

IUPUI
Academic Policies and Procedures Committee
Minutes
Friday 4/2/04
1:00—3:00

Minutes

- The 3/5/04 minutes were reviewed and confirmed.

Announcements

- Items from the Chair
 - Update on Summer Registration
Compared with the same Friday morning in 2003

Summer I	5,450 heads (+6.7%)	22,544 credits (+8.7%)
Summer II	3,740 heads (+9.7%)	14,167 credits (+7.6%)
 - An email was sent to at least one student on 4/1 appearing to be from the Office of the Registrar stating that computer error resulted in the credits for Spring courses being lost and that a delay in graduation would occur. If you learn of other students who received the message, contact Mark Bruhn, Chief IT Security and Policy Officer.

Academic Affairs Committee Report *Betty Jones, Chair*

- No report

Items for Review, Discussion, or Action

- Update on SIS
 - Update on Fall Registration
 - Process for registration has moved reasonably smoothly. When problems were identified, they were corrected. The preparatory efforts of the Office of the Registrar and the academic units were successful in preparing the students for the new process and providing assistance as needed.
 - Mark Grove will be sending an email with information on how faculty can check on the enrollment in their courses.
 - (NOTE: The information is available at [http://registrar.iupui.edu/sis - web/course-monitoring/](http://registrar.iupui.edu/sis-web/course-monitoring/))
 - Update on Financial Aid module
 - Work is progressing on preparing to package financial aid using the SIS processes. All new students will be packaged as full-time for the initial notification with the award adjusted during the summer to reflect enrollment.
 - While the goal is to send out the financial aid notification letters to new students during the week of April 19.
- Policy on drop/add during late registration (partial refund) period
 - See information beginning on page 3
 - It will be important to continue to inform students that if they are going to both drop and add credits, the changes should be made during the first week of classes to avoid the financial consequences of a partial refund from dropping a course and adding a course at the full credit hour charge.
- Diversity Recruitment Initiatives —*Kim Stewart-Brinston and Felica Ahasteen-Bryant*

- Kim and Felica presented a summary of the activities of the Multicultural Outreach Coordinator and the Middle School Outreach Coordinator. Both offices are working closely with the academic units to maximize the effectiveness and efficiencies of the efforts in the high schools and middle schools as well as the community activities.
 - Individuals with questions or suggestions are encouraged to contact Kim (Multicultural Outreach Coordinator, kastewar@iupui.edu, 8-7808) or Felica (Middle School Outreach Coordinator, fashastee@iupui.edu, 4-0403)
- Proposal for AS in Applied Biotechnologies
 - Proposal begins on page 5
 - The proposal was approved by the School of Science committee on 3/31
 - The School of Science presented additional information on the plans for the assessment of the program, including a 5 year review.
 - Dean Plater clarified that this degree proposal should be viewed as an exception to the March 1 statement quoted in the subcommittee report. The AS degree is a component of the BS degree proposal that will be presented for APPC review next month.
 - The report of the subcommittee which reviewed the proposal is on pages 28 -30.
 - After discussion and suggestions to Joe Kuczkowski on ways to strengthen the proposal, the members of the APPC expressed support for the offering of the AS in Applied Biotechnology at IUPUI.
- Policies on retaining student work—*Rick Ward*
 - Deferred until May
- Policies on retaining student evaluations of faculty—*Rick Ward*
 - Deferred until May

Future Agenda Items

- Adult Learner Focused Institution Coalition (ALFI)—*Amanda Zimmerman*
- Certificate in Network Security
- May—Parents/spouses contacting offices for information about students —*Joe Kuczkowski, Mark Grove, Joe Scodro*

Meeting Dates and Locations

5/7 UL 1126

Calculation of Fees for courses that are dropped and added during the Late Registration Period

During the exploration of how PS would calculate refunds for courses that were dropped during the partial refund period (weeks 2-4 of classes), two potential issues were identified. Initially, there was concern that the Late Program Change Fee (the transaction or service fee which is currently \$20.75) might have to be assessed similarly at all campuses. Since there are variations among the campuses, e.g., IUB assesses a fee for both drops and adds while IUPUI assesses the fee only when courses are added), there was concern about developing a similar policy on all campuses. Subsequently, it was determined that the rules for assessing the Late Program Change Fee could be specified by the campus.

The second issue related to the differences in the logic used by PS and IU for the calculation of the fee forfeiture when courses are dropped and added during the second, third, and fourth week of classes. Currently, if a student drops and adds courses during the same week, the tuition dollars from the added courses protect the dollars from the dropped courses from forfeiture during the partial refund period (75% refund in week 2, 50% in week 3, 25% in week 4). Thus the partial refund percentage is only applied to the difference between the number of credit hours added and dropped. In PS, the tuition refunded for the dropped course would be calculated and the resulting credit applied against the tuition owed for the added course. In the legacy system, if the student were to drop a 3 credit course and add a 3 credit course any time within the same week of the partial refund period, an even exchange would occur. In PS, it is more difficult to assure that an even exchange would occur since the credit hours dropped and added must match exactly (3 drop and 3 add, not a 2 credit course drop plus a 1 credit course add) and the sequence of the listing of the dropped and added courses can influence the even exchange. Given the complexities of attempting to explain the PS logic to students and issues of fairness, implementing an even exchange process would be very difficult for students who are being assessed tuition on a per credit hour basis.

The impact of the differences in these calculations was examined from the perspective of the students and the campuses and whether a different formula should be proposed for calculation of the tuition refund. After examining the patterns of drops and adds on each campus and alternative formulas for the refund period, the decision was made to retain the current refund schedule (75% in week 2, 50% in week 3, 25% in week 4) and to use the PS logic in the calculations.

The following is the statement developed by IUPUI to inform students on the policy that will be used for the next academic year.

Refunds and Course Exchanges

1. Students dropping courses prior to the end of the *first week* of classes will receive a 100% credit for the credit-hour fees associated with the courses dropped.
2. A Late Program Change Fee (service charge) will be assessed per course beginning in the *second week* of the classes for any courses added.
3. Students performing an exchange of courses in the *second week* of classes will be refunded 75% of their fees for the dropped course. The credit will be applied toward the fees for the added course.

4. Students performing an exchange of courses in the *third week* of classes will be refunded 50% of their fees for the dropped course. The credit will be applied toward the fees for the added course.
5. Students performing an exchange of courses in the *fourth week* of classes will be refunded 25% of their fees for the dropped course. The credit will be applied toward the fees for the added course.
6. Students performing an exchange of courses in the *fifth week* of classes and thereafter will not receive any refund of their fees for the dropped course.

PRE-PROPOSAL FOR NEW UNDERGRADUATE DEGREE PROGRAM

Purdue School of Science, IUPUI

1. Name of proposed program.

Applied Biotechnologies.

2. Title of degree to be conferred.

Associate of Science

3. Field of study, department and school involved.

The field of study can be generalized as Biotechnology although the program is designed to address several individual areas in laboratory and manufacturing biotechnology. The program will utilize basic science course work in biology, chemistry, physics, and mathematics in combination with specially designed course sets arranged in cassettes to meet categories of workforce need. The program will be housed in the School of Science and specialized courses comprising some of the education/training in the major have been, and will continue to be, developed, taught and assessed in collaboration with our industrial partners.

4. Objectives of the program

The primary objectives are to 1. create flexible, modern educational/training programs for the central Indiana Biotechnology and Life Sciences industries, 2. place Indiana closer to the forefront in the rapidly emerging areas clustered under the Biotechnology umbrella, 3. provide high technology training that will enhance economic growth in central Indiana and beyond, and, 4. increase the intellectual capital of the state by increasing the number of Indiana citizens holding higher education degrees including the baccalaureate by making the ASAB degrees fully transferable to a BS in Biotechnology, 5. to attract new biotechnology-related industries to central Indiana.

5. Proposed date of initiation.

Fall, 2004.

6. A statement describing the relationship of the proposed program to the mission and scope of the campus.

The program proposed addresses each of the stated missions of IUPUI. This ASAB program **raises the educational achievement** of the central Indiana population and makes a full BS a very reachable goal. The emphasis on the life sciences represented in the Central Indiana Life Sciences Initiative (now BioCrossroads) has many aspects. Research and new product development represent one but the technical expertise to bring complex products to the market in a strictly regulated environment is also an essential element to this sector of the economy. **Developing and applying the new knowledge** run hand in hand. Our promise at IUPUI is to bring to the state a comprehensive range of academic programs and this program, in combination with other IUPUI programs, meet that promise probably for more than just the state. The program also represents a new model for **collaboration with our external partners**. We have developed the academic composition of these programs together and have entered into agreements to work together to seek the resources to implement them and to recruit the best instructors for the applied program elements. Finally, these programs will overlap with the training of students in Biology, Chemistry and other disciplines. In so doing, students in this program will be educated in an environment that is characterized by a **diverse mixture of gender and culture**.

7. A statement describing the relationship of the proposed program to already existing programs at the campus.

The program is unique to campus and unique to the state of Indiana. In fact, few programs addressing this element of workforce development exist in the mid-west with the nearest being a program offered at Sinclair Community College in Dayton, OH. The ASAB is also complementary to existing programs in life sciences at IUPUI. In combination with Bachelor's degrees in Biology, which feature emphasis on theory and practice in cell/ molecular biology and undergraduate research, and thesis -based Master of Science degrees, IUPUI is a position to address the workforce needs in life sciences at several levels. The program is also complementary to the Graduate Certificate Program in Biotechnology offered by the Indiana University School of Medicine. The program proposed here distinguishes itself from most community college-based programs in that it is based on science course work for majors and all credits are directly applicable to a four-year degree (Bachelor of Science in Biotechnology).

8. A statement describing the relationship of this program to similar programs in other regional and Indiana post-secondary educational institutions.

There are no Associate of Science degree programs in Indiana that address the existing workforce need in laboratory and manufacturing biotechnology. There is a very similar program under development at CCI. IUPUI has been working with CCI to insure equivalency of the two programs to allow full transferability. The clientele of each

institution will differ. CCI will attract beginning student some of whom will not meet IUPUI admission standards. These students will have to complete some developmental work before beginning the Biotechnology curriculum. IUPUI will serve beginning students including those ready to start the ASAB curriculum, existing science majors moving from other programs, and transfer students from other 2 and 4 year institutions.

9. A statement describing cooperative endeavors explored and/or intended with other institutions, particularly those located in same geographic area.

The program is designed to meet present and emerging needs of life sciences industries of central Indiana. We have established productive partnerships with four major industries (Eli Lilly, Dow AgroSciences, Roche Diagnostics, and Baxter Pharmaceutical Solutions) and anticipate that our flexible program model will attract other partners in the future. That partnership has led to program design and the identification of new courses necessary to meet employment needs. Those new courses have been developed, will be staffed and will be assessed in collaboration with our partners. Our partners will also host the intensive internship element of the program. As previously stated, we have worked with CCI to make the programs equivalent and fully transferable to a BS in Biotechnology. IUPUI's history of high graduate placement in the local economy will be further enhanced by the partnership and the internship features of the program.

10. A statement indicating the need for the program in terms of manpower supply and demand.

The Executive Summary of the 2003 "Workforce Gap Analysis" conducted by the Indiana Health Industry Forum (IHIF) provides compelling data indicating the need for programs like the one proposed here. IHIF utilized information from the U.S. Department of Labor, the Indiana Department of Workforce Development, and information collected from individual health industries in Indiana. The Summary predicts 40,000-45,000 job openings in Indiana health industries in the period 2003-08. These jobs are spread among several specific areas and many require high technical skill but not graduate degrees. Among those jobs targeted by this proposal (Medical Manufacturing is the inclusive descriptive term used) many typically seek experienced workers but there is a trend to requiring more post-secondary education. This proposal accomplishes this for those employed in biotechnology areas such as Laboratory Technician (research & development, quality control) and Manufacturing Technician (production, process support, quality assurance). The Summary also emphasizes the importance of programs being located near the source of demand and our central location places us in the most convenient position in the state. Analysis of the needs of our current partners alone projects the need for 60-70 new workers per year with training in applied biotechnology. This does not include retraining of the incumbent workforce in these areas.

11. A statement describing resources over an above present levels required to initiate the program.

The program will be built largely from existing courses in general education and science. Specialty courses developed with our industrial collaborators will require equipment not presently available and space for dedicated laboratories. The School of Science will submit an NSF Partnership for Innovation grant that will provide initial funding for equipment, an advisor/recruiter, program marketing, and space acquisition. In addition, our industrial partners have pledged some financial support (\$30,000) to fund first year costs. Space reallocation on campus and within the School of Science has made lab space available to initiate the program. We are seeking to tap into funds available for the advancement of the BioCrossroads initiative and funding programs established to connect university initiatives to local economic development. Our partners will actively seek funding from the Indiana Office Department of Workforce Development to fund program development and pay for incumbent workforce training and education. In the long term, the program will sustain itself through tuition and fees paid by students and state appropriation.

SUMMARY OF NEW DEGREE PROGRAM PROPOSAL

I. Campus: Indiana University-Purdue University Indianapolis

II. Proposed degree: Associate of Science in Applied Biotechnologies (ASAB)

III. Projected date of implementation: Fall, 2004

IV. List the major objectives of the proposed program, and describe its chief features briefly.

The primary objectives are to 1. create flexible, modern educational/training programs for the central Indiana Biotechnology industries, 2. place Indiana closer to the forefront in the rapidly emerging areas clustered under the Biotechnology umbrella, 3. provide high technology training that will enhance economic growth in central Indiana and beyond, and, 4. increase the intellectual capital of the state by increasing the number of Indian citizens holding higher education degrees including the baccalaureate by making the degree fully transferable to a BS in Biotechnology, 5. to attract new biotechnology - related industries to central Indiana.

The proposed degree offers a flexible education/training program that allows student to tailor the experience to particular industrial needs. This is accomplished by combining basic foundational courses in the sciences with groups of related experiences in the major called cassettes. The program is relevant for workforce needs in production and manufacturing biotechnology. Employees can easily move to new positions because the core requirements are firmly based in the sciences and subsequent training is available through the cassette system. All requirements for the ASAB are accepted into a BS degree.

V. Why is the degree needed? (Rationale)

Local industry is currently faced with the need for a better-educated and trained workforce to staff positions in biotechnology-related positions in production and manufacturing. This need is driven by the increased scientific sophistication of the nature of the biotechnology products coming to market and the increased expectation of federal regulatory agencies regarding employee knowledge of the product and how it is produced. These positions have been manned most frequently by high school graduates who are trained on the job. Two-year programs for education and training relative to such positions are found on the coasts with few in the mid-west. Local industry approached IUPUI to develop a biotechnology program and this proposal is the result of that collaboration. This program addresses an acute workforce development void for existing and emerging life sciences industries in central Indiana.

VI. Describe the student population served.

This program will serve students coming out of high school, current students who are undecided, transfer students, and current employees who wish or need to upgrade their skills and credentials.

VII. How does the program complement the campus or department mission?

The mission of IUPUI is to serve the needs of the central Indiana population. This service includes raising the educational achievement of the local citizenry, developing and applying new knowledge, and collaborating with external partners. This program addresses all aspects of the IUPUI mission.

VIII. Describe any relationship to existing degree programs within the IU system.

There are no programs of this type in Indiana although a parallel program is under development at the Community College of Indiana. The IUPUI and CCI programs have been designed to interface with a Bachelor of Science in Biotechnology (BSB, see accompanying degree proposal) allowing students to transfer all the work of the ASAB and CCI degree into the BSB.

IX. List the sources (including reallocation) of any new resources (personnel, financial, learning, etc.) required to implement the proposed program.

New resources needed are being developed in collaboration with our four industrial partners. The IUPUI School of Science (N. D. Lees, PI) will resubmit a \$600,000 proposal to the NSF Partnership in Innovation Program to provide funding for equipment and supplies, marketing, course development, and instructor training plus initial funding of salaries for an advisor/recruiter and a technician to support and prepare lab courses. The industrial partners have also set aside company funding to help with first year expenses. In addition, the School of Science will pursue other local funding opportunities and the partner industries will submit proposals to the Indiana Department of Workforce Development for development of the program and training support for incumbent employees. The new lecture and lab courses and the internship experiences have been developed in collaboration with our industrial partners. The remainder of the curriculum is based on already-existing courses.

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

The program is innovative in several ways. It is **not a terminal degree** and fully articulates with a BS degree. Our partners have agreed to encourage and support completion of the BS. The ASAB degree has been developed based on an inventory of skills and knowledge (attached) developed by the industrial partners. In addition our

partners have supported a recent Biotechnology Curriculum Development Conference to which representatives of four 2-year Biotechnology programs were invited to comment on, guide, advise on the development of the ASAB and the BSB.

The ASAB has built-in flexibility that allows specialization of training to meet a variety of workforce needs. Flexibility is made possible by the use of specifically designed cassettes of course which complement the core requirements of the major. This allows for future cassettes as dictated by changing work needs. The new courses have been developed via collaboration between university faculty and industrial scientists. Since this specialized education/training is unique to the industrial setting, instructors will be recruited from the industrial sector. They will be supported through workshops and other teaching-related support programs and facilities available at IUPUI.

ASSOCIATE OF SCIENCE IN APPLIED BIOTECHNOLOGIES (ASAB) A Flexible Degree Program for Workforce Development

Objectives: The primary objectives are to 1. create flexible, modern educational/training programs for the central Indiana Biotechnology industries, 2. place Indiana closer to the forefront in the rapidly emerging areas clustered under the Biotechnology umbrella, 3. provide high technology training that will enhance economic growth in central Indiana and beyond, and, 4. increase the intellectual capital of the state by increasing the number of Indian citizens holding advanced degrees including the baccalaureate. 5. attract new biotechnology-related industries to central Indiana.

Clientele to be Served: High school graduates seeking careers in a variety of life sciences industries, current industrial employees who wish to upgrade their credentials or to increase employment prospects, displaced workers seeking new careers, and exploratory, existing and transfer students seeking career alternatives.

Curriculum: The ASAB will be comprised of a minimum of 62 credit hours of university work with most of the options developed thus far calling for approximately 70 credit hours. Several iterations of the major have been developed to allow for tailoring of the training to address several areas of industrial need. These degree options are designed for articulation to the Bachelor of Science in Biotechnology (BSB). The degrees consist of core courses in general education, mathematics, and ancillary sciences plus courses in the major that are complemented by specialized course clusters called cassettes.

The courses in the major total a minimum of 20 credit hours. In all categories, the ASAB courses are a subset of the full complement of courses required for the BSB. The composition of the core courses and cassette courses in the major have been identified and defined in accordance with an industry-generated inventory of skills and knowledge. Three versions for application in critical industrial work areas in Molecular Biology, Fermentation, and Protein Production and Formulation have resulted. The unique feature in the program is the "cassette" concept that allows customization of the training and permits convenient re-training options. All programs include a 6 credit hour industrial internship to be provided by our partner industries. Another innovative feature of the

program is that all cassettes are based on a solid foundation in science courses drawn from the curricula of science majors. They add a specific dimension to the training and re-training for new work can be accomplished by taking other cassettes. Additional information and examples can be found in Section I.B.3.b.

Employment Possibilities : Suffice to say at this point that industry came to us to fulfill workforce needs and, after several meetings, we have responded with this proposal for the ASAB. See Section I.C.2.a. We have been quite intentional about the conversion of the ASAB degree to a full BS degree. We have included sufficient levels of real science course work in the programs to make BSB students eligible for many graduate programs, for minors in the sciences and, with judicious selection of electives, for application to professional schools. Thus, the potential value of the program to the individual and to the employer is considerable.

B. Program Description:

1. Program description and objectives

The degree program proposed is a two to two and one-half year Associate of Science in Applied Biotechnologies. Three features make this program truly innovative and one that should serve central Indiana industry as it now exists and as it will exist as the focus on the BioCrossroads initiative gains momentum and transforms the local and state economies. First, the program, in all of its possible iterations, fully articulates into a full Bachelor of Science degree in Biotechnology, an accompanying new degree being proposed. Most iterations of the ASAB call for about 70 of the total 124 credit hours required for the BSB and, thus, there is an excellent opportunity for those who are initially employed with the ASAB to complete the BSB. Second, the program is an unusual Biotechnology program in that it is designed with a "real" science course foundation. Typically, AS degrees in Biotechnology are comprised of specially designed, applied experiences that train employees for certain tasks but result in a lack of a sound, fundamental understanding of the underlying science that is gained from basic work in the sciences that is found in Bachelor's programs in science. Typical two-year Biotechnology degree programs rarely articulate into to bachelor's degree programs and are, thus, terminal degrees. The program proposed is based on majors' science courses in Biology and Chemistry allowing for an enhanced understanding level and also allowing degree recipients to more easily transfer their knowledge and skills to new tasks and to take advantage of the wider range of future academic programs. The ASAB is not a terminal degree; it is comprised of acceptable science course work that allows all iterations to slide into the requirements of a full bachelor's degree that, with the careful selection of electives in the major, will also make graduates eligible for application to science graduate programs and professional schools. Third, the program has built-in flexibility made possible by the creation of course cassettes that along with core courses comprise the major. This provides almost unlimited flexibility in meeting the needs, both present and future, of a vast number of life sciences industries. This aspect of the program directly addresses the expectation that higher education provide programs "with the customized training demanded by employers" ((Indiana Health Industry Forum, Workforce Gap Analysis Executive Summary, 6/4/03). The solid core and ancillary sciences requirements also allow for the re-tooling for new assignments by returning for

additional cassettes that have been and will be created as demand emerges. Thus, there are many possible majors in the program and each one has been/will be designed to fully articulate with the BSB degree.

The following are the overall goals of the program:

- Create an infrastructure that provides flexible education/training to produce workforces tailored to industrial needs.
- Create a well-trained employee pool and potential future employees that will attract new organizations to the central Indian area.
- Link university degree programs directly with state and city workforce development objectives in the life sciences.
- Create vigorous and meaningful collaborations among university-industrial-city-state entities to further education and research.
- Promote educational achievement by encouraging degree attainment and supporting life-long learning.
- Foster greater awareness in K-12 regarding employment potential in scientific areas thereby encouraging increased rigor in science education.
- Create Associate degrees that move seamlessly to Bachelor's degrees with the support of industrial employers.
- Create a set of proficiency standards (skills and knowledge inventory) in the local Biotechnology industry that may be used as national standards.

The curricula have been developed in collaboration with our industrial partners based on their present and projected needs. A set of standards defined in terms of what students will know and what they will be able to do have been developed at this time and a copy is appended to this proposal.

2. Admission, clientele, and financial support

a. Students will be admitted part-time or full-time in accordance with the standard IUPUI admission guidelines.

b. IUPUI performs placement testing in mathematics, English and chemistry. Some students may have to fulfill lower level pre-requisites than those listed for the program as indicated by the placement tests.

c. The program will be open to full-time and part-time high school graduates, currently enrolled and transfer students, currently employed individuals, displaced workers, and students who already hold degrees.

d. We anticipate no formal enrollment limits except those posed by occasional class size limits in some of the laboratory courses.

e. N/A

3. Curriculum.

a. The Associate of Science in Applied Biotechnologies degree is comprised of a minimum of 62 hours of course work. Within those parameters, 10 credit hours are required in General Education, 12 credit hours in mathematics/statistics/computer science, a minimum of 18 credit hours in ancillary sciences, and a minimum of 20 credit hours in core and cassette courses in the major. Experiences in the major include a 6 credit hour internship.

b. In order to see how the proposed curriculum fits into the BSB program three examples of the ASAB will be provided. They will represent the three general areas of need identified by our four industrial partners. Other possible configurations may emerge from our present constituents as well as from industrial needs not represented at this time.

**Associate of Science in Applied Biotechnologies (ASAB)
Molecular Biology Option**

Semester 1	Semester 2
1 Freshmen Seminar, SCI 120 or UCOL U110 3 Elem. Composition I, ENG W131 3 Algebra & Trig I or Calculus I for Technology I, MATH 153 or 221 3 Prin. Chemistry, CHEM C105 2 Prin. Chemistry Lab, CHEMC125 5 <u>Concepts of Biology I, BIOL K101</u> 17 Total credits	3 Prin. Chemistry II, CHEM C106 2 Prin. Chemistry Lab, CHEM C126 3 Algebra & Trig II or Calculus II for Technology I, MATH 154 or 222 3 Written Comm. in Science & Industry, TCM 320 3 <u>Business & Regulatory Practices*</u> 14 Total Credits

Semester 3	Semester 4
3 Organic Chemistry I, CHEM C341 3 Genetics & Molec Biol. (K322) 2 Genetics & Molec Biol. Lab (K323) 3 <i>Prin. of Biotechnology*</i> 2 <i>Cell Culture*</i> 3 <u>Computer Science, CSCI (several)</u> 16 Total credits	3 Biochemistry, BIOL K483 2 Molec. Biol. Elective 2 Cassette elective 2 <i>Biotechnology Analytical Practices</i> 3 Statistics (several) 3 <u>Humanities/Soc. Sci. elective (several)</u> 15 Total credits

Semester 5
5 General Physics I, P210 6 <u>Internship*</u> 11 Total credits Total Degree credits 73

**Associate of Science in Applied Biotechnologies (ASAB)
Fermentation Option**

Semester 1	Semester 2
1 Freshmen Seminar, SCI 120 or UCOL U110 3 Elem. Composition I, ENG W131 3 Algebra & Trig I or Calculus I for Technology I, MATH 153 or 221 3 Prin. Chemistry, CHEM C105 2 Prin. Chemistry Lab, CHEMC125 5 <u>Concepts of Biology I, BIOL K101</u> 17 Total credits	3 Prin. Chemistry II, CHEM C106 2 Prin. Chemistry Lab, CHEM C126 3 Algebra & Trig II or Calculus II for Technology I, MATH 154 or 222 3 Written Comm. in Science & Industry, TCM 320 3 <u>Business & Regulatory Practices*</u> 14 Total Credits

Semester 3	Semester 4
3 Organic Chemistry I, CHEM C341 5 General Physics I, P210 3 <i>Prin. of Biotechnology*</i> 2 <i>Cell Culture*</i> 3 <u>Computer Science, CSCI (several)</u> 16 Total credits	3 Microbiology (K356) 2 Microbiology Lab (K357) 2 Fermentation Elective 2 <i>Biotechnology Analytical Practices</i> 3 Statistics (several) 3 <u>Humanities/Soc. Sci. elective (several)</u> 15 Total credits

Semester 5
3 Biochemistry, BIOL K483 2 Cassette elective 6 <u>Internship*</u> 11 Total credits Total Degree credits 73

**Associate of Science in Applied Biotechnologies (ASAB)
Protein Purification and Formulation Option**

Semester 1	Semester 2
1 Freshmen Seminar, SCI 120 or UCOL U110 3 Elem. Composition I, ENG W131 3 Algebra & Trig I or Calculus I for Technology I, MATH 153 or 221 3 Prin. Chemistry, CHEM C105 2 Prin. Chemistry Lab, CHEMC125 5 <u>Concepts of Biology I, BIOL K101</u> 17 Total credits	3 Prin. Chemistry II, CHEM C106 2 Prin. Chemistry Lab, CHEM C126 3 Algebra & Trig II or Calculus II for Technology I, MATH 154 or 222 3 Written Comm. in Science & Industry, TCM 320 3 <u>Business & Regulatory Practices*</u> 14 Total Credits

Semester 3	Semester 4
3 Organic Chemistry I, CHEM C341 5 General Physics I, P210 3 <i>Prin. of Biotechnology*</i>	2 <i>Protein Purification*</i> 3 Cassette Elective 2 <i>Biotechnology Analytical Practices*</i>

2 <i>Cell Culture</i> *	3 Statistics (several)
3 Computer Science, CSCI (several)	3 Humanities/Soc. Sci. elective (several)
16 Total credits	15 Total credits

Semester 5
3 Biochemistry, BIOL K483
2 Cassette elective
6 <i>Internship</i> *
11 Total credits
Total Degree credits 73

*All new courses are indicated in italics.

Bachelor of Science in Biotechnology (BSB)

Semester 1	Semester 2
1 Freshmen Seminar, SCI 120 or UCOL U110	3 Prin. Chemistry II, CHEM C106
3 Elem. Composition I, ENG W131	2 Prin. Chemistry Lab, CHEM C126
3 Algebra & Trig I or Calculus for Technology I, MATH 153 or 221	3 Algebra & Trig II or Calculus for Technology II, MATH 154 or 222
3 Prin. Chemistry, CHEM C105	3 Written Comm. in Science & Industry, TCM 320
2 Prin. Chemistry Lab, CHEMC125	3 General Education
5 <u>Concepts of Biology I, BIOL K101</u>	3 <u>Humanities/Soc. Sci. elective (several)</u>
17 Total credits	17 Total Credits

Semester 3	Semester 4
3 Organic Chemistry I, CHEM C341	3 Cell Biology, BIOL K324
3 General Education	3 General Education
3 <i>Prin. of Biotechnology</i> *	3 Fund. Speech Comm., COMM R110
3 Genet. & Molec. Biol., BIOL K322	3 <i>Business & Regulatory Practices</i> *
2 Genet. & Molec. Biol. Lab, BIOL K323	3 <u>Humanities/Soc. Sci. elective (several)</u>
3 <u>Humanities/Soc. Sci. elective (several)</u>	15 Total credits
17 Total credits	

Semester 5	Semester 6
3 General Education	3 Microbiology, BIOL K356
3 Computer Science, CSCI (several)	2 Microbiology Lab, BIOL K357
3 Biochemistry, BIOL K483 or CHEM C483	2 <i>Biotechnology Recovery Practices</i> *
2 <i>Cell Culture & Fermentation</i> *	3 Statistics
3 <u>Elective/(MATH 221)</u>	4 <u>Electives/(MATH 222)</u>
14 Total credits	14 Total credits

Semester 7	Semester 8
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5 General Physics I, PHYS P201	3 Cellular Biochemistry, BIOL K484
3 Jr./Sr. Integrator	2 <i>Protein Purification*</i>
3 Elective (many)	3 Humanities/Soc. Sci. elective (several)
3 Elective (many)	<u>6 <i>Internship*</i></u>
<u>2 <i>Biotechnology Analytical Practices*</i></u>	14 Total credits
16 Total credits	

*All new courses are entered in italics.

The BSIS totals 124 credits.

All courses in the ASAB are listed in the BSIS.

c. For the BSB (includes placement of ASAB courses) the courses listed are distributed as shown below. All italicized course are new and existing courses are in regular type.

General Education*: First Year Seminar, SCI 120 or UCOL U110 (1)
Writing, W131 and TCM 320 (6)
Speech, COMM R110 (3)
Humanities and Social Sciences (12)
Jr./Sr. Integrator (3)

*These course plus some in Mathematics and Science fulfill the IUPUI campus requirements for the CLAS undergraduate core curriculum.

Mathematics: Algebra & Trig I, II, 153-154, or Calculus for Technology
I, II,
221-222 (6)
Computer Science, several choices (3)
Statistics, several choices (3)

Physical & Biol. Sciences General Chemistry, C105/125, C106/126 (10)
Organic Chemistry, C341 (3)
General Physics (P201) (5)

Major (Core): Concepts of Biology I (5)
Biochemistry, K483 or C483 (3)
Principles of Biotechnology (3)
Business & Regulatory Practices (3)
Biotechnology Analytical Practices (2)
Cell Culture (2)
Internship (6)

Molec. Biol. Cassette: Genet. & Molec. Biol. & Lab, K322 & K323 (5)
Electives (2-4)

Fermentation Cassette: Microbiology & Lab, K356 & K357 (5)
Electives (2-4)

Prot. Purif. Cassette: *Protein Purification* (2)
Electives (2-6)

Frequency of offering of existing Majors' Courses (ASAB) over a three year period:

Course	Number of Sections (semester)
BIOL K101	9 (F,S,Summer)
BIOL K322	5 (F,S)
BIOL K323	8 (F)
BIOL K483/CHEM C483	6 (F,S)/3 (F)
BIOL K356	6 (F,S)
BIOL K357	6 (S)

d. New courses: *Principles of Biotechnology* (3)
Business & Regulatory Practices (3)
Cell Culture (2)
Biotechnology Analytical Practices (2)
Protein Purification (2)
Internship (6)

(The 2 credit courses are laboratory courses.)

Course content has been developed with the collaboration of industrial scientists and university faculty. These are examples that fit the major need categories (on the knowledge and skills inventory) of our industrial partners but others may emerge in the future. The new courses are not typically found on university campuses and faculty members with expertise in these areas are not represented on most university faculties. Thus, instructors will be drawn from the industrial community to ensure that the appropriate learning outcomes are achieved. These "adjunct faculty" will be recruited and selected by university and industrial representatives. They will receive appropriate teaching orientation through IUPUI structures such as the Office for Professional Development (OPD) and the associated Center for Teaching & Learning (CTL).

e. none

4. Recognition

a. Those completing the curriculum will receive an Associate of Science in Applied Biotechnologies degree.

b. CIP code 410101

c. Associate of Science

5. Program Faculty and Administrators

a. The program will be administered through the School of Science at IUPUI rather than at the department level. Thus, the Dean of the School of Science along with the Associate Dean for Academic Affairs would be directly involved. Curriculum design and industrial partner interface will be through the Chair of the Department of Biology, the individual responsible for program design. All are fulltime appointments at IUPUI.

David Stocum, Ph.D., Professor of Biology and Dean, School of Science, IUPUI
Joseph Kuczkowski, Ph.D., Professor of Mathematics and Associate Dean, School of Science, IUPUI
N. Douglas Lees, Ph.D., Professor and Chair, Department of Biology, IUPUI

b. No new full-time faculty positions are required to implement the program. The science courses listed in the core are currently available and used by science majors to satisfy degree requirements. Other courses (CHEM courses, for example) are used for degrees in other disciplines. We will recruit, with the help of our industrial partners, prepare and orient a new set of adjunct instructors from local industry. These individuals will bring experiences matched to the content of the applied lab courses and the lecture courses found in the curricula (See 4.d. for New Courses). The courses will have approved content and syllabi to guide instruction. The resources of the IUPUI Office for Professional Development and the IUPUI Center for Teaching & Learning will be available to the new instructors. We expect interest and motivation of these instructors to be high since many will be educating their future employees.

6. Learning resources.

a. The IUPUI School of Science houses seven departments 6 of which have been approved to engage in Ph.D. training. Five of these units have been doing this for over a decade. Thus, library resources and the facilities and equipment to offer the already existing courses and labs are in place. New sections for some are projected but such expansion is within current capabilities. There are no new resources needed for the new lecture courses. The resources for program infrastructure and for the new applied labs are currently being sought.

b. **Personnel:** Two new hires have been identified as essential for operating the program. The first is an **academic advisor** who would be responsible for helping students with course selection and scheduling, dealing with transfer credits into the programs (many IUPUI students come with credits from other institutions), constructing new cassettes to meet employment needs, and submitting, for School of Science approval, new plans of study for the ASAB. This individual would also conduct degree audits, arrange for and place students in internships, visit industry and local educational sites to make these programs known, and participate in student recruitment. The second individual essential to program operation is a **technician** who would be responsible for making certain the materials and equipment are in place for the operation of the new lab courses and any others that may be essential to a constituent. The technician would also order and stock lab materials and oversee student help involved in set-up and clean-up of the facilities. **Equipment:** The content of the new lab courses proposed for the curriculum is directly related to the work done in our partner industries. In addition, a few new courses may

emerge over time. In all cases these hands-on experiences will involve exercises not typically found in undergraduate science labs. They will require different instrumentation and will involve procedures done on a different scale. Thus, a considerable amount of new equipment will be needed. This will be accumulated using industry and scientific supplier donations, external grant funds, university resources, and contributions from local industry.

Space: There is no free laboratory space available in the Department of Biology for full implementation of the proposed new labs. Current labs are not appropriately configured for the equipment and activities associated with the new lab courses. New space for the School has recently been identified and is suitable for conversion to be used for the applied labs. Off-site renovated space and a partnership with the CCI for offering the new applied labs are also good possibilities if additional space is needed in the future. Current laboratory space is available to accommodate existing labs including some that are included in these programs.

Although distinct issues at some level, all three resource challenges have been discussed with our partner industries and plans are in motion and under development to address each.

In April, 2003, a proposal entitled "Biofuture: An Innovative Partnership for Biotechnology Workforce Development" was submitted to the Partnership for Innovation (PFI) Program of the National Science Foundation (NSF). This proposal (#0332697) was submitted with Dr. Lees as PI and Dr. Stocum as Co-PI and listed, as partnering industries, Eli Lilly & Co., Dow AgroSciences LLC, Roche Diagnostics, and Baxter Pharmaceutical Solutions LLC. The \$600,000 proposal also had the endorsement of the Central Indiana Life Sciences initiative and the Indiana Health Industry Forum, plus the offices of the governor and mayor. The proposal was not funded but will be re-submitted (May 2004) following the feedback from the NSF review panel.

If approved, this proposal will provide funding for the following items relevant to this degree proposal:

- I. Course development
- II. New instructor preparation
- III. Supplies and lab equipment
- IV. Salaries for the advisor and technician for lab preparation and clean-up
- V. Funds for program marketing

*The major gifts officer of the School of Science will be charged with finding partners for the construction/renovation of new space to accommodate the new laboratories. With the recent investments in the life sciences in Indianapolis on and adjacent to the IUPUI campus, we are confident that we can accumulate the remaining resources to implement this workforce development program and to expand our existing programs which also feed directly into the Life Sciences initiative. Our partnering companies have also set aside funding for the first year.

7. Program strengths

a. The program fills a major void in Biotechnology education in the mid-west and Indiana in particular. The major programs in the U.S. for such experiences are located primarily on the coasts. In addition, such programs are most commonly offered by junior colleges and are frequently built on science experiences that are specially designed for terminal, 2-year programs. Thus, many of the credits are not transferable to higher degree programs and often do not provide the appropriate prerequisites for advanced study. The major distinguishing features of this program are the following:

- The science foundation of the ASAB is based on the same biology and chemistry course work used in majors programs from those disciplines.
- The degree has built-in flexibility through the use of cassettes. These cassettes are designed to meet the needs of our industrial partners. Two cassettes are contained in the sample program provided but others are possible.
- All courses are directly transferable to the BSB degree. This is not a terminal degree.
- The basic science courses allow students to return to take upper and graduate level courses. Many of the courses would be transferable to full degree programs elsewhere.
- Since this degree allows for seamless transition to the BSB and meets many of the prerequisites for further education, it fully promotes the concept of life-long learning and our industrial partners will support students in their continuation on to the BSB.

b. At this point we have in hand four collaborators but we envision we will be able to attract more once the program is approved. The industrial consortium has defined 3 options for training that have a common science core and vary by cassettes that specialize the training. We plan to aggressively market this program in the hopes of attracting other companies to the region and to bring in high quality students from outside the central Indiana region. Our programs are also collaborative in a sense with BioCrossroads and the Indiana Health Industries Forum, both of which have endorsed our efforts, and the city and state governments who have a deep interest in high-end workforce development and have indicated their interest in and support for this degree initiative. Our partner institutions have worked together to define a common inventory of skills and knowledge for graduates of the program, have worked with IUPUI in curriculum development, and have set aside some seed funding. Their letters of support are attached.

C. Program Rationale

1. Institutional Factors

a. The stated mission of IUPUI has several dimensions and this proposal supports each one. The workforce we are targeting has traditionally been provided by high school graduates, those with some education, or those with 1 or 2 years of training at a community college. The changing nature of this work and new national standards now

mandate further training. This ASAB program **raises the educational achievement** of this population and makes a full BSB a very reachable goal. The emphasis on the Life Sciences has many aspects. Research is one but the technical expertise to bring complex products to the market in a strictly regulated environment is an essential element to this sector of the economy. **Developing and applying the new knowledge** run hand in hand. Our promise at IUPUI is to bring to the state a comprehensive range of academic programs and this program meets that promise probably for more than just the state. The program also represents a new model for **collaboration with our external partners**. We have developed the academic composition of these programs together and have entered into agreements to work together to seek the resources to implement them and to recruit the best instructors for the applied elements of the program. In addition, we have collaborated with CCI on the content of their program to ensure full articulation to a 4 year program at IUPUI. Finally, these programs will overlap with the training of students in Biology, Chemistry and other disciplines. In so doing, students in this program will be educated in an environment that is characterized by a **diverse mixture of gender and culture**.

b. The School of Science was approached in 2000 by representatives from the Biotechnology Production Facility of Eli Lilly & Co. The interest was in having a two-year degree for the training of production workers. A sample curriculum was provided that had only one or two courses that were already in place at IUPUI and that required a number of classes for which IUPUI did not the expertise to develop and offer. Two years later a second contact was made this time in response to a more general industrial need. This need was prompted by new FDA regulations regarding the knowledge and understanding of production workers who were involved in the production, isolation and purification of complex, biological molecules. It was clear that special expertise was needed to produce this new type of product and that future products would have similar, though not identical, employee expectations and that more sophisticated and flexible programs would be needed to provide employees for the coming decades. The School of Science responded with a BS program in Biotechnology. Lilly responded with an Associate's degree carved from the BSB. Both sides agreed that it was in the best long-term interests of IUPUI, Lilly and other industrial partners, and the state of Indiana to increase the educational attainment level of the Indiana citizenry and, thus, agreed that all parties would encourage and support those completing the ASAB degree to complete the BSB. During the development of the initial curricula, the IUPUI representatives suggested that other industrial partners be invited to join in the discussions to increase the potential impact of new programs in Biotechnology. Dow AgroSciences, Roche Diagnostics, and Baxter Pharmaceutical Products soon joined in the discussions, in the development of academic programs, and in developing strategies for implementation. Among the emerging items was a tight time-line of announcing that the program would be available in the spring of 2005.

c. Full implementation of this program with the current clientele and their need to retrain existing employees plus recruit new employees will challenge our instructional capacity with regard to the already existing basic science courses. Additional partners will further stretch our capacity. Biology is currently re-configuring its course schedule to increase

the number of sections and one replacement faculty position has been re-deployed to an area where demand from this program will be high. Biology will also be reviewing and revising the way some of its introductory courses are offered to both improve student success and to make better use of laboratory time and space. In addition, two new lecturers have been hired to address the instructional requirements at the beginning level. We have identified space to house the new lab courses. We have already cited the needs for an advisor-recruiter and a technician for the program and these positions are addressed in the NSF proposal.

d. The resources in Biology are very heavily used with enrollments at an all time record high. Other departments such as Chemistry and Physics also show strong enrollment in the courses used in this program. All are working to reconfigure our course schedules, the format of our courses, and identify new instructional space to accommodate the increased demand for seats in key courses.

2. Student Demand

a. We have asked our industrial partners to project that number of employees who would enter the program for retraining or skills upgrading and how many new employees with this training they anticipate over time. These data have been used to complete Table 1 (Item C15). We anticipate other users will come on board but cannot provide details on these sources of demand. The program will be heavily marketed in central Indiana high schools. Part of our NSF budget is dedicated to this function. Indeed, we expect this program to add to campus enrollment. It will be another reason why students will choose to come to IUPUI.

In our discussion with our industrial partners, the question of whether students from other programs would be allowed to take the new lecture and lab courses that are being collaboratively developed. At this point, these courses will be available as service courses or as electives in other programs provided the students have the appropriate pre-requisites.

b. Table; see below

3. Transferability

The basic general education, mathematics, chemistry, and physics courses should be readily transferable to any other institution. The core courses in the major (Biology primarily) should also transfer to any other institution into the Biology degree program. There are no plans at this time to transfer students to other institutions to complete this program. All credits earned will be applicable to the BSB at IUPUI. As far as we know, this is the only program of its kind in the mid-west. Thus, we expect no student would seek to transfer to complete this program. There is a possibility that students would seek to apply the ASAB to a bachelor's degree elsewhere or to complete the BSB by taking the remaining course elsewhere. Once the program is in place and running we anticipate that others may wish to replicate it. In such cases, transferability should be possible and IUPUI will work to facilitate this within the current campus limits on transfer and residency and provided that the individual experiences are equivalent. As a part of the

program we have established a skills and knowledge inventory mechanism of ensuring minimal requirements for an acceptable program. In many areas, the program at IUPUI exceeds those minimum expectations.

IUPUI is quite open to transfer credits from other institutions and courses in Chemistry, Physics, Mathematics, general education, and Biology are routinely accepted. Such courses would have to cover approximately the same material, have similar pre-requisites, have the same credits hours (+/-1), and be intended for the same audience (e.g. for majors in Biology and Chemistry).

The issue of transferability from the CCI is important to the long-term growth and success of both institutions. At present, the Ivy Tech system does not offer equivalents to the Biology and Chemistry courses that form the foundation of the ASAB. However, they are seeking to develop such courses and are crafting, with the collaboration of IUPUI, an Associate's degree program patterned after the one presented here. This would allow transferability to IUPUI for those seeking the BSB. To develop and offer these courses the CCI will seek to hire full-time PhD level faculty members for these critical courses in Biology and Chemistry. Full-time ownership coupled with instructional participation and oversight are critical to maintaining standards and quality. IUPUI could help identifying appropriate faculty and in ensuring equivalency of the courses. Although lesser courses could meet the knowledge and skills expectations of an AS for local employment, such courses would not be transferable to the 4 year science degree. Both CCI and IUPUI are committed to programs that can be continued on to the baccalaureate level.

4. Access to graduate and professional programs.

The emphasis here is to create access to the Bachelor's (the required degree for graduate and professional schools) degree. The BSB degree envisioned (see accompanying proposal) would be acceptable to many graduate programs and professional schools with judicious selection of the electives. For example, the completion of freshmen Biology (BIOL K103), Organic Chemistry (C342, C343, C344), and Physics (P202) would be wise for students who may have such aspirations.

5. Demand and employment factors.

Geographic region to be served.

We anticipate that the program will serve our immediate partners and others in present and emerging industries related to the work of the BioCrossroads initiative. The availability of this program and local employment prospects should result in some presently uncommitted students to move into the curriculum resulting in the first graduates in less than two years from the program start (Spring 2005). Since the mid-west is a near void in programs of this type we envision serving students and needs in a more regional way over time. Dissemination of this program to other regions (Northwest corner and Fort Wayne, for example) would provide economic stimuli more globally.

Review of the literature

The recent Executive Summary (6/4/03) of the "Workforce Gap Analysis" conducted by the Indiana Health Industry Forum (IHIF) provides compelling data relevant to programs

like the one proposed here. IHIF utilized information from the U.S. Department of Labor, the Indiana Department of Workforce Development, and information collected from individual health industries in Indiana. The Summary predicts 40,000-45,000 job openings in Indiana health industries in the period 2003-08. These jobs are spread among several specific areas and many require high technical skill but not graduate degrees. Among those jobs targeted by this proposal (Medical Manufacturing in the inclusive descriptive term used) many typically seek experienced workers but there is a trend to requiring more post-secondary education. This proposal accomplishes this for those employed in Biotechnology areas such as Laboratory Technician (research & development, quality control) and Manufacturing Technician (production, process support, quality assurance). The Summary also indicates the importance of programs being located near the source of demand and our central location fits very well.

Among the recommendations from IHIF is that employers, education, government, and workforce development groups work collaboratively to address the workforce challenges confronting the further development and expansion of life sciences in Indiana. Our response to local industrial need meets the expectation that we develop and implement the right program at the right time. The program has elements that extend back to K-12 in encouraging more work in science by making careers in local scientific industry known and achievable. In addition, the program is suitable for those already employed and for those who wish to move to other positions within their current organizations.

Potential employers

Eli Lilly & Co., Dow AgroSciences LLC, Roche Diagnostics, and Baxter Pharmaceutical Solutions LLC are our immediate audience but we envision others to emerge once the program is more widely known.

Independent Needs analysis

We have asked our current four industrial partners to indicate their anticipated **annual** need for new employees with this training and to approximate the number of current employees who might enter the program as part-time degree students or who might take some element of the program for continuing education.

COMPANY	NEW EMPLOYEES (Annual)	CURRENT EMPLOYEES
Dow AgroSciences	5-10	5-10
Eli Lilly & Co.	40-60	10
Roche Diagnostics	5-10	5-10
Baxter Pharmaceutical Sol.	10	20-30

Program experience

Few programs of this type exist in the mid-west. Sinclair College in Dayton, OH, has a biotechnology training program. This program is seven quarters (2 years plus) and has several features that are the same as the one here. Where it varies is in the rigor of the Math, Chemistry, and upper level Biology required and in the flexibility conferred by the cassette system. Most programs of this type are located in the east and west coasts. They serve the large biotechnology industries in those areas. We have also reviewed program in California (Moorpark and Solano) and one in New Hampshire. All have severe transferability limitations to the bachelor's. All four institutions have attended the Biotechnology Curriculum Development conference held in Indianapolis 12-15-17 and have indicated their enthusiasm for our program that promises entry to the baccalaureate without loss of credit and for our development of the knowledge and skills standards upon which we have based our curricula.

Expert opinion

IHIF Executive Summary of Workforce Gap Analysis, 6/4/03. (www.ihif.org)

6. Regional, state, and national factors

- a. There are no existing programs in the state at this time although one is under collaborative development with CCI. The closest 2-year program is the one at Sinclair Community College in Dayton. The degree is terminal with no transferability to a baccalaureate program.
- b. There are no licensing requirements for this type of program but it has been crafted using an industry -formulated set of standards for knowledge and skills. (Attached) Content of the applied courses has been based in the standards not covered in the existing basic science curricula of IUPUI. Our industrial end-users have been intimately involved in program construction.

D. Program Implementation and Evaluation

The program will be implemented effective fall, 2004. The first year is comprised of existing courses with the exception of one new lecture course in the second semester. A primary objective has been to create flexible degrees in Biotechnology that meet existing and future need of local industry. The program has been constructed to accomplish this and placement in the local workforce will provide evidence that this objective is being met. An important element in the regional emphasis in the life sciences will be the availability of a quality dependable, well-trained workforce in Biotechnology. Having flexible programs available to existing industry, emerging new industries and organizations that are lured to relocate in central Indiana will be a major factor in the success of the life sciences initiative. This program and its full articulation to a BS degree will raise the education attainment of central Indiana thus making the number of degrees a measure of program success.

The program will have some unique assessment features. As compared to traditional laboratories at colleges and universities where experiments are done to illustrate concepts, the applied labs will have different intentions. These labs will involve specific outcomes (e. g. Can you perform the series of steps that will result in the isolation and purification of protein X?) and will be done until they are completed properly and accurately. Since the Biotechnology industry is a regulated entity, appropriate documentation is very much a part of the experience in the lab. The outcomes in these settings more closely resemble those in health sciences. The assessment of knowledge and skills will be further enhanced by the work place assignments that will comprise the intensive industry internships that will be a part of all versions of the ASAB.

Indiana University Purdue University Indianapolis
Academic Policies and Procedures Committee
Guidelines for Review of New Degree Proposals
Associate of Science Applied Biotechnologies

When the chair of the APPC is informed that an academic unit is preparing a new degree proposal, this document will be sent to the Dean of the unit to inform the faculty of the areas that are reviewed by the APPC. Item 10 (program evaluation plan) may require the proposing unit to develop a brief addition to the information requested in the ICHE new degree proposal format.

APPC will not review a new degree proposal unless a representative of the proposing academic unit is present to answer questions during the APPC meeting.

A working group of APPC members will be assigned as 'primary reviewers' of the proposal and will prepare a summary report for distribution to the APPC prior to the scheduled discussion of the proposal. The summary will be distributed without attribution to those involved in preparing the report. All members of APPC are expected to review the proposal prior to the discussion.

In the review of the New Degree Proposal, the APPC will consider the following items.

- 1. Does the Program Description clearly describe the new degree?**
 - a. Purpose is to provide biotechnology production workers with a 2-year degree and technical expertise to support the life sciences industries represented by the BioCrossroads initiatives.
 - b. Basic foundational courses in the sciences are combined with groups of related experiences in the major called cassettes.
- 2. Does the statement of the program's goals and objectives clearly differentiate this degree from other degrees at IUPUI?**
 - a. The proposal states that 'The program is unique to campus and unique to the state of Indiana.
 - b. The proposal states that 'All credits can be directly applied to a four year degree (Bachelor of Science in Biotechnology).' A draft plan of study for the B.S. program is included in the proposal.
 - c. The program is complementary to the Graduate Certificate Program in Biotechnology.
- 3. Are the admission requirements and enrollment restrictions consistent with other IUPUI programs? If not, is the rationale clearly presented?**
 - a. Students will meet IUPUI admission standards.
 - b. Students who do not meet IUPUI admission standards can begin coursework at Ivy Tech-Indianapolis and transfer into the IUPUI program.
- 4. Are the degree requirements consistent with other IUPUI programs?**

- a. Requires a minimum of 62 credit hours with most options requiring approximately 70 hours which is consistent with other IUPUI programs.
 - b. The proposed plan of study includes core courses in general education, mathematics, and ancillary sciences plus courses in the major that are complemented by specialize course clusters called cassettes . The plan of study incorporates:
 - (1) 10 credit hours in General education
 - (2) 12 credit hours in mathematics/statistics/computer science
 - (3) Minimum of 18 credit hours in ancillary sciences
 - (4) Courses in the major total a minimum of 20 credit hours
 - Includes a 6 credit hour industrial partnership
- 5. Is the sample curriculum consistent with similar IUPUI degree programs?**
- a. The sample plan of study and the various options are consistent with IUPUI degree programs in technology.
- 6. Does the curriculum have potential positive or negative impact on the enrollment in the courses or degrees in other academic units?**
- a. The curriculum may have a small negative impact on the manufacturing technology 2-year degree program offered by the School of Engineering and Technology.
- 7. Will the faculty resources dedicated to the program have positive or negative impact other academic units?**
- a. NSF funding is being sought for instructor training and initial funding of salaries for an advisor/recruiter and a technician to support and prepare lab courses.
 - b. No new full-time faculty positions are required.
 - c. Will recruit a new set of adjunct instructors from local industry.
- 8. Does the program rationale support the institutional need for the degree?**
- a. The 2-year A.S. degree program is not consistent with the general philosophy outlined in Vice Chancellor Plater’s memorandum of March 1, 2004 on the subject of associate degrees. That memo indicates that “IUPUI will not propose new associate degree programs unless: (1) we have been invited to do so by ICHE; (2) we have ascertained that the Community College of Indiana will not oppose the proposal publically; and (3) we are meeting a clearly documented public need.” The proposal does not specifically address the three criteria identified.
- 9. Is it likely that this degree will compete with existing degrees for students?**
- a. The School of Science does not project a negative competition with currently offered degrees and it is unlikely that the degree would draw a significant number of students from degree programs outside of the School of Science.
 - b. However, the proposal also indicates that the Community College of Indiana is developing a 2-year degree in biotechnology and that the proposed B.S. degree in biotechnology will articulate with the CCI program. It is known that the CCI

campus developing the 2-year biotechnology program is Ivy Tech State College – Central Indiana.

- c. Since it appears there will be a parallel degree in place through CCI, a better explanation for the duplication of such a program is needed. For instance, do two parallel programs work against each other in terms of pulling in enough students? Are there enough students in the pool (and jobs for the same) to meet the needs of two programs?
- d. The School of Engineering and Technology projects the degree program may have a small negative impact on its 2-year manufacturing technology. However, the opportunity exists for the proposed biotechnology degree programs to utilize existing courses offered by the School of Engineering and Technology in manufacturing related areas such as quality assurance, production planning and automated processes as technical selective.

10. Is the program evaluation plan consistent with the learning outcome assessment strategies used by other IUPUI degree programs?

- a. The new courses will be assessed in collaboration with the life science industry partners of the program.
- b. The program evaluation plan was weak. It is not clear what the expected outcomes for this degree will be and how they differ among concentrations.
- c. There was no obvious integration of IUPUI Principles of Undergraduate Education either in the curriculum or evaluation of this program.
- d. The proposal should address the potential existence of national accreditation standards or industry standards that might add in the evaluation of program outcomes.