



# ESF Minor Curriculum Change Proposal Form

Committee on Curriculum - ESF Faculty Governance  
Office of Instruction & Graduate Studies

**Date:** January 15, 2023  
**Department:** Environmental Biology  
**Curriculum Title:** Biotechnology

**For Minor Changes in existing curriculum (check all that apply):**

- |   |  |
|---|--|
| <input checked="" type="checkbox"/> revised courses   | <input type="checkbox"/> change in total cr. hrs.                  |
| <input type="checkbox"/> new course sequence          | <input type="checkbox"/> new program objectives*                   |
| <input checked="" type="checkbox"/> new courses added | <input type="checkbox"/> new accreditation/assessment requirements |

\*See SUNY Guidelines

## 1. Rationale for Change

Please provide an explanatory narrative outlining the rationale for the change, and the impacts of this change on the learning outcomes of the curriculum:

**Add EFB 311 Principles of Evolution (3cr) as required coursework.**

To more completely understand Biology, we are adding Principles of Evolution. Evolutionary processes underpin all aspects of biotechnology, including selection for recombinant organisms, using enzyme systems cloned/isolated from a wide range of species, mobile genetic elements, comparisons of nucleic acid sequences to understand relationships, interaction and evolution of genetically modified organisms and their environment, etc. The addition of this course is aimed at giving BTC students a deeper understanding of the history of life on earth and its future trajectory in a changing world.

**Remove EFB210/211 Diversity of Life I or II as a program requirement.**

To make room in the curriculum for EFB 311, we are removing the Diversity of Life courses as a requirement. BTC students can choose other biodiversity courses as directed electives, depending on their career interests.

**Change in credits for BTC401/EFB601 Molecular Biology Techniques from 4 to 3.**

The course will be changed from 2 labs per week to 1 lab per week to make the course more accessible to students in a wide range of majors.

**Change required credits for Internship/Research option from 5 to 3.**

Currently, 5 credits of BTC420, or BTC 498, or a combination of both, are required for BTC students. To provide more flexibility in our curriculum, we are changing the credit requirement to 3.

**Add General Education category Diversity: Equity, Inclusion, and Social Justice as a required coursework.**

Required by SUNY

**Update General Education list:**

Complete courses in two of the following categories (6 cr)

- Social Sciences
- The Arts
- US History and Civic Engagement
- World History and Global Awareness
- World Languages

**Change Open elective credits from 20 to 23 to accommodate change in credits described above.**

## 2. Institutional Impact:

### Changes from existing condition:

Anticipated Enrollment or Enrollment Change: none

Faculty or Staffing Requirements: none

Technology, Computing Resources, and Classroom Resource Demands: none

Change in Accreditation Requirements: none

Changes to Assessment Plan: The courses we propose to remove (EFB210 and EFB211) are not part of our current program assessment, so removing them will not require a change. In adding EFB311 (Principles of Evolution), we will integrate this into our program assessment.

Library Resource Requirements: none

## 3. Catalog Narrative:

Please attach to this proposal form a copy of the current catalog description in MS Word format, with revisions shown in "track changes".

### Bachelor of Science in Biotechnology

- [www.esf.edu/biotech](http://www.esf.edu/biotech)

Biotechnology is the application of biological organisms, cells, or molecules to produce a product or service for the betterment of humankind. This area of study includes aspects of molecular biology, microbiology, cell biology, biochemistry, and genetic engineering, among other related disciplines.

### The Biotechnology Curriculum

The curriculum builds on introductory courses in the sciences including biology, chemistry, calculus, and physics, creating a strong foundation for more advanced upper-level courses. This degree program prepares students to use molecular and biochemical approaches to tackle environmental, natural resource, agricultural, or medical questions, and provides sufficient breadth for students interested in veterinary and human medicine careers ~~veterinary and human medicine~~. Students who complete this major will be qualified to enter the growing biotechnology job market or continue their studies in graduate or professional school.

The Biotechnology curriculum requires a minimum of 126 total credits. The core requirements are listed in the typical schedule. There are also 12 credits of directed electives that can be chosen from a list of approved courses. Twenty open elective credits can be selected depending on a student's individual interests. There are also many courses offered at Syracuse University or the SUNY Upstate Medical University that could be used to fill these electives and open electives.

### Required Courses

Course	Codes*	Credits	
APM 105 Survey of Calculus and Its Applications I	G	4	Formatted: Font: (Default) Arial, 10 pt
APM 106 Survey of Calculus and Its Applications II		4	Formatted: Font: (Default) Arial, 10 pt
APM 391 Introduction to Probability and Statistics	G	3	Formatted: Font: (Default) Arial, 10 pt
BTC 132 Orientation Seminar		1	Formatted: Font: (Default) Arial, 10 pt
BTC 401 Molecular Biology Techniques		4 <del>3</del>	Formatted: Font: (Default) Arial, 10 pt
BTC 420 Internship in Biotechnology		1 <del>_</del> 5	Formatted: Font: (Default) Arial, 10 pt
OR			Formatted Table
BTC 498 Research Problems in Biotechnology		4 <del>_</del> 9 <del>_</del> 3	
BTC 497 Research Design and Professional Development		1	Formatted: Font: (Default) Arial, 10 pt
BTC 499 Senior Project Synthesis		1	Formatted: Font: (Default) Arial, 10 pt
EFB 101 General Biology I: Organismal Biology and Ecology	G	3	Formatted: Font: (Default) Arial, 10 pt
EFB 102 General Biology I Laboratory	G	1	Formatted: Font: (Default) Arial, 10 pt
EFB 103 General Biology II: Cell Biology and Genetics	G	3	Formatted: Font: (Default) Arial, 10 pt
EFB 104 General Biology II Laboratory	G	1	Formatted: Font: (Default) Arial, 10 pt
EFB 210 Diversity of Life I		3	Formatted: Font: (Default) Arial, 10 pt
OR			Formatted Table
EFB 211 Diversity of Life II		3	
EFB 303 Introductory Environmental Microbiology		4	Formatted: Font: (Default) Arial, 10 pt
EFB 307 Principles of Genetics		3	Formatted: Font: (Default) Arial, 10 pt
EFB 308 Principles of Genetics Laboratory		1	Formatted: Font: (Default) Arial, 10 pt
EFB 311 Principles of Evolution		3	Formatted: Font: (Default) Arial, 10 pt
EFB 320 General Ecology		4	Formatted: Font: (Default) Arial, 10 pt
EFB 325 Cell Biology		3	Formatted: Font: (Default) Arial, 10 pt
EWP 190 Writing and the Environment	G	3	Formatted: Font: (Default) Arial, 10 pt

EWP 290	Research Writing and Humanities	G	3	Formatted: Font: (Default) Arial, 10 pt
FCH 150	General Chemistry I	G	3	Formatted: Font: (Default) Arial, 10 pt
FCH 151	General Chemistry Laboratory I	G	1	Formatted: Font: (Default) Arial, 10 pt
FCH 152	General Chemistry II	G	3	Formatted: Font: (Default) Arial, 10 pt
FCH 153	General Chemistry Laboratory II	G	1	Formatted: Font: (Default) Arial, 10 pt
FCH 221	Organic Chemistry I		3	Formatted: Font: (Default) Arial, 10 pt
FCH 222	Organic Chemistry Laboratory I		1	Formatted: Font: (Default) Arial, 10 pt
FCH 223	Organic Chemistry II		3	Formatted: Font: (Default) Arial, 10 pt
FCH 224	Organic Chemistry Laboratory II		1	Formatted: Font: (Default) Arial, 10 pt
FCH 430	Biochemistry I		3	Formatted: Font: (Default) Arial, 10 pt
FCH 432	Biochemistry II		3	Formatted: Font: (Default) Arial, 10 pt
PHY 101	Major Concepts of Physics I		4	Formatted: Font: (Default) Arial, 10 pt
PHY 102	Major Concepts of Physics II		4	Formatted: Font: (Default) Arial, 10 pt
XXX,###	<a href="#">Diversity: Equity, Inclusion, and Social Justice (possibly pick list)</a>	G	3	Formatted: Font: (Default) Arial, 10 pt

**NOTE:** BTC 420 (Internship in Biotechnology) is typically done in the summer. Formatted: Font: (Default) Arial, 10 pt

**NOTE:** 35 credits of BTC 498 or BTC 420 are required.

### Electives

Course	Codes*	Credits	
General Education Course in <u>three-two</u> of the following categories: <a href="#">Social Sciences</a> , <a href="#">The Arts</a> , <a href="#">US History and Civic Engagement</a> , <a href="#">World History and Global Awareness</a> , <a href="#">World Languages</a> , <a href="#">American History</a> , <a href="#">The Arts</a> , <a href="#">Western Civilization</a> , <a href="#">Other World Civilizations</a> , <a href="#">Social Science</a> , <a href="#">Foreign Language</a>	G	69	Formatted: Font: (Default) Arial, 10 pt
Directed Electives		12	Formatted: Font: (Default) Arial, 10 pt
Open Electives		230	Formatted: Font: (Default) Arial, 10 pt

**Directed Electives - Biotechnology** Formatted: Font: (Default) Arial

A minimum of 12 credits of directed elective courses required. New biotechnology related courses not currently on the list may also fulfill this requirement with permission of your advisor.

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Although any combination of courses below may satisfy the minimum 12 credits required, the following list has been categorized into 4 of the most common subject areas of interest to BTC students, as well as those courses that would be suitable for multiple subject areas of interest. These groupings of elective courses are guidelines. Probably no two students in the biotechnology program have exactly the same career goals or interests. Consult your advisor if your subject interests vary.

#### Courses that fit multiple areas of interest

- [EFB 311 Principles of Evolution \(3 cr.\) S](#)
- FCH 380 Analytical Chemistry I (2 cr.) F
- FCH 381 Analytical Chemistry II (3 cr.) S
- FCH 382 Analytical Chemistry I Laboratory (1 cr.) F
- FCH 510 Environmental Chemistry (3 cr.) S
- FCH 531 Biochemistry lab (3 cr.) F
- MCR 480 Fundamentals of Microscopy (3 cr.) F
- MCR 484 Scanning Electron Microscopy (3 cr.) F
- MCR 485 Transmission Electron Microscopy (3 cr.) S
- BIO 422 Bioinformatics for Life Scientists (3 cr.) – SU course
- BIO 442 Seminar in Model Organism Genetics (3 cr.) – SU course
- BIO 443 Seminar in Epigenetics (3 cr.) – SU course
- BIO 450 Seminar in Evolutionary Genetics (3 cr.) – SU course
- BIO 463 Molecular Biotechnology (4 cr.) – SU course
- BIO 464 Applied Biotechnology (4 cr.) – SU course
- BCM 477 Proteins and Nucleic Acids Lab (3 cr.) – SU course
- BCM 484 Biomolecular Modeling (3 cr.) – SU course
- BEN 541 Principles of Tissue Engineering (3 cr.) – SU course

#### Pre-health (Pre-Veterinary, Pre-Medical, etc.)

- EFB 360 Epidemiology (3 cr.) F
- EFB 385 Comparative Vertebrate Anatomy (4 cr.) S
- EFB 400 Toxic Health Hazards (3 cr.) F
- EFB 453 Parasitology (3 cr.) F
- EFB 462 Animal Physiology: Environmental & Ecological (4 cr.) F
- EHS 320 Disease Prevention (3 cr.) S
- FCH 390 Drugs from the Wild (3 cr.) F
- BIO 211 Introduction to Neuroscience (3 cr.) S – SU course
- BIO 216 Anatomy and Physiology I (4 cr.) F – SU course
- BIO 217 Anatomy and Physiology II (4 cr.) S – SU course
- BIO 316 Anatomy & Physiology I for Biology Majors (4 cr.) – SU course
- BIO 317 Anatomy & Physiology II for Biology Majors (4 cr.) – SU course
- BIO 355 General Physiology (3 cr.) S – SU course
- BIO 396 Stem Cells and Society (3 cr.) – SU course
- BIO 441 Seminar in Infectious Diseases (3 cr.) S – SU course
- BIO 447 Basic Immunology (3 cr.) – SU course
- BIO 448 Evolutionary Medicine (3 cr.) – SU course
- BIO 501 Biology of Cancer (3 cr.) – SU course

- BIO 503 Developmental Biology (3 cr.) – SU course

#### Plant Biotechnology

- BTC 425 Plant Biotechnology (3 cr.) S
- BTC 426 Intro. Plant Tissue Culture (3 cr.) F
- EFB 427 Plant Anatomy and Development (3 cr.) F
- EFB 530 Plant Physiology (3 cr.) S
- EFB 531 Plant Physiology Lab (2 cr.) S
- FCH 630 Plant Biochemistry (3 cr.) S

#### Microbial Biotechnology

- EFB 340 Forest & Shade tree Pathology (3 cr.) S
- ~~EFB 428 Mycorrhizal Ecology (3 cr.) F~~
- EFB 440 Mycology (3 cr.) F
- EFB 505 Microbial Ecology (2 cr.) S

#### Bioprocess Engineering

- PSE 200 Introduction to Papermaking (3 cr.)\*
- PSE 202 Pulp and Paper Laboratory Skills (1 cr.)\*
- PSE 223 Introduction to Lignocellulosics (4 cr.)\*
- PSE 361 Engineering Thermodynamics (3 cr.)\*
- PSE 370/570 Principles of Mass and Energy Balance (3 cr.)\*\*
- PSE 371 Fluid Mechanics (3 cr.)\*
- BPE 300 Introduction to Industrial Bioprocessing (3 cr.)\*
- PSE 350/550 Fiber Processing (3 cr.)\*
- PSE 450/650 Pulping and Bleaching Processes (3 cr.)\*\*
- PSE 465/665 Fiber and Paper Properties (3 cr.)\*\*
- PSE 438/638 Biorenewable Fibrous and Nonfibrous products (3 cr.)\*\*
- BPE 310 Colloid and Interface Science (3 cr.)\*
- BPE 420/620 Bioseparations (3 cr.)\*\*
- BPE 438/638 Introduction to Biorefinery Processes (3 cr.)\*\*
- BPE 510 Introduction to Polymer Coatings (3 cr.)
- BPE 536 Radiation Curing of Polymer Technologies (3 cr.)
- BPE 658 Advanced Biocatalysis (3 cr.)
- BEN 364/664 Quantitative Physiology (4 cr.) – SU course\*\*
- BEN 421/621 Biochemical Engineering (3 cr.) – SU course\*\*
- BEN 433/633 Drug Delivery (3 cr.) – SU course\*\*
- BEN 462/662 Biofuels, Bioproducts, and Biorefining (3 cr.) – SU course\*\*
- BEN 468/668 Biomaterials & Medical Devices (3 cr.) – SU course\*\*
- BEN 473/673 Biomanufacturing (3 cr.) – SU course\*\*
- BEN 481 Bioinstrumentation (3 cr.) – SU course
- BEN 561 Polymer Science & Engineering (3 cr.) – SU course

\*Useful background and prerequisite courses if you are planning on entering the MPS program in Paper and Bioprocess Engineering.

\*\*The graduate level course may be applicable to the MPS program in Paper and Bioprocess Engineering.

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**4. Curriculum Transition Plan:**

Please provide a narrative description of your plan for transitioning from your existing curriculum to the proposed new curriculum. Please provide specific dates for implementing curriculum changes, overlap periods where old and new curricula may exist simultaneously, and final phase out of old curricula. Please also include impacts and mitigating considerations for transfer students and students in mid-program during implementation, impacts of changes in semester delivery of existing courses, addition of new courses within a particular semester, etc.

Once approved, new students would complete this new curriculum (anticipated Fall 2023). Existing students would have the option to switch to the new curriculum or continue with the existing curriculum. Both curricula could overlap for at least the next 3-4 years as current students complete their programs. Because the same courses continue to be offered, there is not a concern that students in the old curriculum would be unable to complete those courses.

The addition of EFB 311 Principles of Evolution, is not expected to disrupt the current course sequence. Students would take this in the Spring of their 3<sup>rd</sup> or 4<sup>th</sup> year, where there are currently many open elective slots in their 'suggested schedule'.

**5. Approval Signatures:**

Signatures below, or attached letters, indicate that the affected departments, programs or units have been notified of this proposal and have had an opportunity to assess the impact of the proposal on their respective units. If departments did not respond to your notification, you may wish to document your effort to contact them.

**Affected Academic Department(s) or Program(s):**

|                      |                                |                                             |
|----------------------|--------------------------------|---------------------------------------------|
| _____                | _____                          |                                             |
| Department/Program 1 | Name of Chair/Program Director |                                             |
| _____                | _____                          | Or letter attached <input type="checkbox"/> |
| Chair Signature      | Date                           |                                             |
| _____                | _____                          |                                             |
| Department/Program 2 | Name of Chair/Program Director |                                             |
| _____                | _____                          | Or letter attached <input type="checkbox"/> |
| Chair Signature      | Date                           |                                             |
| _____                | _____                          |                                             |
| Department/Program 3 | Name of Chair/Program Director |                                             |
| _____                | _____                          | Or letter attached <input type="checkbox"/> |
| Chair Signature      | Date                           |                                             |

*[If more/ess than three Departments/Programs, please add/delete lines as appropriate.]*

**Other Units**



\_\_\_\_\_  
Library Director Date \_\_\_\_\_ Or letter attached

\_\_\_\_\_  
Computing and Network Services Date \_\_\_\_\_ Or letter attached

\_\_\_\_\_  
Physical Plant Date \_\_\_\_\_ Or letter attached

\_\_\_\_\_  
Forest Properties Date \_\_\_\_\_ Or letter attached

\_\_\_\_\_  
Environmental Health and Safety Date \_\_\_\_\_ Or letter attached

\_\_\_\_\_  
Admissions Date \_\_\_\_\_ Or letter attached

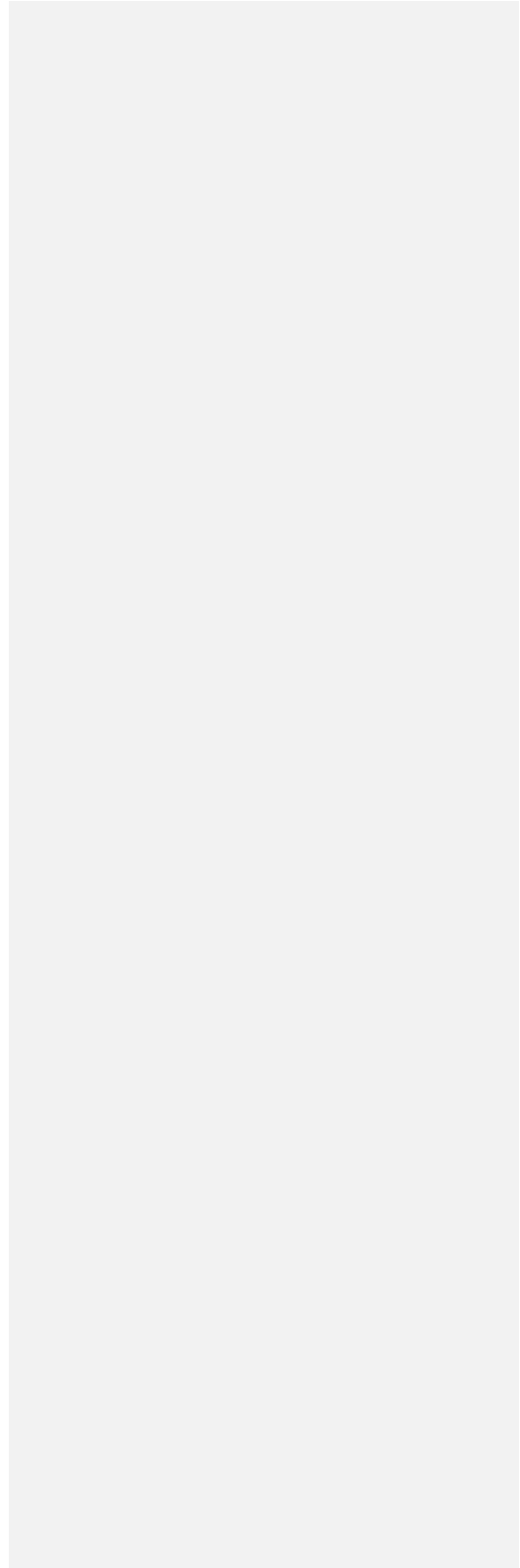
Other \_\_\_\_\_  
Date \_\_\_\_\_ Or letter attached

Other \_\_\_\_\_  
Date \_\_\_\_\_ Or letter attached

**Office of the Provost**

Signature below, or attached letter, indicates that the Provost either a) agrees that that there is no need for additional resources from the College; or b) indicates willingness to provide the extra support to the department.

\_\_\_\_\_  
Provost Signature Date \_\_\_\_\_ Or letter attached



## 6. Proposer Information and Department Chair Affirmation:

Contact Person:

Name: Christopher Whipps Department: Environmental Biology

Email: cwhipps@esf.edu Phone: x4762

This proposal has been reviewed and approved by the sponsoring Department. Affected departments have been notified and given the opportunity to provide feedback. Department resources are or will be made available to support this curriculum revision, or a plan is in place to meet the resource needs as identified in the Institutional Impacts section of this proposal (see Section 2, above) .

Name: \_\_\_\_\_ Date: \_\_\_\_\_  
Department Chair (or designated curriculum representative)

Signature: \_\_\_\_\_ Or letter attached   
Department Chair (or designated curriculum representative)

**7. Final Approvals:**

\_\_\_\_\_ **Curriculum Committee** \_\_\_\_\_ **Date**

\_\_\_\_\_ **Faculty Governance** \_\_\_\_\_ **Date**

\_\_\_\_\_ **Provost** \_\_\_\_\_ **Date**

