



ARIZONA STATE UNIVERSITY  
PROPOSAL TO ESTABLISH A NEW UNDERGRADUATE DEGREE

This template is to be used only by programs that have received specific written approval from the Provost's office to proceed with internal proposal development and review. A separate proposal must be submitted for each individual new degree program.

DEGREE PROGRAM INFORMATION

College/School(s) offering this degree: College of Liberal Arts & Sciences

Unit(s) within college/school responsible for program: Department of Physics

If this is for an official joint degree program, list all units and colleges/schools that will be involved in offering the degree program and providing the necessary resources:

Proposed Degree Name: Biophysics

Undergraduate Degree Type: Bachelor of Science

If Degree Type is Other, provide proposed degree type:

and proposed abbreviation:

Proposed title of major: Biophysics

Is a program fee required? Yes  No

Is the unit willing and able to implement the program if the fee is denied? Yes  No

Requested effective term: Fall and year: 2013

(The first semester and year for which students may begin applying to the program.)

PROPOSAL CONTACT INFORMATION

(Person to contact regarding this proposal)

Name: Dr. Robert Ros

Title: Associate Professor

Phone: 480-727-9280

email: [Robert.Ros@asu.edu](mailto:Robert.Ros@asu.edu)

DEAN APPROVAL

This proposal has been approved by all necessary unit and College/School levels of review, and the College/School(s) has the resources to offer this degree program. I recommend implementation of the proposed degree program. (Note: An electronic signature, an email from the dean or dean's designee, or a PDF of the signed signature page is acceptable.)

College Dean name: Robert Page

College Dean signature \_\_\_\_\_ Date: \_\_\_\_\_

College Dean name:  
(if more than one college involved)

College Dean signature \_\_\_\_\_ Date: \_\_\_\_\_

**ARIZONA STATE UNIVERSITY  
PROPOSAL TO ESTABLISH A NEW UNDERGRADUATE DEGREE**

This proposal template should be completed in full and submitted to the University Provost's Academic Council [[mailto: curriculumplanning@asu.edu](mailto:curriculumplanning@asu.edu) ]. It must undergo all internal university review and approval steps including those at the unit, college, and university levels. A program **may not** be implemented until the Provost's Office notifies the academic unit that the program may be offered.

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**DEGREE PROGRAM INFORMATION**

**Undergraduate:** BS-Bachelor of Science

**If Degree Type is Other, provide proposed degree type:  
and proposed abbreviation:**

**Proposed title of major:** Biophysics

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**1. PURPOSE AND NATURE OF PROGRAM**

**A. Brief program description** (This is a catalog type description. Include the distinctive features of the program that make it unique. Do not include program or admission requirements.)

Biophysics is concerned with the energies, forces and motions that govern the molecular processes of life. The B.S. degree in biophysics is interdisciplinary, providing students with a working understanding of the important principles of physics, chemistry and biology that control molecular biophysics of cells.

**2. STUDENT LEARNING OUTCOMES AND ASSESSMENT**

**A. List the knowledge, competencies, and skills** students should have when they graduate from the proposed degree program. (You can find examples of program Learning Outcomes at (<http://www.asu.edu/oue/assessment.html>))

1. Students will acquire a working understanding of the conservation laws of physics, energy, momentum, and angular momentum.
2. Students will develop a deep understanding of the thermodynamic and statistical forces that govern molecular motion in cells.
3. Students will become proficient in the application of the scientific method for exploring hypotheses.

**B. Describe the plan and methods to assess** whether students have achieved the knowledge, competencies and skills identified in the Learning Outcomes. (You can find examples of assessment methods at (<http://www.asu.edu/oue/assessment.html>))

1. The capstone course PHY 312 Mechanics & Electromagnetism will test understanding in a series of quizzes and exams. Quizzes and exams in PHY 150 [or PHY 121/122] and PHY 151 [or PHY 131/132] will also be monitored. The goal is that over 75% of students will perform satisfactorily.
2. The capstone course PHY 473 will evaluate material learned in PHY 371 & PHY 472 through quizzes and exams. The goal is that over 75% of students will perform satisfactorily.
3. The lab class PHY 472 will evaluate the students' ability to design experiments and write up professional level lab reports. The goal is that over 75% of students will perform satisfactorily.

### 3. CURRICULUM OF THE PROPOSED PROGRAM

Total credit hours must be 120 to include: first year composition, general studies, core/required courses, program specific electives, and any additional requirements.

**A. Major Map.** Please prepare and attach a Major Map. If there are concentrations in this degree program, prepare a separate Major Map for each one. (Examples of Major Maps can be found at <http://provost.asu.edu/curriculum>)

**B. Total credit hours required for this program: 120**

#### C. Core/Required Courses.

i. Total required and/or core course credit hours: **36**

ii. List the name, prefix, and credit hours for each required/core class for this program

BIO 360 Animal Physiology (3 cr) [or BIO 353 Cell Biology (3 cr)]

CHM 240 Introduction to Physical Chemistry (3 cr)

CHM 345 Physical Chemistry I (3 cr)

CHM 346 Physical Chemistry II (3 cr)

PHY 150 Physics I [or PHY 121/122 University Physics I: Mechanics /Lab] (4 cr)

PHY 151 Physics II [or PHY 131/132 University Physics II: Electricity and Magnetics/Lab] (4 cr)

PHY 252 Physics III (4 cr)

PHY 312 Mechanics & Electromagnetism (3 cr)

PHY 371 Driving Forces in Biology (3 cr)

PHY 472 Advanced Biophysics Lab (3 cr)

PHY 473 From Molecules to Cells (3 cr)

#### D. Program Specific Electives.

i. Total required program elective credit hours: **24**

ii. List the name, prefix, and credit hours for any program specific electives for this program:

BIO 181 General Biology I (4 cr)

BIO 182 General Biology II (4 cr)

CHM 117/111 General Chemistry for Majors I/Lab (3/1 cr) [or CHM 113 General Chemistry I (4 cr)]

CHM 118/112 General Chemistry for Majors II/Lab (3/1 cr) [or CHM 116 General Chemistry II (4cr)]

MAT 271 Calculus with Analytic Geometry II (4 cr)

MAT 272 Calculus with Analytic Geometry III (4 cr)

**E. Additional Program Requirements, if any.** List and describe any capstone experiences, milestone, and/or additional requirements for this degree program:

F. Are any concentrations to be established under this degree program?  Yes  No

i. If "Yes", please check one:

- Students must select a concentration as part of this degree program  
 Concentrations are optional

ii. List courses & additional requirements for the proposed concentration (s):

Concentration Name	Total credit hours	Core/Required Courses for Concentration (include course name and prefix)	Total Core credit hours	Program Specific Electives (include course name and prefix)	Total Elective credit hours	Additional Requirements (i.e. milestones, capstones)

(Please expand table as needed. Right click in white space of last cell. Select "Insert Rows Below")

#### 4. NEW COURSE DEVELOPMENT

A. Will a new course prefix(es) be required for this degree program? Yes  No

If yes, complete the Request for a New Prefix for each prefix and submit with this proposal:

[http://provost.asu.edu/files/shared/curriculum/Prefix\\_Request.doc](http://provost.asu.edu/files/shared/curriculum/Prefix_Request.doc).

B. New Courses Required for Proposed Degree Program. List all new courses required for this program, including course prefix, number and course description.

PHY 312 (3) Mechanics & Electromagnetism: Covers two major topics in physics. The unifying theme is that they both deal with forms of energy and momentum, and how they are transmitted in space. The first half will cover mechanics and dynamics, describing how bodies with mass move under various types of forces. The second half covers Electromagnetism, which describes how electric charges and magnets, and their motions, generate fields of force. It also describes how time-varying electric and magnetic fields are associated with electromagnetic waves, which include light.

PHY 371 (3) Driving Forces in Biology: What are the stable states of biomolecules? How do molecules interact? What forces drive molecules to bond and associate, to absorb, to permeate through membranes, to undergo chemical reactions, to undergo conformational changes? Why are some changes gradual, as in the weakening of a ligand interaction with temperature, and others sudden [cooperative] such as protein folding or the insolubility of oil in water? This course will address these questions by statistical thermodynamics, a collection of principles and models that when combined with thermodynamics, aim to explain molecular forces and flows.

PHY 472 (3) Advanced Biophysics Lab: This course offers selected experiments from contemporary biophysics. It emphasizes modern instrumentation, computer-assisted acquisition and analysis of data, and report writing. The importance of good notebook keeping is emphasized. This course also qualifies for the one-credit Upper Division Literacy and Critical Inquiry [L] requirement.

PHY 473 (3) From Molecules to Cells: This course offers selected subjects from Biological Physics covering the length scales from biomolecules to cells. The course builds on knowledge acquired from thermodynamics (CHM346) and statistical mechanics (PHY371) to formulate basic principles behind the working of life systems. Free energy, entropic forces, chemical potentials, and electrostatic interactions rule the "nanometer soup" of a living cell. Proton gradients across cell membranes are behind all the energy consumed by life. Random walks, dissipative dynamics, and hydrodynamic fluxes rule time-dependent phenomena. The systems covered in the course will include biomolecules, membranes, cells, and nerves.

5. **PROGRAM NEED.** Explain why the university needs to offer this program (include target audience and market).

With the success of the ASU biochemistry program, which has 1300 students enrolled, the need for a physics-based variant has become apparent. Undergraduate students have been enquiring about a biophysics degree for some while. In addition, with the growth of the biophysics group within the physics department, we are in a strong position to offer a biophysics program. We expect enrollment to be at least comparable to the physics BS major degree. The biophysics degree will not be so mathematically-demanding, which we know will appeal to many students, and total enrollment will likely grow (conservatively) to 200+ students after five years.

6. **IMPACT ON OTHER PROGRAMS.** List other academic units that might be impacted by the proposed program and describe the potential impact (e.g., how the implementation of this program might affect student headcount/enrollment, student recruitment, faculty participation, course content, etc. in other programs). Attach letters of collaboration/support from impacted programs.

**Biochemistry, School of Mathematical and Statistical Sciences, School of Life Sciences, School of Earth & Space Exploration (see attached impact statement).**

7. **PROJECTED ENROLLMENT** How many new students do you anticipate enrolling in this program each year for the next five years? Please utilize the following tabular format.

<b>5-YEAR PROJECTED ANNUAL ENROLLMENT</b>					
	<b>1<sup>st</sup> Year</b>	<b>2<sup>nd</sup> Year</b> (Yr 1 continuing + new entering)	<b>3<sup>rd</sup> Year</b> (Yr 1 & 2 continuing + new entering)	<b>4<sup>th</sup> Year</b> (Yrs 1, 2, 3 continuing + new entering)	<b>5<sup>th</sup> Year</b> (Yrs 1, 2, 3, 4 continuing + new entering)
Number of Students Majoring (Headcount)	20-30	50-80	100-140	150-180	200+

8. **ACCREDITATION OR LICENSING REQUIREMENTS (if applicable).** Provide the names of the external agencies for accreditation, professional licensing, etc. that guide your curriculum for this program, if any. Describe any requirements for accreditation or licensing.

**9. FACULTY and STAFF**

- a. **Current Faculty.** List the name, rank, highest degree, area of specialization/expertise and estimate of the level of involvement of all current faculty who will teach in the program.

Dr. Banu Ozkan, Assistant Professor, PhD, protein folding & dynamics, Director Undergraduate Physics Programs who will teach PHY 371 Driving forces in Biology.

Dr. Robert Ross, Associate Professor, PhD, nanobiophysics, Co-Chair Undergrad Curriculum Committee who will teach PHY 472 Advanced Biophysics Lab.

Dr. Dmitry Matyushov, Professor, PhD, soft matter, who will teach PHY 473 From Molecules to cells.

Dr. Robert Culbertson, Associate Professor, PhD, experimental solid state physics & science education who will teach PHY 150 & PHY 151.

Dr. Robert Nemanich, Professor, PhD, interfaces & nanostructures, who will teach PHY 150 & PHY 151.

Dr. Molly McCartney, Professor, PhD, electron holography & nanomagnetism who will teach PHY 252.

Dr. Michael Treacy, Professor, PhD, diffraction-physics, Director Undergraduate Physics Programs who will teach the new course PHY 312 Mechanics & Electromagnetism.

- b. **New Faculty.** Describe the new faculty hiring needed during the next three years to sustain the program. List the anticipated hiring schedule and financial sources for supporting the addition of these faculty.

**None.**

- c. **Administration of the program.** Explain how the program will be administered for the purposes of admissions, advising, course offerings, etc. Discuss the available staff support.

Administered seamlessly through the physics department based on proposed \$400/semester fee per student. As the program grows, a separate director for the biophysics program will be appointed and likely an additional advisor will be hired.

**10. RESOURCES (necessary to launch and sustain the program)**

- a. Describe any new resources required for this program's success, such as new support staff, new facilities, new library resources, new technology resources, etc.

A new biophysics lab will need to be located & outfitted at the Tempe campus.

- b. Explain where you will get the resources to support this program.

Resources for the new lab will be identified in collaboration with College of Liberal Arts & Sciences.

**APPENDIX**  
**OPERATIONAL INFORMATION FOR UNDERGRADUATE PROGRAMS**

(This information is used to populate the Degree Search/catalog website.)

**1. Program Name (Major):** Biophysics, BS

**2. Program Description** (150 words maximum)

Biophysics is concerned with the energies, forces and motions that govern the molecular processes of life. The BS degree in biophysics is interdisciplinary, providing students with a working understanding of the important principles of physics, chemistry and biology that control molecular biophysics of cells.

**3. Contact and Support Information**

Building Name, code and room number: ( <i>Search ASU map</i> )	PSF 470
Program office telephone number: ( <i>i.e. 480/965-2100</i> )	480/965-3561
Program Email Address:	physics.info@asu.edu
Program Website Address:	http://physics.asu.edu

**4. Delivery/Campus Information Delivery: On-campus only (ground courses and/or iCourses)**

*Note: Once students elect a campus or On-line option, students will not be able to move back and forth between the on-campus and the ASU Online options. Approval from the Office of the Provost and Philip Regier (Executive Vice Provost and Dean) is required to offer programs through ASU Online.*

**5. Campus/Locations:** indicate all locations where this program will be offered.

Downtown Phoenix       Polytechnic       Tempe       West      Other:

**6. Additional Program Description Information**

- A. Additional program fee required for this program?      Yes
- B. Does this program have a second language requirement?      No

**7. Career Opportunities & Concentrations**

Provide a brief description of career opportunities available for this degree program. If program will have concentrations, provide a brief description for each concentration. (150 words maximum)

The broad range of applicability of the principles of biophysics gives great flexibility in a choice of career or further education including but not limited to: chemical industries, government, healthcare, engineering, physics research, teaching and other areas.



**8. Additional Admission Requirements**

If applicable list any admission requirements (freshman and/or transfer) that are higher than and/or in addition to the university minimum undergraduate admission requirements.)

n/a

**9. Keywords**

List all keywords used to search for this program. Keywords should be specific to the proposed program. Interdisciplinary, biophysics, chemistry, cells, forces, energies, molecules, physics, biological sciences.

**10. Advising Committee Code**

List the existing advising committee code to be associated with this degree. UGASPH

*Note: If a new advising committee needs to be created, please complete the following form:*

[Proposal to create an undergraduate advising committee](#)

**11. First Required Math Course**

List the first math course required in the major map. MAT 270

**12. Western Undergraduate Exchange (WUE) Eligible:**

Has a request been submitted to the Provost by the Dean to consider this degree program as eligible for WUE? No

*Note: No action will be taken during the implementation process with regards to WUE until approval is received from the Provost.*

**13. Area(s) of Interest**

A. Select **one (1)** primary Area of Interest from the list below that applies to this program.

- |  |  |
|--|--|
| <input type="checkbox"/> <u><a href="#">Architecture, Construction &amp; Design</a></u>    | <input type="checkbox"/> <u><a href="#">Engineering &amp; Technology</a></u>                           |
| <input type="checkbox"/> <u><a href="#">Artistic Expression &amp; Performance</a></u>      | <input checked="" type="checkbox"/> <u><a href="#">Environmental Issues &amp; Physical Science</a></u> |
| <input type="checkbox"/> <u><a href="#">Biological Sciences, Health &amp; Wellness</a></u> | <input type="checkbox"/> <u><a href="#">Interdisciplinary Studies</a></u>                              |
| <input type="checkbox"/> <u><a href="#">Business, Management &amp; Economics</a></u>       | <input type="checkbox"/> <u><a href="#">Languages &amp; Cultures</a></u>                               |
| <input type="checkbox"/> <u><a href="#">Communication &amp; Media</a></u>                  | <input type="checkbox"/> <u><a href="#">Law &amp; Justice</a></u>                                      |
| <input type="checkbox"/> <u><a href="#">Computing &amp; Mathematics</a></u>                | <input type="checkbox"/> <u><a href="#">Social Science, Policies &amp; Issues</a></u>                  |
| <input type="checkbox"/> <u><a href="#">Education &amp; Teaching</a></u>                   |  |

B. Select **any** additional Areas of Interest that apply to this program from the list below.

- |   |   |
|---|---|
| <input type="checkbox"/> <u><a href="#">Architecture, Construction &amp; Design</a></u>               | <input checked="" type="checkbox"/> <u><a href="#">Engineering &amp; Technology</a></u>     |
| <input type="checkbox"/> <u><a href="#">Artistic Expression &amp; Performance</a></u>                 | <input type="checkbox"/> <u><a href="#">Environmental Issues &amp; Physical Science</a></u> |
| <input checked="" type="checkbox"/> <u><a href="#">Biological Sciences, Health &amp; Wellness</a></u> | <input checked="" type="checkbox"/> <u><a href="#">Interdisciplinary Studies</a></u>        |
| <input type="checkbox"/> <u><a href="#">Business, Management &amp; Economics</a></u>                  | <input type="checkbox"/> <u><a href="#">Languages &amp; Cultures</a></u>                    |
| <input type="checkbox"/> <u><a href="#">Communication &amp; Media</a></u>                             | <input type="checkbox"/> <u><a href="#">Law &amp; Justice</a></u>                           |
| <input type="checkbox"/> <u><a href="#">Computing &amp; Mathematics</a></u>                           | <input type="checkbox"/> <u><a href="#">Social Science, Policies &amp; Issues</a></u>       |
| <input checked="" type="checkbox"/> <u><a href="#">Education &amp; Teaching</a></u>                   |   |

<b>The following fields are to be completed by the Office of the Executive Vice President and Provost of the University.</b>	
<b>CIP Code:</b>	_____
<b>Plan Code:</b>	_____





SIGN IN

**2013 - 2014 Major Map  
Biophysics, BS (Proposed)**

Term 1	0 - 15 Credit Hours	Critical course signified by	Hours	Minimum Grade	Notes
		<ul style="list-style-type: none"> <li>LIA 194: Academic Success Seminar OR PHY 191: First-Year Seminar</li> </ul>	1		<ul style="list-style-type: none"> <li>SAT, ACT (or TOEFL) score determines placement into first-year composition courses</li> <li>ASU Math Placement Exam score determines placement in Mathematics course</li> <li>All critical courses must be completed by the end of semester 4</li> <li>Maintain 2.6 cumulative GPA in all critical courses</li> <li>PHY 121/122 and 131/132 (or other equivalents) may be used in place of PHY 150 and 151, respectively</li> <li>CHM 113 may be used in place of CHM 117 and CHM 111</li> </ul>
		<ul style="list-style-type: none"> <li>MAT 270: Calculus with Analytic Geometry I (MA)</li> </ul>	4	C	
		<ul style="list-style-type: none"> <li>BIO 181: General Biology I (SQ) OR BIO 182: General Biology II (SQ) OR CHM 117: General Chemistry for Majors I (SQ) AND CHM 111: General Chemistry Laboratory for Majors I</li> </ul>	4	C	
		<ul style="list-style-type: none"> <li>ENG 101 or ENG 102: First-Year Composition OR ENG 105: Advanced First-Year Composition OR ENG 107 or ENG 108: English for Foreign Students</li> </ul>	3	C	
		<ul style="list-style-type: none"> <li>Humanities, Fine Arts and Design (HU) AND Cultural Diversity in the U.S. (C) OR Humanities, Fine Arts and Design (HU) AND Historical Awareness (H)</li> </ul>	3		
		<ul style="list-style-type: none"> <li>Maintain 2.60 GPA in Critical Tracking Courses.</li> </ul>			
		Term hours subtotal:	15		
<b>Term 2</b>	<b>16 - 30 Credit Hours</b>	<b>Critical course signified by</b>	<b>Hours</b>	<b>Minimum Grade</b>	<b>Notes</b>
		<ul style="list-style-type: none"> <li>MAT 271: Calculus with Analytic Geometry II (MA)</li> </ul>	4	C	<ul style="list-style-type: none"> <li>All critical courses must be completed by the end of semester 4</li> <li>Maintain 2.6 cumulative GPA in all critical courses</li> <li>PHY 121/122 and 131/132 (or other equivalents) may be used in place of PHY 150 and 151, respectively</li> <li>CHM 113 may be used in place of CHM 117 and CHM 111</li> </ul>
		<ul style="list-style-type: none"> <li>PHY 150: Physics I (SQ)</li> </ul>	4	C	
		<ul style="list-style-type: none"> <li>BIO 181: General Biology I (SQ) OR BIO 182: General Biology II (SQ) OR CHM 117: General Chemistry for Majors I (SQ) AND CHM 111: General Chemistry Laboratory for Majors I</li> </ul>	4	C	
		<ul style="list-style-type: none"> <li>ENG 101 or ENG 102: First-Year Composition OR ENG 105: Advanced First-Year Composition OR ENG 107 or ENG 108: English for Foreign Students</li> </ul>	3	C	
		<ul style="list-style-type: none"> <li>Complete ENG 101 OR ENG 105 OR ENG 107 course(s).</li> </ul>			
		<ul style="list-style-type: none"> <li>Maintain 2.60 GPA in Critical Tracking Courses.</li> </ul>			
		Term hours subtotal:	15		
<b>Term 3</b>	<b>31 - 45 Credit Hours</b>	<b>Critical course signified by</b>	<b>Hours</b>	<b>Minimum Grade</b>	<b>Notes</b>
		<ul style="list-style-type: none"> <li>MAT 272: Calculus with Analytic Geometry III (MA)</li> </ul>	4	C	<ul style="list-style-type: none"> <li>First year composition completed.</li> <li>All critical courses must be completed by the end of semester 4</li> <li>Maintain 2.6 cumulative GPA in all critical courses</li> <li>PHY 121/122 and 131/132 (or other equivalents) may be used in place of PHY 150 and 151, respectively</li> <li>CHM 113 may be used in place of CHM 117 and CHM 111</li> </ul>
		<ul style="list-style-type: none"> <li>PHY 151: Physics II (SQ)</li> </ul>	4	C	
		<ul style="list-style-type: none"> <li>BIO 181: General Biology I (SQ) OR BIO 182: General Biology II (SQ) OR CHM 117: General Chemistry for Majors I (SQ) AND CHM 111: General Chemistry Laboratory for Majors I</li> </ul>	4	C	
		<ul style="list-style-type: none"> <li>CLAS Science and Society Elective</li> </ul>	3	C	
		<ul style="list-style-type: none"> <li>Complete Mathematics (MA) requirement.</li> </ul>			
		<ul style="list-style-type: none"> <li>Maintain 2.60 GPA in Critical Tracking Courses.</li> </ul>			
		Term hours subtotal:	15		
<b>Term 4</b>	<b>46 - 62 Credit Hours</b>	<b>Critical course signified by</b>	<b>Hours</b>	<b>Minimum Grade</b>	<b>Notes</b>
		<ul style="list-style-type: none"> <li>CHM 240: Introduction to Physical Chemistry (CS)</li> </ul>	3	C	<ul style="list-style-type: none"> <li>All critical courses must be completed by end of semester 4</li> <li>Maintain 2.6 cumulative GPA in all critical courses</li> <li>CHM 116 may be used in place of CHM 118 and CHM 112</li> <li>MAT 275 (Modern Differential equations) (or MAT 274, Elementary Differential Equations) plus MAT 243 (Elementary Linear Algebra) (or MAT 343, Applied Linear Algebra) may be taken in place of CHM 240. The combination MAT275 + MAT 343 is recommended, but CHM 240 is sufficient.</li> </ul>
		<ul style="list-style-type: none"> <li>PHY 252: Physics III (SQ)</li> </ul>	4	C	
		<ul style="list-style-type: none"> <li>CHM 118: General Chemistry for Majors II (SQ) AND CHM 112: General Chemistry Laboratory for Majors II</li> </ul>	4	C	
		<ul style="list-style-type: none"> <li>Social and Behavioral Sciences (SB) AND Global Awareness (G)</li> </ul>	3		
		<ul style="list-style-type: none"> <li>Humanities, Fine Arts and Design (HU) AND Cultural Diversity in the U.S. (C) OR Humanities, Fine Arts and Design (HU) AND Historical Awareness (H)</li> </ul>	3		
		<ul style="list-style-type: none"> <li>Maintain 2.60 GPA in Critical Tracking Courses.</li> </ul>			
		Term hours subtotal:	17		
<b>Term 5</b>	<b>63 - 77 Credit Hours</b>		<b>Hours</b>	<b>Minimum Grade</b>	<b>Notes</b>
		<ul style="list-style-type: none"> <li>CHM 345: Physical Chemistry I</li> </ul>			

	3	C	
BIO 160: Animal Physiology OR BIO 353: Cell Biology	3	C	
Literacy and Critical Inquiry (L)	3		
Computer/Statistics/Quantitative Applications (CS)	3		
Upper Division CLAS Science and Society Elective	3	C	
<b>Term hours subtotal:</b>	<b>15</b>		
<b>Term 6 78 - 92 Credit Hours</b>	<b>Hours</b>	<b>Minimum Grade</b>	<b>Notes</b>
CHM 346: Physical Chemistry II	3	C	
PHY 312: Mechanics and Electromagnetism	3	C	
PHY 371: Driving Forces in Biology	3	C	
Upper Division Humanities, Fine Arts and Design (HU) OR Upper Division Social and Behavioral Sciences (SB)	3		
Social and Behavioral Sciences (SB)	3		
<b>Term hours subtotal:</b>	<b>15</b>		
<b>Term 7 93 - 107 Credit Hours</b>	<b>Hours</b>	<b>Minimum Grade</b>	<b>Notes</b>
PHY 472: Advanced Biophysics Lab	3	C	• PHY 472 includes a 1 credit lab component
Upper Division Literacy and Critical Inquiry (L)	3		
Elective	3		
Complete 2 courses: Upper Division Elective	6		
<b>Term hours subtotal:</b>	<b>15</b>		
<b>Term 8 108 - 120 Credit Hours</b>	<b>Hours</b>	<b>Minimum Grade</b>	<b>Notes</b>
PHY 473: From Molecules to Cells	3	C	
Elective	1		
Complete 3 courses: Upper Division Elective	9		
<b>Term hours subtotal:</b>	<b>13</b>		

**Total Hours:** 120  
**Upper Division Hours:** 45 minimum  
**Major GPA:** 2.00 minimum  
**Cumulative GPA:** 2.00 minimum  
**Total hrs at ASU:** 30 minimum  
**Hrs Resident Credit for Academic Recognition:** 56 minimum  
**Total Community College Hrs:** 64 maximum

**General University Requirements Legend**

- General Studies Core Requirements:
- Literacy and Critical Inquiry (L)
  - Mathematical Studies (MA)
  - Computer/Statistics/Quantitative Applications (CS)
  - Humanities, Fine Arts and Design (HU)
  - Social and Behavioral Sciences (SB)
  - Natural Science - Quantitative (SQ)
  - Natural Science - General (SG)

General Studies Awareness Requirements:

- Cultural Diversity in the U.S. (C)
- Global Awareness (G)
- Historical Awareness (H)
- First-Year Composition

General Studies designations listed on the major map are current for the 2013 - 2014 academic year.

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**From:** Robert Page  
**Sent:** Tuesday, September 25, 2012 12:12 PM  
**To:** curriculumplanning@asu.edu  
**Cc:** Jenny Smith  
**Subject:** FW: Proposal for a BS in Biophysics  
**Attachments:** Proposal\_BIOphysics FALL 2013 rev beta.doc; BioPhysMap\_v10.doc; Letters of support Biophysics.pdf

**Importance:** High

I approve.

Rob

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Robert E. Page, Jr.  
Vice Provost and Dean  
College of Liberal Arts and Sciences  
Arizona State University

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**From:** Jenny Smith <[jenny.smith@asu.edu](mailto:jenny.smith@asu.edu)>  
**Date:** Tuesday, September 25, 2012 10:52 AM  
**To:** Microsoft Office User <[Robert.Page@asu.edu](mailto:Robert.Page@asu.edu)>  
**Cc:** Paul LePore <[paul.lepore@asu.edu](mailto:paul.lepore@asu.edu)>, Patty <[p.duncan@asu.edu](mailto:p.duncan@asu.edu)>  
**Subject:** Proposal for a BS in Biophysics

Dean Page,

The CLAS Curriculum Committee and Senate have approved the attached proposal for a Bachelor of Science degree in Biophysics. Please forward the proposal with your approval to [curriculumplanning@asu.edu](mailto:curriculumplanning@asu.edu)

Thank you,  
Jenny

**JENNY SMITH**  
Executive Administrative Support Specialist  
**College of Liberal Arts and Sciences**  
Arizona State University | P.O. Box 876605 | Tempe, Arizona 85287-6605  
480.965.6506 | Fax: 480.965.2110 | e-mail: [jenny.smith@asu.edu](mailto:jenny.smith@asu.edu)

**ASU College of Liberal Arts and Sciences** — *Transforming learning, discovery and lives*

March 19, 2012

**Impact Statement by SoMSS regarding the proposed BioPhysics major and new courses:**

**PHY 371 "Driving forces in Biology" (3 credits)**

**PHY 472 "Advanced Biophysics Lab" (3 credits)**

**PHY 373 "From Molecules to cells" (3 credits)**

From the perspective of the School of Mathematical and Statistical Sciences (SoMSS) the proposed new major and the proposed new courses appear academically sound and are not expected to have any negative impacts. There do not appear to be any conflicts with courses offered by SoMSS. Moreover, the mathematics requirements of the new program (primarily at the calculus level) do not cause any new burden on SoMSS and SoMSS will be happy to provide the required instruction.

The proposed new major and new courses have the full support by SoMSS.

Sincerely,



Matthias Kawski, Professor and  
Associate Director for Undergraduate Programs  
<http://math.asu.edu/~kawski>

## Jenny Smith

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**From:** Adam Farni  
**Sent:** Tuesday, March 20, 2012 2:50 PM  
**To:** Adam Farni  
**Subject:** FW: BioChem/Chem Impact Statement Request for comments on a new Biophysics major

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**From:** William Petuskey [mailto:wpetuskey@asu.edu]  
**Sent:** Tuesday, March 20, 2012 11:36 AM  
**To:** Mike Treacy  
**Cc:** Robert Nemanich; Marcia Levitus; George Wolf; Adam Farni; Peter Williams  
**Subject:** Re: Request for comments on a new Biophysics major

Mike,

I talked with Bob Nemanich last night and we worked out an understanding. Fundamentally, DCB will need to reserve our majors courses for our majors, however, we are willing for your biophysics students to take up unused capacity.

With respect to CHM 240, Bob indicated that if we needed to add a lecture section due to biophysics students tipping the enrollments, then Physics will dedicate a faculty member to teach the extra section. He suggested Oliver Beckstein as a possible instructor.

We also understand that the Department of Physics will be willing to accept CHM 113 and 116 as alternatives for CHM 117/111 and 118/112 for the biophysics degree. Please keep in mind that the latter courses are intended by us to give our majors as much attention as is possible, and so it is expected that we will be planning these courses so as not to have large excess capacity. You may wish to designate CHM 113 and 116 as equivalent in meeting biophysics degree program requirements in case that excess capacity is small.

With respect to the P-Chem courses, we will play this by ear depending on what your enrollments will be like at the time your students arrive at that level. If there is a crush of new enrollments that we can't conveniently accommodate without affecting the intent and quality of these courses, we will then rely on the intrinsic understanding established here by working out the teaching needs with the Department of Physics.

With all this in mind, the Department of Chemistry and Biochemistry will endorse your plan.

Will this e-mail suffice for your purposes, or is there a formal mechanism that must be followed?

Bill

William Petuskey, Sc.D.  
Professor and Chair, Department of Chemistry & Biochemistry  
Arizona State University  
P.O. Box 871604  
Tempe, AZ 85287-1604

[wpetuskey@asu.edu](mailto:wpetuskey@asu.edu)

(480)965-4430 (ph) (480)965-8607(fx)  
[http://chemistry.asu.edu/faculty/W\\_petuskey.asp](http://chemistry.asu.edu/faculty/W_petuskey.asp)

Betty Landon, Executive Assistant  
(480)965-8657; [blandon@asu.edu](mailto:blandon@asu.edu)

On Mar 19, 2012, at 7:47 PM, Mike Treacy wrote:

Bill,

Thank you for your comments. Your response is greatly appreciated at such short notice.

I appreciate your concerns about the impact of a large biophysics enrollment on your majors courses. In principle, we are happy to use CHM 113 and 116. The decision to go with CHM 117/111 and CHM 118/112, rather than the General Studies equivalents may have arisen during earlier discussions with you and/or George Wolf. It may have been George who planted the idea for using CHM 240.

May I propose the following interim solution? For the first year of the program students take the Majors courses so we can assess the students' capabilities. Similarly for CHM 240? We can modify the existing Majors map to reflect that CHM 113 and CHM 116 are acceptable alternatives. If you find that CHM 117/111 and CHM 118/112 are being deluged, then we can simply redirect students.

I am perfectly happy to find/create an alternative for CHM 240, but it is too late for this stage of the proposal.

I am happy with you reserving first-choice placement for your students. Since it is nominally a second-year course, we would have time to find or develop an alternative course.

Best wishes

Mike

William Petuskey wrote:  
Mike,

George Wolf just contacted us about what you two had discussed about the program. In effect, he would endorse including your students in our majors courses, as long as, we have the capacity without excluding our own majors. The general chemistry and physical chemistry courses has plenty of capacity at the moment. Our remaining concern is therefore CHM 240. Do you have an alternative for this if our sections are booked? Do you have a problem with us reserving first choice enrollment for our own students?

Bill

William Petuskey wrote:

Mike,



In principle, we are in favor of this initiative and are supportive, but we are still actively discussing your proposal. But let me tell you initially of our concerns.

We are concerned about the possible impact on our foundational courses. In particular, I am thinking of CHM 117/111, 118/112, and 240. These are courses specifically geared for our majors and there are limitations on enrollment that would become a problem if we had to expand by going to larger facilities, rather than simply increasing the number senior faculty led lecture sections.

My first question, why is it that you chose 117 and 118 rather than 113 and 116 which is oriented toward the non-chemistry physical science students? It is much easier for us to expand sections for the latter than for the former.

Second, the distinctive feature of CHM 240 is the personalized attention given to the students. This course is mathematics for chemistry and biochemistry majors. Right now, we have a capacity for 48 students (two lab sections of 24) which uses the computing lab extensively. While we usually have some unused capacity, a large biophysics program would outstrip what we are able to offer without adding more senior faculty. Please keep in mind that we see that CHM 240 is one of the specialized offerings that we have that are specifically meant for our majors. We do not want to alter the emphasis for chemists. (We tried this once with engineering students. Even though they were superior in math skills, they simply could not easily translate that into terms that chemists use for thinking through problems.)

Both questions boil down to resource issues and not wanting to change the character of the courses. Within our current infrastructure, I can see some students taking such courses, but not so many that it detracts from the attention that is meant to be given to our majors. Do you have a sense of what would happen if enrollments expand dramatically and we are not able to offer these courses beyond what we are doing now? (I'll see what our unused capacity has been for the last couple of years.)

Finally, we note that the biophysics students would be taking physical chemistry for majors and also not be taking the labs. Can you tell me what is your thinking on this?

Thanks.

Bill

William Petuskey, Sc.D.  
Professor and Chair, Department of Chemistry & Biochemistry  
Arizona State University  
P.O. Box 871604  
Tempe, AZ 85287-1604

[wpetuskey@asu.edu](mailto:wpetuskey@asu.edu)  
(480)965-4430 (ph) (480)965-8607(fx)  
[http://chemistry.asu.edu/faculty/W\\_petuskey.asp](http://chemistry.asu.edu/faculty/W_petuskey.asp)

Betty Landon, Executive Assistant  
(480)965-8657; [blandon@asu.edu](mailto:blandon@asu.edu)

On Mar 18, 2012, at 4:23 PM, Mike Treacy wrote:

Hi Bill,

I hope you will be able to get your comments to us by tomorrow, Monday March 19th.

Best wishes

Mike

Dear Bill,

The Department of Physics is looking to offer a new Biophysics major (BS) starting in the fall of 2013. It will be an interdisciplinary degree with significant exposure to chemistry and biology, as well as physics. The syllabus will rely on existing CHM and BIO courses, as well as existing PHY courses.

I am seeking your feedback on this new proposed major. Please may I have your comments back by Monday March 19th? I apologize for the relatively short lead time - I hope to present this to the College Curriculum Committee on March 27th, and the committee will need materials before their meeting.

Three new upper-division biophysics-specific courses are being created;

**PHY 371 "Driving forces in Biology"** (3 credits)

**PHY 472 "Advanced Biophysics Lab"** (3 credits)

**PHY 373 "From Molecules to cells"** (3 credits)

The new degree will demand a total of 60 credit hours, of which 36 credits are Major degree, 24 credits are related area. 4 additional credits are pre-requisite math (MAT270). 21 credit hours are upper division, meeting college requirements.

Because of the high demand of 60 credits hours (the maximum permitted by CLAS), we cannot ask students to take our usual PHY310 (Mechanics) and PHY 311 (Electromagnetism) courses. Instead, we have created a new hybrid course

**PHY 312 "Mechanics and Electromagnetism"** (3 credits)

This course will ensure that students get appropriate upper-division exposure to essentials in these important topics. The course will also be taught at a more appropriate mathematical level, as the Biophysics majors will not receive quite as advanced a mathematical training as the physics majors themselves.

Attached, you will find the syllabi-of-record for the four new courses. I also attach the proposed Biophysics Majors Map, as well as a Biophysics majors Chart, which attempts to lay out a likely sequence of courses that students will take.

It is likely that the four new Syllabi will evolve further, particularly with regard to fine detail, when the first classes approach. However, we believe that the essential details are in place.

The proposed changes for this new degree do not impact our existing physics Major degrees (BS, options 1 and 2; and the BA) or the minor physics degree. The minor-degree students could benefit from the new PHY312

course, which could be offered to them as an upper-division elective.

Your help with this proposal is most appreciated.

Sincerely

*Mike Treacy*

Professor of Physics, Director of Undergraduate Studies

Department of Physics, Bateman Building, PSB-147

Arizona State University | P.O. Box 871504 | Tempe, Arizona 85287-1504

Phone: 480.965.5359 | Fax: 480.965.7565 | e-mail: [treacy@asu.edu](mailto:treacy@asu.edu)

<BioPhysics\_BS\_Chart.pdf><PHY312\_SyllabusOfRecord.pdf><PHY371\_SyllabusOfRecord.pdf><PHY472\_SyllabusOfRecord.pdf><PHY473\_SyllabusOfRecord.pdf><BiophysicsMajorMap.pdf>

## Jenny Smith

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**From:** Adam Farni  
**Sent:** Monday, March 19, 2012 2:50 PM  
**To:** Jenny Smith  
**Cc:** treacy@asu.edu; Robert Nemanich  
**Subject:** FW: Request for comments on a new Biophysics major

Hi Jenny,

Impact statement from Sols.

Thank you.

Adam

[Adam.Farni@asu.edu](mailto:Adam.Farni@asu.edu), M.Ed.  
Undergraduate Coordinator  
Department of Physics, CLAS  
Arizona State University | Tempe, Arizona 85287-1504  
Phone: 480.965.6794 | Fax: 480.965.7565 | PSF 470

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**From:** Miles Orchinik  
**Sent:** Monday, March 19, 2012 1:47 PM  
**To:** Robert Nemanich; Michael Treacy  
**Cc:** Adam Farni  
**Subject:** RE: Request for comments on a new Biophysics major

Hi Bob, Mike.

As a neuroscientist, I'd be glad to see a Biophysics major on campus. SoLS has a number of course that touch on biophysics, including BIO 353 (Cell Biology), BIO 360 (Animal Physiology), BIO 467 (Neurobiology), and BIO 465 (Neurophysiology), BIO 466 (Neurophysiology Lab), BIO 467 (Neurobiology), BIO 469 (Computational Neurosciences), and secondarily, BIO 340 (Genetics) and BIO 462 (Photobiology).

After looking over the proposed or current course syllabi, I see some overlap of content, but the biophysics approach is different enough that I would not consider this course duplication.

After looking over the major map, I suggest that you consider a change in BIO requirements. While mol biology/mol genetics grew out of collaborations between biologists and physicists, I don't think that BIO 340 (Genetics) would be as useful to your students as BIO 353 (Cell Biology). I suggest giving the students the choice between BIO 360 (Animal Physiology; 1<sup>st</sup> half of course is largely membrane biology, excitability) and BIO 353 (membrane biology, signaling, molecular motors, molecular genetics) in Tracking Term Five, since you don't have room to require both.

I'd like to know what the pre-reqs would be for PHY 371, Driving Forces in Biology, because it might be of interest to some Life Sciences students.

Please let me know if I can provide additional information.

Thanks,  
Miles

**MILES ORCHINIK**

Associate Director of Undergraduate Programs

SCHOOL OF LIFE SCIENCES

ARIZONA STATE UNIVERSITY

Box 874501 | Tempe AZ 85287-4501 | Life Sciences C wing, room 502

480-965-5084 | [orchinik@asu.edu](mailto:orchinik@asu.edu)

<http://sols.asu.edu/people/faculty/morchinik.php>

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**From:** Robert Nemanich

**Sent:** Monday, March 19, 2012 11:13 AM

**To:** Miles Orchinik

**Cc:** Michael Treacy; Adam Farni

**Subject:** FW: Request for comments on a new Biophysics major

Dear Miles,

I would appreciate if you could endorse and comment on our plans to initiative a new degree program in Biophysics. The program has been approved at the Provost's office but now we need approval for the curriculum and the four new courses.

I am forwarding a previous email from Mike Treacy with all of the details. It is important that we have your input prior to Thursday (3/22/12) of this week. The CLAS curriculum committee is reviewing the proposal in its next meeting.

Sincerely,  
Bob

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Robert J. Nemanich

Professor and Chair, Department of Physics

Arizona State University P.O. Box 871504, Tempe, AZ 85287-1504

Phone: (480) 965-2240, [robert.nemanich@asu.edu](mailto:robert.nemanich@asu.edu), <http://physics.asu.edu>

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Dear Miles,

The Department of Physics is looking to offer a new Biophysics major (BS) starting in the fall of 2013. It will be an interdisciplinary degree with significant exposure to chemistry and biology, as well as physics. The syllabus will rely on existing CHM and BIO courses, as well as existing PHY courses.

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Your help with this proposal is most appreciated.

Sincerely

*Mike Treacy*

Professor of Physics, Director of Undergraduate Studies

Department of Physics, Bateman Building, PSB-147

Arizona State University | P.O. Box 871504 | Tempe, Arizona 85287-1504

Phone: 480.965.5359 | Fax: 480.965.7565 | e-mail: [treacy@asu.edu](mailto:treacy@asu.edu)



## Jenny Smith

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**From:** Mike Treacy [treacy@asu.edu]  
**Sent:** Monday, March 12, 2012 10:39 AM  
**To:** Steven Semken  
**Cc:** Adam Farni  
**Subject:** Re: Request for comments on a new Biophysics major

Dear Steve,

Thank you for the prompt response.

Best wishes

Mike

Steven Semken wrote:

Dear Mike,

The School of Earth and Space Exploration has no objection to the proposed new BS Biophysics major and the four new courses PHY 312, 371, 373, and 472.

Best regards,  
Steve Semken

*Steven Semken*

Associate Professor of Geology and Geoscience Education  
and Associate Director for Undergraduate Education  
School of Earth and Space Exploration

Arizona State University  
PO Box 871404 / 550 E Tyler Mall  
Tempe, Arizona 85287-1404 USA

Research website: [semken.asu.edu](http://semken.asu.edu)  
School website: [sese.asu.edu](http://sese.asu.edu)

On 11 Mar 2012, at 22:21 , Mike Treacy wrote:

Dear Steven,

The Department of Physics is looking to offer a new Biophysics major (BS) starting in the fall of 2013. It will be an interdisciplinary degree with significant exposure to chemistry and biology, as well as physics. The syllabus will rely on existing CHM and BIO courses, as well as existing PHY courses.

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Your help with this proposal is most appreciated.

Sincerely

*Mike Treacy*

Professor of Physics, Director of Undergraduate Studies

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