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

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: ___________________________
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]. 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.

<table>
<thead>
<tr>
<th>DEGREE PROGRAM INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Undergraduate: BS-Bachelor of Science</td>
</tr>
</tbody>
</table>

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

Proposed title of major: Biophysics

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 Magnetism/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 (4 cr)]
   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):

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

(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.

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.

<table>
<thead>
<tr>
<th>5-YEAR PROJECTED ANNUAL ENROLLMENT</th>
</tr>
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<tbody>
<tr>
<td></td>
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<tr>
<td>1st Year</td>
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<td>2nd Year</td>
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<tr>
<td>3rd Year</td>
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<tr>
<td>4th Year</td>
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<tr>
<td>5th Year</td>
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<tr>
<td></td>
</tr>
<tr>
<td>Number of Students Majoring</td>
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<tr>
<td>(Headcount)</td>
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<td></td>
</tr>
<tr>
<td>20-30</td>
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<tr>
<td>50-80</td>
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<tr>
<td>100-140</td>
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<tr>
<td>150-180</td>
</tr>
<tr>
<td>200+</td>
</tr>
</tbody>
</table>

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: PSF 470
- Program office telephone number: 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
- [X] Phoenix
- [ ] Polytechnic
- [X] 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.

- Architecture, Construction & Design
- Artistic Expression & Performance
- Biological Sciences, Health & Wellness
- Business, Management & Economics
- Communication & Media
- Computing & Mathematics
- Education & Teaching
- Engineering & Technology
- Environmental Issues & Physical Science
- Interdisciplinary Studies
- Languages & Cultures
- Law & Justice
- Social Science, Policies & Issues

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

- Architecture, Construction & Design
- Artistic Expression & Performance
- Biological Sciences, Health & Wellness
- Business, Management & Economics
- Communication & Media
- Computing & Mathematics
- Education & Teaching
- Engineering & Technology
- Environmental Issues & Physical Science
- Interdisciplinary Studies
- Languages & Cultures
- Law & Justice
- Social Science, Policies & Issues

The following fields are to be completed by the Office of the Executive Vice President and Provost of the University.

CIP Code: _____________
Plan Code: _____________

Request to implement a new undergrad degree
### 2013 - 2014 Major Map
**Biophysics, BS (Proposed)**

#### Term 1 0 - 15 Credit Hours

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Minimum Grade</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIA 151</td>
<td>Academic Success Seminar</td>
<td>1</td>
<td>SAT, ACT (or TOEFL) score determines placement into first-year composition courses.</td>
</tr>
<tr>
<td>PHYS 106</td>
<td>First-Year Seminar</td>
<td>1</td>
<td>ASU Math Placement Exam score determines placement in Mathematics course.</td>
</tr>
<tr>
<td>MAT 270</td>
<td>Calculus with Analytic Geometry I (MA)</td>
<td>4</td>
<td>All critical courses must be completed by the end of semester 4.</td>
</tr>
<tr>
<td>BIO 181</td>
<td>General Biology I (SGP OR OR ENG 101 or ENG 103) or First-Year Composition OR</td>
<td>4</td>
<td>Maintain 2.6 cumulative GPA in all critical courses.</td>
</tr>
<tr>
<td>CHEM 111</td>
<td>General Chemistry Laboratory for Majors I</td>
<td>3</td>
<td>PHY 121/122 and 131/132 (or other equivalents) may be used in place of PHY 150 and 151, respectively.</td>
</tr>
<tr>
<td>HUM 113</td>
<td>Humanities, Fine Arts and Design (Hi) AND Cultural Diversity in the U.S. (Hi)</td>
<td>3</td>
<td>CPI 113 may be used in place of CPI 117 and CHEM 111.</td>
</tr>
<tr>
<td>Maintain 2.60 GPA in Critical Tracking Courses.</td>
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</tbody>
</table>

Term hours subtotal: 15

#### Term 2 16 - 30 Credit Hours

<table>
<thead>
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<th>Course Code</th>
<th>Course Title</th>
<th>Minimum Grade</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAT 271</td>
<td>Calculus with Analytic Geometry II (MA)</td>
<td>4</td>
<td>All critical courses must be completed by the end of semester 4.</td>
</tr>
<tr>
<td>PHYS 150</td>
<td>Physics I (SGP) OR</td>
<td>4</td>
<td>Maintain 2.6 cumulative GPA in all critical courses.</td>
</tr>
<tr>
<td>ENG 101 or ENG 103</td>
<td>First-Year Composition OR</td>
<td>4</td>
<td>PHY 121/122 and 131/132 (or other equivalents) may be used in place of PHY 150 and 151, respectively.</td>
</tr>
<tr>
<td>CHEM 111</td>
<td>General Chemistry Laboratory for Majors I</td>
<td>3</td>
<td>CPI 113 may be used in place of CPI 117 and CHEM 111.</td>
</tr>
<tr>
<td>Complete ENG 101 or EN 105 or EN 107 course(s).</td>
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<tr>
<td>Maintain 2.60 GPA in Critical Tracking Courses.</td>
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</table>

Term hours subtotal: 15

#### Term 3 31 - 45 Credit Hours

<table>
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<tr>
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<th>Course Title</th>
<th>Minimum Grade</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAT 272</td>
<td>Calculus with Analytic Geometry III (MA)</td>
<td>4</td>
<td>First year composition completed.</td>
</tr>
<tr>
<td>PHYS 151</td>
<td>Physics II (SGP)</td>
<td>4</td>
<td>All critical courses must be completed by the end of semester 4.</td>
</tr>
<tr>
<td>BIO 181</td>
<td>General Biology I (SGP) OR</td>
<td>4</td>
<td>Maintain 2.6 cumulative GPA in all critical courses.</td>
</tr>
<tr>
<td>CHEM 111</td>
<td>General Chemistry Laboratory for Majors I</td>
<td>3</td>
<td>PHY 121/122 and 131/132 (or other equivalents) may be used in place of PHY 150 and 151, respectively.</td>
</tr>
<tr>
<td>CLAS Science and Society Elective</td>
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<tr>
<td>Complete Mathematics (MA) requirement.</td>
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<tr>
<td>Maintain 3.00 GPA in Critical Tracking Courses.</td>
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Term hours subtotal: 15

#### Term 4 46 - 52 Credit Hours

<table>
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<th>Course Code</th>
<th>Course Title</th>
<th>Minimum Grade</th>
<th>Notes</th>
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<tbody>
<tr>
<td>CHEM 240</td>
<td>Introduction to Physical Chemistry (CS)</td>
<td>3</td>
<td>All critical courses must be completed by end of semester 4.</td>
</tr>
<tr>
<td>PHYS 252</td>
<td>Physics III (SGP) OR</td>
<td>4</td>
<td>Maintain 2.6 cumulative GPA in all critical courses.</td>
</tr>
<tr>
<td>CHEM 112</td>
<td>General Chemistry Laboratory for Majors II</td>
<td>4</td>
<td>CPI 116 may be used in place of CHEM 118 and CHEM 112.</td>
</tr>
<tr>
<td>Social and Behavioral Sciences (SGP) AND Global Awareness (G)</td>
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</tr>
<tr>
<td>HUM 113</td>
<td>Humanities, Fine Arts and Design (Hi) AND Cultural Diversity in the U.S. (Hi)</td>
<td>3</td>
<td>CPI 113 may be used in place of CPI 117 and CHEM 111.</td>
</tr>
<tr>
<td>Maintain 2.60 GPA in Critical Tracking Courses.</td>
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Term hours subtotal: 17

#### Term 5 63 - 77 Credit Hours

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<th>Course Code</th>
<th>Course Title</th>
<th>Minimum Grade</th>
<th>Notes</th>
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</thead>
<tbody>
<tr>
<td>CHEM 345</td>
<td>Physical Chemistry</td>
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</tbody>
</table>

Term hours subtotal: 17
BIO 350: Animal Physiology OR
BIO 351: Cell Biology
3

Literacy and Critical Inquiry (L)
3

Computer/Statistics/Quantitative Applications (CS)
3

Upper Division CHAS Science and Society Elective
3

Term hours subtotal: 15

Term 6 78 - 92 Credit Hours

PHY 346: Physical Chemistry II
3

PHY 312: Mechanics and Electromagnetism
3

PHY 371: Driving Forces in Biology
3

Upper Division Humanities, Fine Arts and Design (HU) OR
Upper Division Social and Behavioral Sciences (SB)
3

Social and Behavioral Sciences (SB)
3

Term hours subtotal: 15

Term 7 93 - 107 Credit Hours

PHY 472: Advanced Biophysics Lab
3

Upper Division Literacy and Critical Inquiry (L)
3

Elective
3

Complete 2 courses:
Upper Division Elective
6

Term hours subtotal: 15

Term 8 108 - 120 Credit Hours

PHY 473: From Molecule to Cells
3

Elective
1

Complete 3 courses:
Upper Division Elective
9

Term hours subtotal: 13

Total Hours: 110

Upper Division Hours: 45 minimum

Major GPA: 2.00 minimum

Cumulative GPA: 2.00 minimum

Total hrs at ASU: 30 minimum

Hrs Resistant Credit for Academic Recognitions: 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 designations listed on the major map are current for the 2013 - 2014 academic year.

General Studies Awareness Requirements:
• Cultural Diversity in the U.S. (C)
• Global Awareness (G)
• Historical Awareness (H)
• First-Year Composition

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I approve.

Rob

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

From: Jenny Smith <jenny.smith@asu.edu>
Date: Tuesday, September 25, 2012 10:52 AM
To: Microsoft Office User <Robert.Page@asu.edu>
Cc: Paul LePore <paul.lepore@asu.edu>, Patty <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

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

ASU College of Liberal Arts and Sciences — Transforming learning, discovery and lives
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
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
On Mar 19, 2012, at 7:47 PM, Mike Treacy wrote:

Bill,

Thank you for your comments. You 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

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http://chemistry.asu.edu/faculty/W_petuskey.asp

Betty Landon, Executive Assistant
(480)965-8657; 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
Hi Jenny,

Impact statement from SoLS.

Thank you.

Adam

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

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; 1st 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.
Dear Miles,

I would appreciate if you could endorse and comment on our plans to initiate 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

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, http://physics.asu.edu

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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NEW DEGREE REQUIREMENTS

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.

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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
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
School website: 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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Sincerely

Mike Treacy
Professor of Physics, Director of Undergraduate Studies
Department of Physics, Bateman Building, PSB-147
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Phone: 480.965.5359| Fax: 480.965.7565| e-mail: treacy@asu.edu