



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 and 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: n/a

Proposed Degree Name: Physics (Bachelor of Arts)

Undergraduate Degree Type: BA-Bachelor of Arts

If Degree Type is Other, provide proposed degree type: n/a

and proposed abbreviation: LAPHYBA

Proposed title of major: Physics (BA)

Is a program fee required? Yes [] No [x]

Requested effective term: Spring and year: 2010
(The first semester and year for which students may begin applying to the program.)

PROPOSAL CONTACT INFORMATION

(Person to contact regarding this proposal)

Name: Sabrina Mathues

Title: Academic Advisor

Phone: 480-965-9075
Sabrina.Mathues@asu.edu

email:

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:

College Dean signature _____ Date: _____

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

College Dean signature _____ Date: _____

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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:curriculum@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.

DEGREE PROGRAM INFORMATION

Undergraduate: BA-Bachelor of Arts

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

Proposed title of major: Physics (BA)

1. PURPOSE AND NATURE OF PROGRAM

A. Brief program description (This is a catalog type description of no more than 250 words. Include the distinctive features of the program that make it unique. Do not include program or admission requirements.)

The Physics (BA) degree provides a flexible and efficient option for students who are interested in a liberal arts degree with broad knowledge of physics and at least one other area. This degree program is ideal for students seeking double-major degrees with physics as the second degree. Students wishing to pursue a graduate degree in physics are advised to consider the Physics (BS) option.

2. STUDENT LEARNING OUTCOMES AND ASSESMENT

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. Understand the fundamental concepts, principles, and applications of classical physics (mechanics, electricity and magnetism, thermodynamics) and modern physics (relativity, quantum mechanics).
2. Apply mathematical tools to provide qualitative and quantitative solutions to physics problems.
3. Communicate clearly physics concepts, results, and the interpretation of results in oral and written presentations.
4. Augment learning of physics with substantial knowledge in at least one other area (for example – chemistry, education, kinesiology, law, math, political science, etc.) or additional study in physics. [This learning objective distinguishes this program from the B.S. in Physics.]

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>))

SLO 1. Measure 1. A sample of graded examinations and homework problems will be selected from PHY 310, 311, and 314. Question content will be assessed for coverage of standard topics in classical mechanics, electricity and magnetism, modern physics, and quantum mechanics. Student performance assessments on those questions will be reviewed to determine if the topic mastery has been appropriately assessed.

SLO 1. Measure 2. Employment in a position or job using the physics knowledge obtained or entry into a graduate program.

SLO 2. Measure 1. A sample of graded examinations and homework problems will be selected from PHY 310, 311, and 314. Question content will be assessed for usage of mathematical skills in classical mechanics, electricity and magnetism, modern physics, and quantum mechanics. Student performance assessments on those questions will be reviewed to determine if the topic mastery has been appropriately assessed.

SLO 2. Measure 2. Employment in a position or job using mathematical knowledge obtained or entry into a graduate program requiring mathematical skills.

SLO 3. Measure 1. A sample of student project posters and presentations will be selected from courses, department research symposia, or other physics-related activities. These will be assessed for clarity and accuracy.

SLO 3. Measure 2. Employment in a position or job requiring technical communication or entry into a graduate program.

SLO 4. Measure 1. Successful completion of 6 upper-division credit hours of coursework (noted as program specific electives) in physics or another area with a grade of C or better.

SLO 4. Measure 2. Employment in a position or job using the physics or related area knowledge obtained or entry into a graduate program.

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 total (49 specific to the major)

C. Core/Required Courses.

i. Total required and/or core course credit hours: **43 credits**

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

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

| | | |
|--|------|------|
| MAT270 <i>Calculus with Analytic Geometry I</i> | 4 cr | (MA) |
| MAT271 <i>Calculus with Analytic Geometry II</i> | 4 cr | (MA) |
| MAT272 <i>Calculus with Analytic Geometry III</i> | 4 cr | (MA) |
| CHM117 <i>General Chemistry for Majors I</i> | 4 cr | (SQ) |
| PHY150 <i>Physics I</i> | 4 cr | (SQ) |
| PHY151 <i>Physics II</i> | 4 cr | (SQ) |
| PHY252 <i>Physics III</i> | 4 cr | (SQ) |
| PHY201 <i>Mathematical Methods in Physics I</i> | 3 cr | (CS) |
| PHY302 <i>Mathematical Methods in Physics II</i> | 2 cr | |
| PHY310 <i>Classical Particles, Fields, and Matter I</i> | 3 cr | |
| PHY314 <i>Quantum Physics I</i> | 3 cr | |
| PHY311 <i>Classical Particles, Fields, and Matter II</i> | 3 cr | |

D. Program Specific Electives.

- i. Total required program elective credit hours: **6 credits**
- ii. List the name, prefix, and credit hours for any program specific electives for this program:

| | |
|---|------|
| PHY333 <i>Electronic Circuits and Measurements</i> | 3 cr |
| PHY334 <i>Advanced Lab I</i> | 2 cr |
| PHY465 <i>Advanced Lab II</i> | 2 cr |
| PHY412 <i>Classical Particles, Fields, and Matter III</i> | 3 cr |
| PHY416 <i>Quantum Physics III</i> | 3 cr |
| PHY441 <i>Statistical and Thermal Physics</i> | 3 cr |
| PHY498 <i>ST: Biophysics</i> | 3 cr |
| PHY498 <i>ST: Medical Physics</i> | 3 cr |
| PHY498 <i>ST: Solid State Physics</i> | 3 cr |
| PHY481 <i>Materials Physics</i> | 3 cr |
| PHY462 <i>Subatomic Physics</i> | 3 cr |
| AST321 <i>Introduction to Planetary and Stellar Astrophysics</i> | 3 cr |
| AST322 <i>Introduction to Galactic and Extragalactic Astrophysics</i> | 3 cr |
| AST421 <i>Astrophysics I</i> | 3 cr |
| AST422 <i>Astrophysics II</i> | 3 cr |
| CHM345 <i>Physical Chemistry I</i> | 3 cr |
| CHM346 <i>Physical Chemistry II</i> | 3 cr |
| CHM471 <i>Solid-State Chemistry</i> | 3 cr |
| MAT421 <i>Numerical Methods</i> | 3 cr |

E. Additional Program Requirements, if any. List and describe any capstone experiences, milestone, and/or additional requirements for this degree program:
none

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 <small>(include course name and prefix)</small> | Total Core credit hours | Program Specific Electives <small>(include course name and prefix)</small> | Total Elective credit hours | Additional Requirements <small>(i.e. milestones, capstones)</small> |
|--------------------|--------------------|--|-------------------------|---|-----------------------------|--|
| | | | | | | |
| | | | | | | |
| | | | | | | |

(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 establishment of a new prefix](#) for each prefix and submit with this proposal.

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

n/a

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

This initiative is in keeping with the University’s goals to promote transdisciplinary studies while maintaining the standard of four-year degree completion. Students currently pursuing other degree programs have expressed an interest in completing a second degree in physics. The BA will allow the flexibility required for such students to develop a strong foundation in physics while pursuing other interests in the liberal arts and sciences, or other academic areas.

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.

1. Math Department: Core courses for the BA include MAT270, MAT271, and MAT272 as pre- and co-requisites. Enrollment could increase for these courses.
2. Chemistry Department: CHM117 has been adopted as a core course to strengthen the breadth of physics students’ interdisciplinarity. Enrollment could increase for this course.
3. Other departments offering courses which may be used to satisfy the 6 required upper- division credits of program-specific electives may also be impacted (for example, School of Earth and Space Exploration or the School of Life Sciences). While no new courses need be created by these other academic units, enrollment may increase for existing upper-division courses.

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.

| 5-YEAR PROJECTED ANNUAL ENROLLMENT | | | | | |
|---|----------------------------|--|--|---|--|
| | 1st Year | 2nd Year (Yr 1 continuing + new entering) | 3rd Year (Yr 1 & 2 continuing + new entering) | 4th Year (Yrs 1, 2, 3 continuing + new entering) | 5th Year (Yrs 1, 2, 3, 4 continuing + new entering) |
| Number of Students Majoring (Headcount) | 5 | 12 | 20 | 22 | 25 |

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.

n/a

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.

Expertise - Biological Physics

Regents Professor Stuart Lindsay, Ph.D.
 Professor Timothy Newman, Ph.D.
 Assistant Professor Banu Ozkan, Ph.D.

Associate Professor Robert Ros, Ph.D.
 Regents Professor Otto Sankey, Ph.D.
 Professor Michael Thorpe, Ph.D.

Mentors honors research

Teaches biophysics topics courses
Teaches biophysics topics course and statistical and thermal physics
Teaches introductory physics sequence courses
Teaches introductory physics sequence courses
Teaches statistical and thermal physics

| | |
|---|---|
| Assistant Professor Sara Vaiana, Ph.D. | <i>Teaches introductory physics sequence courses</i> |
| <u>Expertise – Materials Physics and Condensed Matter</u> | |
| Lecturer Gary Adams, Ph.D. | <i>Teaches introductory physics sequence courses</i> |
| Professor Peter Bennett, Ph.D. | <i>Teaches lab courses</i> |
| Professor Ralph Chamberlin, Ph.D. | <i>Teaches introductory physics sequence courses and serves as a faculty academic advisor</i> |
| Professor Bruce Doak, Ph.D. | <i>Teaches introductory physics sequence courses</i> |
| Professor Jeff Drucker, Ph.D. | <i>Teaches introductory physics sequence honors section courses</i> |
| Associate Professor Robert Marzke, Ph.D. | <i>Teaches lab courses</i> |
| Professor Jose Menendez, Ph.D. | <i>Teaches introductory physics sequence courses</i> |
| Professor Fernando Ponce, Ph.D. | <i>Teaches materials physics topics course sequence</i> |
| Professor Kevin Schmidt, Ph.D. | <i>Teaches advanced undergraduate courses</i> |
| Associate Professor John Shumway, Ph.D. | <i>Teaches advanced undergraduate courses</i> |
| Professor Kong-Thon Tsen, Ph.D. | <i>Teaches lab courses</i> |
| Professor Ignatius Tsong, Ph.D. | <i>Teaches circuits course</i> |
| <u>Expertise – Subatomic Physics</u> | |
| Professor Ricardo Alarcon, Ph.D. | <i>Teaches advanced undergraduate courses</i> |
| Assistant Professor Andrei Belitsky, Ph.D. | <i>Teaches advanced undergraduate courses</i> |
| Professor Joseph Comfort, Ph.D. | <i>Teaches advanced undergraduate courses</i> |
| Associate Professor Richard Lebed, Ph.D. | <i>Teaches advanced undergraduate courses</i> |
| Assistant Professor Cecilia Lunardini, Ph.D. | <i>Teaches advanced undergraduate courses</i> |
| Professor Barry Ritchie, Ph.D. | <i>Teaches advanced undergraduate courses</i> |
| <u>Expertise – Nanoscale Physics</u> | |
| Associate Professor Martha McCartney, Ph.D. | <i>Teaches advanced undergraduate courses</i> |
| Chair/Professor Robert Nemanich, Ph.D. | <i>Teaches introductory physics sequence courses</i> |
| Professor Peter Rez, Ph.D. | <i>Teaches advanced undergraduate courses</i> |
| Regents Professor David Smith, Ph.D. | <i>Teaches advanced undergraduate courses</i> |
| Regents Professor John Spence, Ph.D. | <i>Teaches advanced undergraduate courses</i> |
| Professor Michael Treacy, Ph.D. | <i>Teaches introductory physics sequence courses</i> |
| Lecturer Carl Covatto, Ph.D. | <i>Teaches math methods courses</i> |
| Associate Professor Robert Culbertson, Ph.D. | <i>Teaches introductory physics sequence courses</i> |

- 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.

This program will be administered through the Department of Physics and will utilize existing staff support.

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.

none

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

none

APPENDIX
OPERATIONAL INFORMATION FOR UNDERGRADUATE PROGRAMS
(This information is used to populate the [Degree Search](#) /catalog website.)

1. Contact and Support Information

Office Location (Building & Room): Bateman Physical Sciences F-Building Room 470

Campus Telephone Number: 480-965-3561

Program email address: physics.info@asu.edu

Program website address: http://physics.asu.edu

2. Additional Program Description Information

A. Additional program fee required for this program? Yes No

B. Does this program have a second language requirement? Yes No

3. 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.

Health Physicist, Medical Doctor (with additional pre-med coursework), Lawyer, Patent Attorney, Physical Therapist, Radiation Physicist, Research/Lab Assistant, Science Policy Analyst, Secondary Science Teacher, Technology Support Analyst

4. 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.)

none

5. Keywords List all keywords used to search for this program. Keywords should be specific to the proposed program.

physics, physical science

6. Area(s) of Interest

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

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

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
- Environmental Issues & Physical Sci
- Engineering & Technology
- Interdisciplinary Studies
- Languages & Cultures
- Law & Justice
- Social Science, Policies & Is

From: Sid P. Bacon [mailto:spb@asu.edu]
Sent: Wednesday, September 23, 2009 4:46 PM
To: curriculumplanning@asu.edu
Cc: Jenny Smith; Roxann Gonzales
Subject: Curriculum proposals ... Natural Sciences in CLAS

The attached curriculum proposals (BA in Physics and PhD in Animal Behavior within the School of Life Sciences) were approved by the CLAS Curriculum Committee and Senate. I endorse these proposals.

Thank you.

SID P. BACON
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