental Biology (3)	Proposed Elective Options (Highlight new or revised classes in red.): At least 5 units from: BIO 312 – Applied Plant Biology (2) BIO 315 - Microbiology (3) BIO 323 - Introduction to Oceanography (3) BIO 325 - Insect Biology (3)

BIO 420 - Vertebrate Physiology (3)	BIO 333 - Marine Biology (3) BIO 340 - Field Biology: Neotropical Ecology (2) BIO 350 - Advanced Cell Biology (3) BIO 352 - Research Methodology (2) BIO363 – Conservation Ecology (3) BIO 390 - Immunology (3) BIO 400 - Developmental Biology (3) BIO 410 - Vertebrate Biology (3) BIO 423 – Advanced Human Physiology (3) BIO 430 - Animal Behavior (3) BIO 470 - Neuroscience (3) BIO 473 - Experimental Marine Ecology (3)
Current Total Required Elective Units: 5-6 from Biology, 7-9 from Biology & Chemistry	**Proposed Total Required Elective Units:** 5-6 from Biology, 7-9 from Biology & Chemistry
Current Names and Course Titles of Concentration #1 (if any—use additional boxes for each concentration.): NA	Proposed Names and Course Titles of Concentration #1 (if any—use additional boxes for each concentration.): NA
Current Total Program Units: 67-70	**Proposed Total Program Units:** 67-70
Current Notes (if any) at the bottom of program catalog copy: Click here to enter text.	Proposed Notes (if any) at the bottom of program catalog copy: Click here to enter text.

- **Step 2:**
  - Arrange a meeting: Arrange a meeting with the APC chair to review the completed portion of the proposal and to receive assistance from the Records liaison in submission of current and/or draft proposed catalog copy called for.
  - Attach Catalog copy:

- For proposed revisions to existing programs, majors, minors, courses, etc, after this page attach the following supplied by Records: 1) The current year catalog copy for that program, major, etc, and 2) the proposed revised catalog pages for your proposal, based on the information from Step One.
- For entirely new programs, majors, minors, courses, etc, after this page attach the draft new catalog pages for your proposal supplied by Records based on the information in Step One.

STEP TWO: ATTACH CURRENT AND/OR PROPOSED CATALOG COPY AFTER THIS PAGE AS SEPARATE PAGES.

Biology, B.A.

Lower-Division Requirements

BIO 210 - Cell Biology and Biochemistry (GE) (4)**
BIO 211 - Ecological and Evolutionary Systems (GE) (4)**
BIO 212 - Organismal Biology (3)
CHE 151 - General Chemistry Tutorial (1) *
CHE 152 - General Chemistry I (GE) (4)**
CHE 153 - General Chemistry II (4)
CHE 294 - Organic Chemistry I (4)
MTH 144 - Calculus With Applications (GE) (4)**

Total: 27-28 Units
Note(s): *Course can be waived.

Upper-Division Requirements

BIO 345 - Genetics (4)
BIO 352 - Research Methodology (2)
BIO 363 - Conservation Ecology (3)
BIO 380 - Molecular Biology (3)
BIO 497 - Biology Seminar (1)
MTH 363 - Calculus Based Statistics With R (3)

Upper Division Total: 16 Units

Take a minimum of 12 units of electives from the following options:
BIO 312 - Applied Plant Biology (2)
BIO 315 - Microbiology (3)
BIO 323 - Introduction to Oceanography (3)
BIO 325 - Insect Biology (3)

BIO 333 - Marine Biology (3)
BIO 340 - Field Biology: Neotropical Ecology (2)
BIO 350 - Advanced Cell Biology (3)
BIO 390 - Immunology (3)
BIO 400 - Developmental Biology (3)
BIO 410 - Vertebrate Biology (3)
BIO 423 – Advanced Human Physiology (3)
BIO 430 - Animal Behavior (3)
BIO 450 - Advanced Biochemistry (4)
BIO 470 - Neuroscience (3)
BIO 473 - Experimental Marine Ecology (3)
BIO 490 - Internship in Biology (1-3)

Upper Division Elective Total: 12 Units
Bachelor of Arts Total: 55-56 Units**
** 12 units meet general education requirements

Biology, B.S.

Lower-Division Requirements
BIO 210 - Cell Biology and Biochemistry (GE) (4)**
BIO 211 - Ecological and Evolutionary Systems (GE) (4)**
BIO 212 - Organismal Biology (3)
CHE 151 - General Chemistry Tutorial (1) *
CHE 152 - General Chemistry I (GE) (4)**
CHE 153 - General Chemistry II (4)
CHE 294 - Organic Chemistry I (4)
MTH 144 - Calculus With Applications (GE) (4)**
PHY 141 - General Physics I (GE) (4)**
PHY 142 - General Physics II (4)

Total: 35-36 Units
Note(s): *Course can be waived.

Upper-Division Requirements
BIO 345 - Genetics (4)
BIO 352 - Research Methodology (2)
BIO 363 - Conservation Ecology (3)
BIO 380 - Molecular Biology (3)
BIO 497 - Biology Seminar (1)
MTH 363 - Calculus Based Statistics With R (3)

Upper Division Total: 16 Units

Take a minimum of 14 units of electives from the following options:

BIO 312 - Applied Plant Biology (2)
BIO 315 - Microbiology (3)
BIO 323 - Introduction to Oceanography (3)

BIO 325 - Insect Biology (3)
BIO 333 - Marine Biology (3)
BIO 340 - Field Biology: Neotropical Ecology (2)
BIO 350 - Advanced Cell Biology (3)
BIO 390 - Immunology (3)**
BIO 400 - Developmental Biology (3)**
BIO 410 - Vertebrate Biology (3)
BIO 423 – Advanced Human Physiology (3)
BIO 430 - Animal Behavior (3)
BIO 450 - Advanced Biochemistry (4)
BIO 470 - Neuroscience (3)
BIO 473 - Experimental Marine Ecology (3)
BIO 490 - Internship in Biology (1-3)
OR
BIO 499 - Research in Biology (1-3)
Approved Off-Campus (1-4)

Upper Division Elective Total: 14 Units
Bachelor of Science Total: 65-66 Units **
** 12 units meet general education requirements.

Biology-Chemistry, B.S. (Biology)

Lower-Division Requirements
BIO 210 - Cell Biology and Biochemistry (GE) (4)**
BIO 211 - Ecological and Evolutionary Systems (GE) (4)**
BIO 212 - Organismal Biology (3)
CHE 151 - General Chemistry Tutorial (1) *
CHE 152 - General Chemistry I (GE) (4)**
CHE 153 - General Chemistry II (4)
CHE 213 - Analytical Chemistry (3)
CHE 294 - Organic Chemistry I (4)
MTH 144 - Calculus With Applications (GE) (4)**

Choose one sequence: 8 Units
PHY 141 - General Physics I (GE) (4)** AND
PHY 142 - General Physics II (4)
OR
PHY 241 - University Physics I (GE) (4)** AND
PHY 242 - University Physics II (4)

Total: 38-39 Units
Note(s): *Course can be waived

Upper-Division Requirements
BIO 345 - Genetics (4)
BIO 380 - Molecular Biology (3)
BIO 497 - Biology Seminar (1)
CHE 304 - Organic Chemistry II (4)
CHE 325 - Physical Chemistry I (4)
CHE 466 - Bioinorganic Chemistry (2)

BIO 450 - Advanced Biochemistry (4) OR
CHE 450 - Advanced Biochemistry (4)

One course from:
CHE 326 - Physical Chemistry II (3)
CHE 351 - Organic Structure Elucidation (2)
CHE 370 - Instrumental Analysis (2)
CHE 453 - Advanced Organic Chemistry (2)
CHE 468 - Advanced Inorganic Chemistry (3)

At least 5 units from:
BIO 312 – Applied Plant Biology (2)
BIO 315 - Microbiology (3)
BIO 323 - Introduction to Oceanography (3)
BIO 325 - Insect Biology (3)
BIO 333 - Marine Biology (3)
BIO 340 - Field Biology: Neotropical Ecology (2)
BIO 350 - Advanced Cell Biology (3)
BIO 352 - Research Methodology (2)
BIO363 – Conservation Ecology (3)
BIO 390 - Immunology (3)
BIO 400 - Developmental Biology (3)
BIO 410 - Vertebrate Biology (3)
BIO 423 – Advanced Human Physiology (3)
BIO 430 - Animal Behavior (3)
BIO 470 - Neuroscience (3)
BIO 473 - Experimental Marine Ecology (3)

Total: 29-31 Units
Bachelor of Science Total: 67-70 Units**
** 12 units meet general education requirements.

Environmental Science (Biology), B.S.

Lower-Division Requirements
BIO 102 - Environment and People (GE) (4)**
BIO 210 - Cell Biology and Biochemistry (GE) (4)**
BIO 211 - Ecological and Evolutionary Systems (GE) (4)**
BIO 212 - Organismal Biology (3)
CHE 151 - General Chemistry Tutorial (1) *
CHE 152 - General Chemistry I (GE) (4)**
CHE 153 - General Chemistry II (4)
CHE 213 - Analytical Chemistry (3)
CHE 294 - Organic Chemistry I (4)
MTH 144 - Calculus With Applications (GE) (4)**

Choose one sequence: 8 Units
PHY 141 - General Physics I (GE) (4)**
PHY 142 - General Physics II (4)
OR
PHY 241 - University Physics I (GE) (4)**
PHY 242 - University Physics II (4)

Choose one of three: 3 Units
ECO 101 - Principles of Macroeconomics (GE) (3)**
ECO 102 - Principles of Microeconomics (GE) (3)**
SOC 201 - Cultural Anthropology (GE) (3)**

Total: 45-46 Units
Note(s): *Course can be waived

Upper-Division Requirements
BIO 345 - Genetics (4)
BIO 363 - Conservation Ecology (3)

BIO 497 - Biology Seminar (1)
CHE 370 - Instrumental Analysis (2)
MTH 363 - Calculus Based Statistics With R (3)
Total: 13 Units

Upper-Division Electives (14 units minimum)

A minimum of 8 units of upper-division electives are required from approved environmental off-campus programs. Both departmental chairs (Biology and Chemistry) or their designees are responsible for approving all off-campus courses. At least one-half of upper-division units in the major must be taken at PLNU.
The following courses can be used to transfer in these 8 units:
EVS396 - Advanced Biology (3)
EVS397 - Advanced Ecology (3)
EVS398 - Advanced Ecological Applications (3)
EVS399 - Public Policy and Stewardship (3)

Advanced Science Electives (8 units minimum)

One or more approved off-campus environmental course(s) may fulfill part or all of this requirement.
BIO 312 - Applied Plant Biology (2)
BIO 315 - Microbiology (3)
BIO 323 - Introduction to Oceanography (3)
BIO 325 - Insect Biology (3)
BIO 333 - Marine Biology (3)
BIO 340 - Field Biology: Neotropical Ecology (2)
BIO 410 - Vertebrate Biology (3)
BIO 420 - Vertebrate Physiology (3)
BIO 430 - Animal Behavior (3)
BIO 473 - Experimental Marine Ecology (3)

BIO 450 - Advanced Biochemistry (4) OR
CHE 450 - Advanced Biochemistry (4)

CHE 304 - Organic Chemistry II (4)
CHE 325 - Physical Chemistry I (4)
CHE 351 - Organic Structure Elucidation (2)
CHE 466 - Bioinorganic Chemistry (2)
CHE 468 - Advanced Inorganic Chemistry (3)

Other Related Electives (6 units minimum)
Students can customize their degree by taking one course from each of the two categories below. One or more approved off-campus environmental course(s) may fulfill part or all of this requirement.

Methodology:
BIO 352 - Research Methodology (2)
BIO 490 - Internship in Biology (1-3)
BIO 499 - Research in Biology (1-3)
CHE 490 - Internship in Chemistry (1-3)
CHE 499 - Research in Chemistry (1-2)

Public Policy and Stewardship:
PHL 360 - Philosophy and the Sciences (3)
POL 435 - Global Governance (4)
POL 441 - Issues in Public Policy (4)

Upper-Division Total: 27 Units
Bachelor of Science Total: 72 - 73 Units **
**15 units meet general education requirements.

Biology: Cell and Molecular Biology Minor

Required

BIO 210 - Cell Biology and Biochemistry (GE) (4)
BIO 211 - Ecological and Evolutionary Systems (GE) (4)
BIO 345 - Genetics (4)
CHE 151 - General Chemistry Tutorial (1) *
CHE 152 - General Chemistry I (GE) (4)

Nine units from the following electives:

BIO 315 - Microbiology (3)
BIO 350 - Advanced Cell Biology (3)
BIO 352 - Research Methodology (2)
BIO 380 - Molecular Biology (3)
BIO 390 - Immunology (3)**
BIO 400 - Developmental Biology (3)**
BIO 423 – Advanced Human Physiology (3)

Total: 25 Units
Note(s): *Course can be waived.

Biology: Organismal Biology Minor

Required

BIO 210 - Cell Biology and Biochemistry (GE) (4)
BIO 211 - Ecological and Evolutionary Systems (GE) (4)
BIO 212 - Organismal Biology (3)
BIO 363 - Conservation Ecology (3)

Nine units from the following electives:

BIO 312 - Applied Plant Biology (2)
BIO 315 - Microbiology (3)
BIO 323 - Introduction to Oceanography (3)
BIO 325 - Insect Biology (3)
BIO 333 - Marine Biology (3)
BIO 340 - Field Biology: Neotropical Ecology (2)
BIO 410 - Vertebrate Biology (3)
BIO 423 – Advanced Human Physiology (3)
BIO 430 - Animal Behavior (3)
BIO 473 - Experimental Marine Ecology (3)

Total: 23 Units

Science-Business Minor (Business Majors)

The Science-Business minors, joint minors between the Fermanian School of Business and the Biology and Chemistry Departments, are for business students who are interested in pursuing business careers in innovative science-related industries such as biotechnology, medical device, and pharmaceutical. Three emphases are available:

- Molecular Emphasis
- Ecology Emphasis
- Chemistry Emphasis

Science-Business Minor with Molecular Emphasis

Lower Division Requirements:

ACC 201 - Principles of Financial Accounting (4)
BIO 210 - Cell Biology and Biochemistry (GE) (4)
BIO 211 - Ecological and Evolutionary Systems (GE) (4)
MGT 212 - Principles of Management (3)

Choose one Chemistry course:
CHE 101 - Chemistry and Society (GE) (4)
CHE 103 - Introduction to General, Organic, and Biological Chemistry (GE) (4)
CHE 152 - General Chemistry I (GE) (4)

Choose one course from the following:
MTH 144 - Calculus With Applications (GE) (4)
MTH 164 - Calculus I (GE) (4)
MTH 173 - Business Calculus (GE) (3)

Total: 22-23 Units

Upper Division Requirements:
BIO 345 - Genetics (4)

BIO 352 - Research Methodology (2)
MKT 332 - Principles of Marketing (3)

Choose one of the following Biology courses:
BIO 315 - Microbiology (3)
BIO 350 - Advanced Cell Biology (3)
BIO 380 - Molecular Biology (3)
BIO 390 - Immunology (3)**
BIO 400 - Developmental Biology (3)**
Total: 15 Units
**With Biology department permission, BIO345 may substitute for this course pre-requisite.

Total Units: 37-38

Science-Business Minor with Ecology Emphasis

This joint minor between the Fermanian School of Business and the Biology department opens avenues of exploration for students pursuing careers in the biotech industry or other venues where business and science intersect.

Lower Division Requirements:
ACC 201 - Principles of Financial Accounting (4)
BIO 211 - Ecological and Evolutionary Systems (GE) (4)
(BIO105 may be substituted with the permission of the Biology Department.)
BIO 212 - Organismal Biology (3)
MGT 212 - Principles of Management (3)

Choose one Chemistry course from the following:
CHE 101 - Chemistry and Society (GE) (4)
CHE 103 - Introduction to General, Organic, and Biological Chemistry (GE) (4)
CHE 152 - General Chemistry I (GE) (4)

Choose one Mathematics course from the following:
MTH 144 - Calculus With Applications (GE) (4)
MTH 164 - Calculus I (GE) (4)
MTH 173 - Business Calculus (GE) (3)

Total: 21-22 units

Upper Division Requirements:
BIO 363 - Conservation Ecology (3)
MKT 332 - Principles of Marketing (3)

Choose one additional course from BUS or MGT 300-499 for three (3) units.

BIO 312 - Applied Plant Biology (2)
BIO 323 - Introduction to Oceanography (3)

BIO 325 - Insect Biology (3)
BIO 333 - Marine Biology (3)
BIO 340 - Field Biology: Neotropical Ecology (2)
BIO 410 - Vertebrate Biology (3)
BIO 423 – Advanced Human Physiology (3)
BIO 430 - Animal Behavior (3)
Up to four of these Biology courses could be taken at Au Sable or in Costa Rica with our sister school (prior permission is required for any substitutions). The following courses can be used to transfer in these units:
EVS396 - Advanced Biology (3)
EVS397 - Advanced Ecology (3)
EVS398 - Advanced Ecological Applications (3)

TOTAL: 13-15 units
Total Units: 34-37

Science-Marketing Minor (Business Majors)

The Science-Marketing minors, joint minors between the Fermanian School of Business and the Biology and Chemistry Departments, are for business students who are interested in pursuing marketing careers in innovative science-related industries such as biotechnology, medical device, and pharmaceutical. Three emphases are available:

- Molecular Emphasis
- Ecology Emphasis
- Chemistry Emphasis

Science-Marketing Minor with Molecular Emphasis

Lower Division Requirements:
ACC 201 - Principles of Financial Accounting (4)
BIO 210 - Cell Biology and Biochemistry (GE) (4)
BIO 211 - Ecological and Evolutionary Systems (GE) (4)

Choose one Chemistry course from the following:
CHE 101 - Chemistry and Society (GE) (4)
CHE 103 - Introduction to General, Organic, and Biological Chemistry (GE) (4)
CHE 152 - General Chemistry I (GE) (4)

Choose one Mathematics course from the following:
MTH 144 - Calculus With Applications (GE) (4)
MTH 164 - Calculus I (GE) (4)
MTH 173 - Business Calculus (GE) (3)

Total: 19-20 units

Upper Division Requirements:
BIO 345 - Genetics (4)
BIO 352 - Research Methodology (2)
BIO 345 - Genetics (4)

MKT 332 - Principles of Marketing (3)

Choose one of the following Biology courses:
BIO 315 - Microbiology (3)
BIO 350 - Advanced Cell Biology (3)
BIO 380 - Molecular Biology (3)
BIO 390 - Immunology (3)**
BIO 400 - Developmental Biology (3)**
**With Biology department permission, BIO345 may substitute for this course pre-requisite.

Choose two (2) additional courses from MKT 300-459 for six (6) units.

Total: 18 units
Total Minor: 37-38 units

Science-Marketing Minor with Ecology Emphasis

Lower Division Requirements:
ACC 201 - Principles of Financial Accounting (4)
BIO 211 - Ecological and Evolutionary Systems (GE) (4)
BIO105 may be substituted with the permission of the Biology Department.
BIO 212 - Organismal Biology (3)**

Choose one Chemistry course from the following:
CHE 101 - Chemistry and Society (GE) (4)
CHE 103 - Introduction to General, Organic, and Biological Chemistry (GE) (4)
must also take CHE103L with this option.
CHE 152 - General Chemistry I (GE) (4)

Choose one Mathematics course from the following:
MTH 144 - Calculus With Applications (GE) (4)
MTH 164 - Calculus I (GE) (4)
MTH 173 - Business Calculus (GE) (3)

Total: 18-19 units

Upper Division Requirements:
BIO 363 - Conservation Ecology (3)
MKT 332 - Principles of Marketing (3)

Choose two (2) courses from the following:
BIO 312 - Applied Plant Biology (2)
BIO 323 - Introduction to Oceanography (3)
BIO 325 - Insect Biology (3)
BIO 333 - Marine Biology (3)
BIO 340 - Field Biology: Neotropical Ecology (2)
BIO 410 - Vertebrate Biology (3)

BIO 423 – Advanced Human Physiology (3)
BIO 430 - Animal Behavior (3)

Choose two (2) additional courses from MKT 300-459 for six (6) units.

Total: 16-18 units
Total Minor: 34-37 units

Up to four of these Biology courses could be taken at Au Sable or in Costa Rica with our sister school (prior permission is required for any substitutions). The following courses can be used to transfer in these units:
EVS396 - Advanced Biology (3)
EVS397 - Advanced Ecology (3)
EVS398 - Advanced Ecological Applications (3)

STEP TWO: ATTACH CURRENT AND/OR PROPOSED CATALOG COPY BEFORE THIS PAGE AS SEPARATE PAGES.

SECTION FIVE: SUMMARY CHECKLIST

5-A: Review course and staffing impact with your academic unit's direct report (College Dean or Provost).

- **Total course additions:** 5
- **Total course deletions:** 1
- **Total unit additions:** 15
- **Total unit deletions:** 3
- **Staff impact (increase or decrease):** 0 (There is no staff impact because 4 of the course (12 units) are not taught at PLNU. They are taught at our approved off-campus field immersion programs, e.g. Au Sable, School for Field Studies, etc.)
- **Rotation of courses or deletions of sections to accommodate additions:**
  NA

I have reviewed this proposal and the items above and believe the proposal meets all university requirements and is ready for APC review.

Department or School Direct Report:

Holly Irwin _____ **Date** 12.1.16

College Dean or Provost as applicable

APC Proposal Reference Information

DEADLINES:

1. Review any Long Form proposal drafts in person with your College Dean or appropriate administrator by **October 2 …., ** prior to submitting the proposal to APC;
2. Submit a short narrative to the APC chair highlighting the proposed changes by **October 9;**
3. Final Long Form proposals are due no later than **November 6 …, MEETING THE APPROPRIATE DEADLINES WILL ENSURE THAT APC WILL HAVE ENOUGH TIME TO PROCESS YOUR PROPOSAL(S). PROPOSALS SUBMITTED AFTER THAT DATE MOST LIKELY WILL BE CONSIDERED FOR THE 2017-2018 CATALOG.**

BASIC ASSUMPTIONS:

1. May be generated by any faculty member within a department;
2. Are made as a result of a department or school program review and assessment data or due to external requirements made by outside accrediting agencies (provide appropriate documentation);
3. Are voted on and approved by all full time department members;
4. Will be thoroughly discussed with other departments who are directly affected by the proposed changes (a written response must be received by affected schools or departments and included in the proposal);
5. Will be reviewed by the dean of the College of Arts & Humanities or the Dean of Natural and Social Sciences or appropriate administrator before the proposal is sent to APC;
6. APC chair will consult with Institutional Research and Institutional Effectiveness to determine any potential external reporting problems;
7 . Will be recommended for consideration by APC to the faculty at large;
8. Are finally voted on by the entire faculty.

ACADEMIC POLICIES INFORMATION:

Majors:

1. Maximum number of units for a B.A. major: **49 units beyond G.E.**
2. Maximum number of units for a B.S. major: **59 units beyond G.E.**

3. Minimum number of upper division units in any major: **24 units**, half of which must be completed in residency.

Minors:

1. Minimum number of units for a minor: **16 units**
2. Minimum number of upper division units: **12 units**
3. Minimum number of units completed in residency: **9 units**
4. Of the 16+ units in the minor, **9 units** must be distinct from the major.

Certificates:

1. Only academic certificates are acceptable for approval.
2. Certificates vary in size: **6-15 units** when associated with a major but up to **24 units** when not aligned with a major.
3. 50% of the units must be unique to that certificate.