→ LS 10/06/03

LSC Use Only No:	LSC Action-Date:	UWUCC USE Only No.	UWUCC Action-Date:	Senate Action Date:
		03-20d	Appr 1/20/04	Appr 3/2/04

Curriculum Proposal Cover Sheet - University-Wide Undergraduate Curriculum Committee

Contact Person	Email Address
Art Hulse	ntcc@iup.edu
Proposing Department/Unit	**Phone**
Biology	7-2279

Check all appropriate lines and complete information as requested. Use a separate cover sheet for each course proposal and for each program proposal.

1. Course Proposals (check all that apply)

_____New Course _____Course Prefix Change _____Course Deletion

_____Course Revision _____Course Number and/or Title Change _____Catalog Description Change

***Current* Course prefix, number and full title**	***Proposed* course prefix, number and full title, if changing**

2. Additional Course Designations: check if appropriate

_____ This course is also proposed as a Liberal Studies Course.

_____ This course is also proposed as an Honors College Course.

_____ Other: (e.g., Women's Studies, Pan-African)

3. Program Proposals

_____Catalog Description Change _____Program Revision

_____New Degree Program _____Program Title Change _____Other

_____New Minor Program __X__New Track

	B.S. in Biology: Cell and Molecular Biology Track
***Current* program name**	***Proposed* program name, if changing**

4. Approvals		**Date**
Department Curriculum Committee Chair(s)	Arthur E. Hale	2-11-03
Department Chair(s)	Carl Lewis	2/13/03
College Curriculum Committee Chair		10/06/03
College Dean		10/06/03
Director of Liberal Studies *		
Director of Honors College *		
Provost *		
Additional signatures as appropriate:		
(include title)		
UWUCC Co-Chairs	Gail S Eschrist	1-20-04

* where applicable

RECEIVED OCT - 6 2003 LIBERAL STUDIES

RECEIVED NOV - 3 2003 LIBERAL STUDIES

RECEIVED JAN 20 2004

RECEIVED JAN 22 2004

Part II: Description of Curriculum Change

1. Complete Catalog Description for New Track

Bachelor of Science in Biology: Cell and Molecular Biology Track

Students electing the Bachelor of Science degree with an emphasis in Cell and Molecular Biology will take all the core Biology courses and, in addition, a collection of upper-division courses that focus collectively on important aspects of modern cell and molecular biology. This track will prepare students for employment in technical positions or for graduate studies in cell biology, molecular biology, biotechnology or related biomedical disciplines

Bachelor of Science in Biology-Cell and Molecular Biology Track

Liberal Studies Courses: **48**

As outlined in the Liberal Studies section with the following specifications:
Mathematics: MATH 121
Natural Sciences: CHEM 111-112
Liberal Studies Electives: PHYS 111(3 cr), no courses with BIOL prefix

Major: **38**

Required Biology Core Courses:

BIOL 111	Principles of Biology I	4 cr
BIOL 112	Principles of Biology II	4 cr
BIOL 210	Botany	3 cr
BIOL 220	General Zoology	3 cr
BIOL 250	Principles of Microbiology	3 cr
BIOL 263	Genetics	3 cr

Additional Required Biology Courses:

BIOL 123	Perspectives in Cell and Molecular Biology	1 cr
BIOL 410	Molecular Biology Topics	3 cr
BIOL 401	Laboratory Methods in Biology and Biotechnology	3 cr

Controlled Biology Electives: (1) 11

BIOL 151	Human Physiology	4 cr
BIOL 269	Bioethics and Coevolution	3 cr
BIOL 271	Evolution	3 cr
BIOL 281	Special Topics	1-3 cr (2)
BIOL 323	Introduction to Toxicology and Risk Assessment	3cr
BIOL 331	Animal Developmental Biology	3 cr
BIOL 352	Comparative Animal Physiology	3 cr
BIOL 362	Ecology	3 cr
BIOL 363	Medical Microbiology	3 cr
BIOL 364	Immunology	3 cr
BIOL 453	Plant Physiology	3 cr
BIOL 460	Fundamentals of Environmental Epidemiology	3cr
BIOL 466	Principles of Virology	3 cr
BIOL 476	Parasitology	3 cr
BIOL 477	Neurobiology	3 cr
BIOL 481	Special Topics	1-3 cr (2)
BIOL 482	Independent Study	1-3 cr (2)
BIOL 493	Biology Internship	1-12 cr (2)

Ancillary Science Requirements: 24

Organic Chemistry Sequence:

CHEM 231	Organic Chemistry I	4 cr
CHEM 232	Organic Chemistry II	4 cr

Biochemistry Sequence:

BIOC 301	Biochemistry I	3 cr
BIOC 302	Biochemistry II	3 cr
BIOC 311	Biochemistry Laboratory I	1 cr
BIOC 312	Biochemistry Laboratory II	1 cr

Other Science/Math Requirements:

PHYS 121	Physics I Lab	1 cr
MATH 217	Probability and Statistics	3 cr

Science/Math Elective:

An additional 4 credits in Ancillary Sciences/Math to be selected from the following: (3)

BIOC 480, 481, CHEM 321, 323, 331, 340, MATH 122, PHYS 112, 122

Other Requirements:	**0-6**
Foreign Language Intermediate Level:	0-6 cr (4)
Free Electives:	**4-10**
Total Degree Requirements:	**120**

(1) No more than 6 cr total from Independent Study, Special Topics, Internship applies to major; excess applied as free electives

(2) No more than 3 cr may count toward Controlled Elective requirements.

(3) Other appropriate majors courses in these departments may be substituted for one or more of those on the above list with the approval of the student's advisor.

(4) Two courses beyond placement or intermediate level. Foreign Language course may count as Liberal Studies Elective (see Liberal Studies section). In lieu of a foreign language the student may elect to take a sequence of courses in Computer Science exclusive of COSC 101 (COSC 110 and 210 recommended).

2. Detailed Description for the Track

Rationale and Justification

The Department of Biology proposes a new academic track leading to a Bachelor of Science degree with an emphasis in Cell and Molecular Biology (CMB Track). The primary justification for the new CMB Track is to provide a formal, well-defined and lab-rich curriculum that will prepare students for employment in biotechnology laboratories or for graduate programs in biotechnology or the biomedical sciences.

The job market for individuals with biotechnology skills is likely to remain strong for the foreseeable future. The United States Bureau of Labor Statistics Occupational Outlook Handbook (http://www.bls.gov/oco/oco1002.htm) predicts that career opportunities for all life scientists will increase at an average/above average rate over the next ten years. The "Focus on Careers" section of the web site of the American Association for the Advancement of Science (http://recruit.sciencemag.org./) currently illustrates numerous opportunities in biotechnology sector, especially in pharmaceuticals. Both of these sources emphasize that opportunities at the bachelor/masters level are likely to be more plentiful than those at the doctoral level.

The proposed CMB Track will provide more options to students interested in attending IUP and thus should aid Department/College recruiting efforts. The proposed CMB Track may also become a resource for IUP programs in allied areas such as anthropology, archeology, food science or nursing.

A 2002 report from the National Research Council points out need for interdisciplinary training for students in the biomedical sciences. The interdisciplinary philosophy of the proposed CMB Track is reflected is by its requirement for numerous science/math courses other than Biology courses. Students in the CMB Track will take 13 or 14 courses for a total of 39 credits in Biochemistry, Chemistry, Physics and Math, one more credit than the 38 required in the major. Several of the courses required in the proposed CMB Track take an integrative approach by incorporating interdisciplinary "modules" into their content.

Credit Requirements

Overview

The proposed CMB Track includes all Biology core courses, three Additional Required Biology Courses (BIOL 123, BIOL 410 and BIOL 401) that focus on cell and molecular biology topics and 11 cr. of Controlled Biology Electives. Thus, the proposed CMB Track meets the IUP-UWUCC definition of a new curricular track.

The proposed CMB Track emphasizes hands-on laboratory experience. The track includes a total of fourteen Biology, Biochemistry, Chemistry and Physics laboratories among its required courses, and students may choose additional labs from among the Controlled Biology Electives

or Science/Math Electives. The required laboratories of the Biology core curriculum introduce basic biological techniques, the scientific method and the skills needed to work flexibly as a team member or as an independent problem-solver, in addition to more discipline-specific methodology. Students will also be encouraged to pursue opportunities for variable-credit internships and independent study projects related to cell and molecular topics.

Among the Ancillary Science Requirements of the CMB Track is a 4 cr. Science/Math Elective that provides students with an opportunity to choose according to their interest from a suite of BIOC, CHEM, MATH or PHYS courses. Some CMB students, for example, might choose a CHEM course in order to qualify for a minor in Chemistry.

Required Majors Courses

The six courses of the Biology core include introductory and diversity courses as well as a writing-intensive course to meet the IUP-LS requirement for one (W) course in the major. All six core courses have an integral lab and two of the six utilize a workshop format. Since 1997 the National Science Foundation has provided support for the Biology Core with four ILI and CCLI grants.

The proposed CMB Track curriculum requires three additional Biology courses. Perspectives in Cell and Molecular Biology (BIOL 123) is a seminar course and Topics in Molecular Biology (BIOL 410) is a lecture course. Both of these courses were developed specifically for the CMB Track and both have already received Senate approval. The third course, Laboratory Methods in Biology and Biotechnology (BIOL 401) has been taught annually for more than a decade, primarily for Biochemistry majors.

The proposed CMB Track curriculum includes 11 cr. of Controlled Biology Electives. To satisfy this requirement, students may choose from among a group of existing courses. This arrangement will allow students to follow an area of special interest within biology or to sample courses from different areas.

Biochemistry Sequence

The CMB Track requires two semesters of Biochemistry Lecture (BIOC 301 and 302) and two accompanying labs (BIOC 311, 312), the same sequence taken by Biochemistry majors at IUP. This BIOC sequence is an integral part of the CMB curriculum. The lecture courses provide students with conceptual and factual background in structural biochemistry, reaction mechanisms, enzyme kinetics, cell and organelle composition and intermediary metabolism. The laboratory courses acquaint students with the theory and operation of common instruments, with cell fractionation, separation techniques and modern analytical methods used for biomolecules.

The BIOC labs concentrate on methodologies and underlying principles that do not include molecular cloning or genetic engineering. The required BIOL 401 course Laboratory Methods in Biology and Biotechnology, on the other hand, focuses exclusively on the analysis and

manipulation of genetic material. Thus BIOL 401 and the BIOC lab sequence complement one another. Both present relevant physical principles in a biological context as interdisciplinary Modules.

Physics

The proposed CMB Track requires one semester of introductory physics lecture and lab (PHYS 111 and 121) with a second semester (PHYS 112 and 122) elective. We recognize that a basic understanding of Physics is necessary for a Biology major, but do not feel that a two semester course is necessary for all Biology majors since the existing courses do not place principles of physics in a biological context. To meet the needs of Biology majors the ideal situation would be to have a one semester Physics course tailored to the needs of Biology students. This interdisciplinary course would rely on examples relevant to biology, as recommended in the NRC report. This Biology/Physics course would be similar in intent to the "designer" courses the Department of Biology offers in Human Anatomy (BIOL 150, for nurses etc.), Human Anatomy and Physiology (BIOL 155, for Dietetics, Food and Nutrition etc.) , Microbiology (BIOL 241 for Nursing, Respiratory Therapy etc.) Unfortunately such a course does not at present exist. As a result PHYS 111 and 121 are the logical courses to meet the requirements of our majors.

Sequencing of the CMB Track

The Biology Department schedules required courses semi-annually, annually or biennially, depending upon demand. Over the years this policy has proved adequate for existing programs since it gives each student at least one chance to take every specialized, upper-division course and several chances to schedule introductory and intermediate-level courses in a four-year program. Since the proposed CMB Track relies primarily on existing courses, this policy should prove adequate.

One possible sequence of courses for Biology majors electing the CMB Track is outlined below.

B.S. in BIOLOGY- Cell and Molecular Biology Track

First Semester

BIOL 111 - Principles of Biology I	4
CHEM 111 – Gen. Chem. I	4
HPED 143/FN143 - Hlth & Wellness[1]	3
LS Humanities: HIST 195 The Modern Era	3
ARHI 101 Intro. to Art or MUHI 101 Intro. to Music or THTR 101 Intro. to Theater or THTR 102 Intro. To Dance	3

Second semester

BIOL 112 - Principles of Biology II	4
BIOL 123 - Perspectives in Molecular Biology	1
CHEM 112 - Gen. Chem. II	4
ENGL 101 – Coll. Writing	4
LS Social Science Elective [2]	3

Third Semester

BIOL 210 - Botany or BIOL 220 - General Zoology or BIOL 250 - Principles of Microbiology	3
CHEM 231 - Organic Chem I	4
MATH 121 - Calc I (Nat & Soc. Sci.)[3]	4
__ ___ - Foreign Language[4]	3-4

Fourth Semester

BIOL 210 – Botany or BIOL 220 – General Zoology or BIOL 250 - Principles of Microbiology	3
CHEM 232 - Organic Chem II	4
MATH 217 – Prob. & Stat.	3
ENGL 202 – Research Writing	3
__ ___ - Foreign Language	3-4

Fifth Semester

BIOL 210 – Botany or BIOL 220 - General Zoology or BIOL 250 - Principles of Microbiology	3
BIOL ___ - Biology Elective	3-4
BIOC 301 - Biochemistry I	3
BIOC 311 - Biochemistry Lab I	1
__ ___ - LS Social Science Elective[2]	3
__ ___ - LS Humanities: Phil/Rel.St.	3

Sixth Semester

BIOL 263 – Genetics (W)	3
BIOL ___ - Biology Elective	3-4
BIOC 302 – Biochemistry II	3
BIOC 312 - Biochemistry Lab II	1
__ ___ - Free Elective	3
__ ___ - LS Social Science Elective[2]	3

Seventh Semester

BIOL 401 - Laboratory Methods in Biology and Biotechnology	3
PHYS 111 – Physics I	3
PHYS 121- Physics I Lab	1
__ ___ - LS Humanities: Literature	3
__ ___ - Free Elective or BIOL Elective	3

Eighth Semester

BIOL 410 – Topics in Molecular Biology	3
BIOL ___ - Biology Elective	3
__ ____ Ancillary Science/Math Elective	4
LBST 499 - Synthesis	3
__ ___ - Free Elective or BIOL Elective	3

[1] MLSC 101 and 102 (World and Am. Mil. Hist.) may be substituted for the Health & Wellness Course

[2] One of these should be a non-Western culture course

[3] Your summer testing program will determine whether or not you should take MATH 105 or 110 prior to Calculus I. MATH 105 or 110 will count as a free elective.

[4] Two courses beyond placement or intermediate level. Spanish 201; French 201, 202, 203 (6 hrs.); Intermediate-level Foreign Language may be included in Liberal Studies elective. Introductory-level Foreign Language courses are counted as free electives. In lieu of a foreign language the student may elect to take a sequence of courses in Computer Science exclusive of COSC 101 (COSC 110 and 210 recommended).

[5] The following courses are not acceptable toward the Biology major: BIOL 150, 155, 232, 241, 265, 311, 321, 322.

Restrictions

Provided they meet the appropriate prerequisites, students from other departments and programs may enroll in courses of the CMB Track.

Part III Implementation

1. How will the proposed new track affect students already in the existing program

We expect that the introduction of the proposed CMB Track will have minimal negative impact on students already in the existing Biology programs. Since the CMB Track relies upon existing courses for the most part, it should not divert significant resources away from these programs. The CMB Track will provide all students in the Biology Department with a more intellectually diverse learning community, opportunities to enroll in new and revised courses and an additional track option.

2. Are faculty resources adequate?

We expect the CMB Track to have minimal impact on teaching loads for two reasons. First, the CMB Track relies upon existing courses whenever possible. Teaching load for these courses is already factored into the Departmental schedule and should not have to be reallocated. The Department's teaching schedule can accommodate the two additional courses of the CMB Track (BIOL 123 and BIOL 410-already approved by the Senate). Second, we expect the implementation of the CMB Track to result in fewer than 20 new enrollments, at least initially. These new students can be merged into the existent student population without strain. If the CMB Track proves to be highly successful, with rapidly increasing enrollments, we would then have to consider reallocating teaching load, using regular Department mechanisms for dealing with enrollment change.

All affected departments have been notified of our program revisions (see attached letters of notification and response).

3. Are other resources adequate?

Space: Existing laboratory space in the Biology Department and in the Biochemistry Program will be adequate for the proposed CMB Track.

Equipment: Equipment currently on hand will be adequate for the proposed track. We may have to replace and/or upgrade equipment more frequently than usual if a large number of students enroll in the program.

Supplies: Since no new lab courses are proposed, current supply budgets are adequate for the CMB track. We may need to address additional funding for supplies should enrollments go up.

Travel Funds: not applicable

Library: Library resources are less than adequate for the proposed program. We expect to supplement library resources with internet materials, interlibrary loan and with our personal journal collections.

4. Do you expect an increase or decrease in the number of students as a result of these revisions? If so how will the department adjust?

We hope that the proposed revision will make the IUP Biology program more attractive to potential students. However, we do not initially expect such an inordinately large influx of students as to affect the operations of either the Department of Biology or any department associated with our Ancillary Science Courses.

We expect overall enrollment in the Department to increase slightly when the CMB Track is implemented. Based on conversations with students and on experience with the implementation of the Biochemistry Program, we expect an initial enrollment of fewer than 10-12 students with a gradual increase to be 25-30 students possible within a four-year period.

Other departments in the College may see changes in the number of Biology students enrolled in their courses due to the additional ancillary science courses required in the CMB Track compared to the "old" BS degree. Since these revisions to the ancillary science requirements include additions, deletions and additional course options compared to the "old" BS degree requirements, the net effects are difficult to predict.

There is likely to be an overall reduction in the number of Biology students enrolled in PHYS 112 and 122 and MATH 122 since these courses are not absolute requirements for the CMB Track. However, all of these courses are still listed among the suite of "Science/Math Electives" (4 credits required for each CMB Track student) and are thus likely to attract some of the CMB students. There will be a reduction in the number of Biology students taking CHEM 351 (one-semester biochemistry course with no lab) but some CMB students are likely to choose one of the Chemistry course options (CHEM 321, 323, 331 or 340) as a Science/Math Elective course. Biochemistry courses are likely to experience an increase in enrollment

5. Intended implementation date

Our plan is to implement the CMB Track beginning with the Fall, 2004 semester.

Part IV Periodic Assessment

We plan a two-pronged method of evaluation of the program. This will involve a survey of graduating seniors as well as a five-year evaluation of the program by the Department of Biology. Upon submission of their graduation application to their advisors, students will be given a Senior Survey that they will be required to complete and return to their advisor in a sealed envelope bearing the letter head of the Department of Biology. These sealed envelopes will be given to the

department secretary and not opened until after graduation (either Fall or Spring). The department secretary will then transcribe the results and distribute the results to the entire faculty of the Department of Biology. If students so choose, they may identify themselves on the survey form for follow-up interviews by phone or e-mail.
At the end of the first five years of the program and every five years thereafter the Student Affairs Committee of the Department of Biology will evaluate all of the Senior Surveys for the last five years. In addition, enrollment trends during each five year period will be examined and included in the evaluation. All faculty within the Department of Biology will also be asked to submit their individual evaluations regarding the success of the program

Part V. Course Proposals

This part is not applicable since no new courses are being proposed.

Part VI. Letters of Notification

See the attached letters and e-mails of notification and acknowledgement.

03.200.

Carl Luciano

From: "Carl Luciano" <luciano@iup.edu>
To: "Ruiess V. Ramsey" <rvbravo@iup.edu>; "Darlene Richardson" <drchrdsn@iup.edu>; "Ken Hershman" <hershman@iup.edu>; "Mary Lou Zanich" <mlzanich@iup.edu>; "gary stoudt" <gsstoudt@iup.edu>; "jim wolfe" <jlwolfe@iup.edu>
Cc: <luciano@iup.edu>; "Art Hulse" <NTCC@iup.edu>
Sent: Monday, February 17, 2003 11:39 AM
Attach: CMB TRACK Spring 03.doc
Subject: Cell and Molecular Biology Track proposal

:NSM Chairs

\ttached please find a Word document that contains a curriculum proposal for the BS in Biology-Cell and Molecular Biology Track. 'he proposal has been revised since last semester to bring it into alignment with the BS in Biology major revisions now in review. 'lease pass the track proposal along to your department's appropriate person or committee for comment. Thanks for your attention.

)r. Carl S. Luciano
'rofessor and Department Chair
)epartment of Biology
ıdiana University of Pennsylvania

Carl Luciano

From: "Gary Stoudt" <gsstoudt@iup.edu>
To: "'Carl Luciano'" <luciano@iup.edu>
Cc: "'Gary Stoudt'" <GSSTOUDT@iup.edu>
Sent: Friday, February 28, 2003 10:21 AM
Subject: Support for CMB

'arl,

'he Mathematics Department supports the creation of the new Cell and
/lolecular Biology Track in the B.S. Biology program. The MATH 121 and
/IATH 217 requirements are consistent with the other Biology programs and
ur current offerings will be able to accommodate these students. The
)ss of Biology students in MATH 122 and MATH 216 is not significant
nough to change the enrollment pattern of those courses.

Jary

Jary Stoudt, Chairperson
/lathematics

To: Curriculum Committee
The University Senate
IUP

From: Dr. N. Bharathan, Dr. Jonathan N. Southard,
Co-Coordinators
Biochemistry Program
IUP

Date: March 14, 2003

Subject: Bachelor of Science in Biology – Cell and Molecular Biology Track

As Co-Coordinators of the Biochemistry Program, we enthusiastically support the proposal for a Bachelor of Science in Biology – Cell and Molecular Biology (CMB) Track. The proposed CMB track will complement and strengthen the existing interdisciplinary Biochemistry Program. It is appropriate that the Biochemistry sequence (BIOC 301, 311, 302, and 312) is an integral part of the proposed curriculum.

The CMB track will provide an opportunity for IUP students to acquire a solid base of knowledge and set of skills relevant to the life sciences at the molecular level. Successful students will be well prepared for a wide variety of career options in biology and many related fields. The demand for these graduates both by industry and government and by graduate degree programs will be high. The emphasis on laboratory coursework is a particularly strong feature of the proposal.

It is difficult to precisely predict the effect of the proposed CMB track on faculty and other resources within the Biochemistry Program. No difficulties are anticipated due to additional enrollment in the lecture courses; however, enrollment in the laboratory courses is currently limited to 12 students. While we typically enroll 6-8 Biochemistry majors in these courses, the recent addition of a minor in Biochemistry has resulted in the enrollment of additional students up to the limit. Currently all these additional students are Biology majors seeking a Biochemistry minor (all students in the CMB track will meet the requirements for a minor in Biochemistry). Given the nature of these upper-level laboratory courses, we feel that while more than 12 students could be accommodated, the limit should be no higher than 16 students. This increase would require a modest supplementation of laboratory equipment and supplies. If the number of Biochemistry majors plus CMB majors exceeds 16, then it would be necessary to open a second laboratory section in to allow students to fulfill degree requirements. As the Biochemistry Program has no faculty complement *per se*, additional laboratory sections would impact faculty complement within the cooperating departments, Biology and Chemistry.