

INDIANA UNIVERSITY
Request for a New Academic Program

Campus: East

Proposed Type (minor, certificate, etc.)

Title of Program: Minor in Biophysics

Proposed Date of Implementation: Fall Semester, 2009.

I. Why is the program needed? (Rationale)

- Combines cross-disciplinary courses to support growing academic interest in biophysics.
- Compliments existing BS degrees in Biology and Biotechnology.
- Opportunity to incorporate a biophysics option specialization into other major programs.
- Would be an asset to students interested in graduate programs in biophysics (e.g. IUPUI, IUB)
- Would provide initial platform for possible later creation of BS biophysics program at IUE.
- Would facilitate transfer into undergraduate programs in biophysics for interested students.

II. List major topics or curriculum of the program.

- Modern Physics Theory (P 300 or P301): Relativity, atomic physics, atomic absorption spectrometry (AAS), X-Rays, properties of electrons (e & e/m), electron diffraction (SEM), electron spin resonance (ESR), nuclear magnetic resonance (NMR/MRI), pair-production (PET), radiation processes (α -particles, β -particles, γ -rays), semiconductors (PN Junction).
- Modern Physics Laboratory (P 309): Relativity, properties of the electron, em-field interaction with electrons, atomic absorption and discharge spectrometry, electron diffraction, laser interferometry, NMR/ESR, quantum dot tagging, semi-conductor devices, radiation.
- Cell Biology (Biology L315): Organization of cells, enzyme function, cell environment, cellular communication, membrane structure and function, cell metabolism, cell functions. Plus an additional 15 cr in biology electives at the 200 or higher level.

III. List the major student outcomes (or set of performance-based standards) for the proposed program.

The Student Learning Outcomes are the same as those for the other science programs and degrees, Students graduating with a Minor in Biophysics should be able to:

1. Demonstrate knowledge and ability to integrate form, function, and organization within and across the disciplines of biological and physical science investigation.
2. Describe basic principles of biology and physics, apply these to experimental outcomes, and examine biophysical phenomena through observation and logical and critical thinking.
3. Apply key concepts, practices, and materials required for hypothesis-based, scientific research in the biological and physical sciences.
4. Demonstrate the ability to locate, evaluate, and use information effectively to develop scientific ideas and concepts and prepare oral and written scientific communication. (In accordance with the *Information Literacy Competency Standards for Higher Education*. American Library Association. 2006 <http://www.ala.org/acrl/ilcomstan.html>)
5. Evaluate the ethical and social implications of biology and physics on humans and the environment, and personally demonstrate adherence to accepted standards of professional and ethical behavior.

IV. Explain how student outcomes will be assessed (course-embedded assessment, graduate follow-up, employer survey, standardized tests, etc.). The assessment plan for other School of Natural Science and Mathematics minor programs will be followed, and may consist of course-embedded assessment questions and problems in examinations, as well as writing and laboratory assignments. Students will be encouraged to voluntarily maintain records of principal course work (papers, projects, and laboratory journals), for personal or professional use, completed in core and elective courses composing the biophysics minor program. Students will also be encouraged to voluntarily maintain records or evidence of all relevant research and presentations for personal or professional use.

V. Describe the student population to be served. The biophysics minor program will meet the needs of students who are interested in the areas where physics and biology overlap. Currently students with an interest in biophysics must choose a degree in either biology or biotechnology, taking only required lower division courses in physics, and optional upper division courses in physics. Those degrees include specific biology courses which may not be relevant to the field of biophysics. Both degree seeking and transfer students in biology, biotechnology, biophysics, physics and mathematics, as well as in the health sciences, will be serviced by the minor program in biophysics. Prospective transfer or graduate students in these areas will receive an introduction to the cross-disciplinary study of biophysics.

VI. How does the program complement the campus or department mission? This minor program complements the other science degrees of the School of Natural Science and Mathematics by using existing courses and combining them in different ways. A biophysics concentration will attract additional students and increase enrollment in existing courses and degree programs. Creating a minor in biophysics is currently listed as an NSM objective.

VII. Describe the relationship to existing programs within Indiana University.

Students seeking BS degrees in biology and biotechnology will be able to add a minor in biophysics by taking just two additional courses; Physics P 300 (3 cr.) or Physics P 301 (3 cr.), and Physics P 309 (2 cr.). Other students who complete the necessary pre-requisite courses and 3 who take additional credit hours at the 200 level in biology or biotechnology may also qualify for the minor, or be interested in pursuing a minor in biophysics at IUE. The minor would also serve to help prepare interested students for advanced degree programs in biophysics offered at other IU campuses, such as those at IUB and IUPUI. This minor has been modeled after the Biochemistry Minor offered through the Potts School of Science and Engineering at the University of Southern Indiana and the Minor in Biochemistry offered at IUSB.

VIII. List and indicate the resources required to implement the proposed program.

Indicate sources, e.g. reallocation or any new resources such as personnel, library holdings, equipment, etc.

None. (Courses, laboratories and materials are already in place.)

P 300 and P301 are currently offered together as a combined independent study hybrid Fall semester course, which is planned to also be offered online (student option) in Fall of '09.

P 309 is currently offered as a Fall semester one four-hour (1x4) laboratory meeting per week, or a two two-hour (2x2) split, (student option), directed weekly traditional laboratory course. (Pending sufficient enrollment, these courses will become regularly offered Fall term courses.)

IX. Describe any innovative features of the program (e.g. involvement with local or regional agencies, offices, etc., cooperative efforts with other institutions, etc.).

Program is currently designed to offer students interested in biophysics, or pursuing other degree programs in natural science and mathematics, or health science fields at IUE with focus on biophysics as a minor option. Students interested in transfer or graduate programs in biophysics will receive a start toward preparing and qualifying for, or completing, those programs at other institutions (eg. IUB or IUPUI)

Physics P 300 and P301 are currently offered as a combined hybrid course, but will be offered online, as an option for the student, as part of the distributed learning curriculum. The minor also combines existing and cross-disciplinary courses in an integrated and complementary manner to support growing interest in biophysics.