University of Wisconsin-Whitewater

Curriculum Proposal Form #1

## New Degree, Major, or Submajor

**Effective Term**:

**Degree**:

**Program Title**: Chemistry Major - Biochemistry emphasis

**GPA Required in the Major/Submajor**: 2.0

Spo**nsor(s):**  Christopher Veldkamp and Catherine Chan

**Department(s):** Chemistry

College(s):

# **Consultation took place:** NA Yes (list departments and attach consultation sheet)

Departments: Biological Sciences

*Check if:*

# New Degree: Intent to Plan \*

# New Degree: Final Proposal

# New Major: Intent to Plan \*

# New Major: Final Proposal

# New Submajor: Minor

# New Submajor: Emphasis/Track

# New Submajor: Certificate Program

# Module: Intent to Plan

# Module: Final Proposal

# Other (list):

**Proposal Information:**

[***(Procedures for form #1)***](http://www.uww.edu/acadaff/ucc/Procedures_form1.docx)*\* Note:* You must receive approval from System to plan a new Degree or Major (submajors not included)

For System requirements see ACIS-1guidelines at <http://www.uwsa.edu/acadaff/acis/index.htm>

**Catalog description of the program:**

This emphasis is designed for students who wish to acquire a strong foundation in both biology and chemistry. It is designed to prepare students for careers that require cross-disciplinary training, such as biomedical research, biotechnology, or the medical, dental and allied health fields.

**Program overview:**

The Biochemistry emphasis in Chemistry was developed to provide a strong foundation in both biology and chemistry. The program was developed for students who wish to:

1) Pursue graduate studies in Biochemistry or related fields (such as Molecular Biology, Molecular Genetics, Biomedical Sciences, Structural Biology, Biophysics and other similar interdisciplinary fields).

2) Be more competitive in the job market in emerging areas such as biomedical research and biotechnology, where cross-disciplinary training is highly desirable.

To enable us to require students to take all the courses we feel are necessary for this emphasis, we are obliged to go with a broad field emphasis which combines major, minor and unique requirements together. These requirements are described below. All students in this program will receive training in Introductory Chemistry as well as 5 fundamental areas of Chemistry as designated by the American Chemical Society (ACS): Biochemistry, Inorganic, Organic, Physical, and Analytical Chemistry. In addition, students will receive fundamental training in Biology and introduction to concepts in Physics and Calculus. The upper level courses for this emphasis balances in depth training in biochemical concepts (Biol/Chem 456, Biochemistry of Metabolism and Signaling), biochemical laboratory techniques (Biol/Chem 458, Research in Biochemistry), and literature review and presentation (Chem 484, Topics in Chemistry), as well as flexibility in selecting other higher-level elective courses from both Chemistry and Biology course offerings to best suit the need of individual students.

**Course requirements:**

It is anticipated that students in the Biochemistry track will complete their degree requirements within 4 years (summer and winterim courses may be taken). An example of a 4-year course offering is provided at the end of this document.

CHEMISTRY CORE REQUIREMENTS

American Chemical Society Mandated Foundation Course Work (30 credits)

|  |  |  |
| --- | --- | --- |
| **Subject/Course** | **Credit Hours** | |
| **Chemistry** |  | **30** |
|  | Chemistry 102 – Introductory Chemistry I | 5 |
|  | Chemistry 104 – Introductory Chemistry II | 5 |
|  | Chemistry 251 – Organic Chemistry I | 3 |
|  | Chemistry 261 – Organic Chemistry Laboratory | 2 |
|  | Chemistry 352 – Quantitative Analysis | 5 |
|  | Chemistry 370 – Physical Chemistry I | 3 |
|  | Chemistry 460 – Inorganic Chemistry | 4 |
|  | Chemistry 454 – Biochemistry of Macromolecules | 3 |

OTHER MAJOR REQUIREMENTS

Math and Physics Requirements (10 credits)

|  |  |  |
| --- | --- | --- |
| **Subject/Course** | **Credit Hours** | |
| **Math** |  | **5** |
|  | Math 253 – Calculus I | 5 |
| **Physics** |  | **5** |
|  | Physics 140 – Principles of Physics I | 5 |
|  | *OR* |  |
|  | Physics 180 – Physics for Scientists and Engineers I | 5 |

UPPER LEVEL COURSES – MANDATORY

In-depth Biochemistry Course Work (6 credits)

|  |  |  |
| --- | --- | --- |
| **Subject/Course** | **Credit Hours** | |
| **Chemistry** |  | **6** |
|  | Chemistry 484 – Topics in Chemistry | 0.5 x 2 |
|  | Chemistry 456 – Biochemistry of Metabolism and Signaling | 3 |
|  | Chemistry 458 – Research in Biochemistry | 2 |

UPPER LEVEL COURSES – ELECTIVES (TO BRING UPPER LEVEL COURSE LOAD TO AT LEAST 12 CREDITS)

In-depth Chemistry or Biology Course Work. Students, in consultation with their advisors, will have flexibility in choosing in-depth course work that matches their interests and career paths. Must include at least 1 course with a lab component (denoted by #).

|  |  |  |
| --- | --- | --- |
| **Subject/Course** | **Credit Hours** | |
| **Chemistry** |  |  |
|  | Chemistry 252 – Organic Chemistry II | 3 |
|  | #Chemistry 262 – Organic Chemistry Laboratory II | 2 |
|  | Chemistry 371 – Physical Chemistry II | 3 |
|  | #Chemistry 470 – Experimental Physical Chemistry | 2 |
|  | #Chemistry 471 – Experimental Physical Chemistry | 2 |
|  | Chemistry 455 – Advanced Organic Chemistry | 3 |
|  | #Chemistry 480 – Instrumental Methods of Analysis | 4 |
|  | #Chemistry 498 R – Independent Study (research) | 1-4 |
|  |  |  |
| **Biology** | #Biology 254 – Biotechnology Laboratory Methods I | 2 |
|  | #Biology 311 – Microbiology | 4 |
|  | #Biology 345 – Animal Physiology | 4 |
|  | #Biology 364 – Biotechnology Laboratory Methods II | 2 |
|  | #Biology 457 – General Ecology | 4 |
|  | Biology 363 – Molecular Biology | 3 |
|  | #Biology 341 – Developmental Biology | 4 |
|  | Biology 317 – Plant Physiology | 3 |
|  | Biology 412 – Immunology | 3 |
|  | Biology 415 –Endocrinology | 3 |
|  | Biology 442 – Environmental Toxicology | 3 |
|  | Biology 446 – Organic Evolution | 3 |
|  | Biology 448 – Bioinformatics | 3 |
|  | #Biology 450 – Introductory Entomology | 4 |

Students may select electives to generate a sub-focus or area of study within biochemistry. Some examples include: Biophysics (Chem 371 and 471), Bioorganic (Chem 252, 262 and 445), Bioanalytical (Chem 480 and Biol 442), and Biotechnology/Molecular Biology (Biol 254, 364 and 363).

UNIQUE REQUIREMENTS

Math, Physics and Biology Requirements. Students can use the following credits towards a minor if they so choose. (27 credits)

|  |  |  |
| --- | --- | --- |
| **Subject/Course** | **Credit Hours** | |
| **Math** |  | **5** |
|  | Math 254 – Calculus II | 5 |
| **Biology** |  | **17** |
|  | Biology 141 – Introductory Biology I | 5 |
|  | Biology 142 – Introductory Biology II | 5 |
|  | Biology 251 – Introduction to Genetics | 4 |
|  | Biology 253 – Introduction to Cell Biology | 3 |
| **Physics** |  | **5** |
|  | Physics 141 – Principles of Physics II | 5 |
|  | *OR* |  |
|  | Physics 181 – Physics for Scientists and Engineers II | 5 |

**Goals and learning objective of the program:**

This program seeks to align the learning objectives with current guidelines issued by ACS – we seek to provide students a thorough foundation in Chemistry and more in-depth coverage of Biochemistry. This necessitates course work that covers introductory and advanced Chemistry, and relevant courses in Biology. The principal goal of the program is to provide cross-disciplinary training desired by graduate/professional schools and employers so that our students will be more competitive and successful upon graduation from UWW.

**The need for the program, including information on student demand and market demand for graduates:**

Our graduates typically either enter into professional/ graduate school or start their careers in chemistry-related positions. A good knowledge base in biochemistry will prepare students for entry into medical schools and other health-related professional programs, graduate programs in biochemistry and related fields (such as molecular biology, structural biology, molecular genetics, biophysics and other disciplines at the intersection of chemistry and biology), and careers in emerging and high-demand fields such as biochemistry/ biomedical sciences, biotech industries, etc. Currently, there is no formal academic program at UWW that serves this need: Students who pursue a degree in Chemistry with a Biology minor typically do not obtain sufficient training in Biochemistry/Biology, and the converse is true for those who pursue a degree in Biology with a Chemistry minor. The course requirement of the proposed Biochemistry track is designed to strike a balance between Chemistry and Biology contents.

**Relation of the proposed program to the institutional mission, strategic plan, goals and objectives:**

**The proposed program supports the following missions of the university cluster institutions:**

1) Offer a program of pre-professional curricular offerings consistent with the university's mission. The proposed track will be an enhancement of our pre-professional offerings.

2) Expect scholarly activity, including research, scholarship and creative endeavor, that supports its programs at the associate and baccalaureate degree level, its selected graduate programs, and its approved mission statement. The proposed track will increase training in research technique, formalize laboratory skills and research as part of a well-rounded undergraduate curriculum, and indirectly strengthen undergraduate and faculty research.

**The proposed program supports the following missions of the University of Wisconsin-Whitewater:**

1) Offer an extensive range of undergraduate programs and degrees, including interdisciplinary programs in letters, sciences, and the arts, as well as programs and degrees leading to professional specialization. The proposed track is consistent with the curricular guidelines issued by ACS, widens our range of available undergraduate programs, and meets the demands of the job market and professional/ graduate schools.

2) Expect scholarly activity, including research, scholarship and creative endeavor, that supports its programs at the associate and baccalaureate degree level, its selected graduate programs, and its special mission. The proposed track will increase training in research technique, formalize laboratory skills and research as part of a well-rounded undergraduate curriculum, and indirectly strengthen undergraduate and faculty research.

**The proposed program supports the following of the Chancellor’s goals:**

1) Increase funding to support undergraduate student research.

Responding to the need of modern sciences, interdisciplinary research is increasingly favorably reviewed by funding agencies. By providing cross-disciplinary biology and chemistry training in both theory and laboratory skills, we are better preparing our students to take advantage of new funding opportunities, with the result of indirectly strengthening the chemistry undergraduate research program and enhancing the ability our faculty to apply for funding on their behalf.

2) Increase experiential learning experience of students.

The proposed new track contains a new inquiry-based laboratory course that can serve as a cap-stone course. Inclusion of research credits as part of the formal curricular further enhances experiential learning opportunities for students.

**Relation of the proposed program to other programs on campus:**

The proposed track, while taking select course requirements of various emphases from Biological Sciences and Chemistry, is a unique program on campus.

**Relationship of the proposed program to other academic programs in the UW System, the region and, if appropriate, the nation:**

A survey among other Wisconsin comprehensive institutions shows that UW–EC, UW–SP, and UW–LaX offer a Biochemistry track. However, it is nearly standard at the best undergraduate colleges and large research universities.

**An assessment plan for the program:**

Program assessment will be integrated into an existing departmental assessment plan.

**Resources needed to support the program:**

Minimal. All courses required for the new track are in place as of Fall 2011.

**Example 4-year plan of course offering:**

**Year 1 - Fall**

Chem 102 5 cr

Math 253 5 cr

English 101 3 cr

Core 3 cr

**16 credits**

**Year 1 - Spring**

Chem 104 5 cr

English 102 3 cr

Math 254 5 cr

Core 3 cr

**16 credits**

**Year 2 - Fall**

Chem 352 5 cr

Biol 141 5 cr

Comm 110 3 cr

Physics 140 5 cr

**18 credits**

**Year 2 - Spring**

Chem 251 3 cr

Chem 261 2 cr

Biol 142 5 cr

Elective 3 cr

Physics 141 5 cr

**18 credits**

**Year 3 - Fall**

Chem 370 3 cr

Major elective - Chem 470 2 cr

Chem 454 3 cr

Biol 253 3 cr

Elective 3 cr

**14 credits**

**Year 3 - Spring**

Chem 456 3 cr

Biol 251 4 cr

Chem 484 0.5 cr

Chem 458 2 cr

Core 3 cr

Elective 3 cr

**15.5 credits**

**Year 4 - Fall**

Chem 484 0.5 cr

Major elective-Chem 498R 1 cr

Core 3 cr

Elective 3 cr

Elective 3 cr

Elective 3 cr

Elective 3 cr

**16.5 credits**

**Year 4 - Spring**

Major elective-Chem 480 4 cr

Chem 460 4 cr

Major elective-Chem 498R 1 cr

Elective 3 cr

Elective 3 cr

**15 credits**