BIOINFORMATICS, COMPREHENSIVE MAJOR

Liberal Arts (Code 183-001)

University Requirements

GRADUATION REQUIREMENTS FOR BACCALAUREATE DEGREE

Credit Requirements

Minimum total for graduation 1
Upper division credits (courses numbered 300 and higher)
Liberal Education Core (http://catalog.uwec.edu/undergraduate/graduation-requirements/#header1)
Academic Concentrations (http://catalog.uwec.edu/undergraduate/graduation-requirements/#header16)
Grade Point Requirements (http://catalog.uwec.edu/undergraduate/graduation-requirements/#header14)

Total
Resident
Major
Minor
Certificate

Grade Point Requirements

2.00 average
2.00 average
2.00 average
2.00 average
2.00 average

Procedures Required for Graduation

Obtain admission to the degree program and/or the College offering it.
Apply for graduation on CampS.

1 Certain programs exceed this minimum.
2 See special requirements in each College.

Applicability of Credits Toward Graduation

Junior College or Two-Year College Credits. A maximum of 72 semester credits earned in a junior college or two-year college will be accepted as degree credits at UW-Eau Claire.

Extension Credits. Credits earned in credit outreach courses offered by UW-Eau Claire are treated as resident credits. Credits earned in extension courses offered by other units of the University of Wisconsin System are treated as transfer credits. All other (non-UW) extension and correspondence credits are normally limited to one-fourth of the total required for graduation from any curriculum.

WTCS Credits. A maximum of 72 semester credits earned in college parallel programs at Madison Area Technical College, Milwaukee Area Technical College, Nicolet Area Technical College, or Chippewa Valley Technical College may be accepted as degree credits at UW-Eau Claire. A set number of general education courses will be accepted from other technical schools.

Occupational and technical courses may also be considered for transfer if the quality and content of the course work from the technical college is judged to be comparable to course work at UW-Eau Claire. Refer to the Transfer Credit Wizard (https://my.uwec.edu/psp/PUBLIC/EMPLOYEE/HRMS/c/EAU_SS_CUSTOM.EAU_TRNCRDWZ.GBL) or contact the UW-Eau Claire Admissions Office for information about the current transfer policy.

USAFI Credit. UW-Eau Claire will accept up to 32 semester credits for work done through the United States Armed Forces Institute, under the provision for non-UW correspondence credit (see Extension Credits above).

Activity Credit (band, chorus, drama, KINS 100-184 courses) Students may count toward graduation no more than one credit of KINS 110-184 courses. Students may count toward graduation no more than four credits earned in any single activity course and no more than 12 credits resulting from any combination of activity courses (excluding KINS 110-184 courses).

Other Restricted Credits. For other University restrictions, see the following: Cooperative Education; Credit by Examination; Satisfactory/Unsatisfactory Registration; Transfer of Credits. College or departmental restrictions may also be placed on Independent Study (399-499 courses), Directed Study (395-495), and other types of credits.

APPLICABILITY OF CREDITS TOWARD GRADUATION

Satisfactory/Unsatisfactory

Total degree credit
Major, Standard
Major, Comprehensive
Minor

Total degree credit
Major or minor

Two-Year College Credits

Total degree credit
Activity credit (band, chorus, drama, KINS 100-184)
Total KINS 100-184
Total Band, chorus, drama
Single course band, chorus, drama

Credit by Examination

Total degree credit
Major, Standard
Major, Comprehensive
Minor

Credit by Examination

Total degree credit
Major or minor

USAFI

USAFI

Liberal Education Core

The University of Wisconsin-Eau Claire measures learning outcomes to ensure that its graduates have achieved a liberal education and prepared themselves...
to contribute to a complex society. Upon graduation, each undergraduate
will have met the five learning goals of our liberal education core and the 12
learning outcomes they comprise.

**LIBERAL EDUCATION CORE REQUIREMENTS**

**Knowledge Goal**

Knowledge Outcome 1 (K1): Natural Sciences (http://
catalog.uwec.edu/undergraduate/attribute-k1/)
Two (2) learning experiences
One experience in laboratory science must be selected from
either K1 or K2.

Knowledge Outcome 2 (K2): Social Sciences (http://
catalog.uwec.edu/undergraduate/attribute-k2/)
Two (2) learning experiences
One experience in laboratory science must be selected from
either K1 or K2.

Knowledge Outcome 3 (K3): Humanities (http://
catalog.uwec.edu/undergraduate/attribute-k3/)
Two (2) learning experiences

Knowledge Outcome 4 (K4): Fine Arts (http://
catalog.uwec.edu/undergraduate/attribute-k4/)
One (1) learning experience

**Skills Goal**

Skills Outcome 1 (S1): Written and Oral Communication (http://
catalog.uwec.edu/undergraduate/attribute-s1/)
Two (2) learning experiences
One S1 must meet the University Writing Requirement
(http://catalog.uwec.edu/undergraduate/graduation-
requirements/#header10)

Skills Outcome 2 (S2): Mathematics (http://catalog.uwec.edu/
undergraduate/attribute-s2/)
One (1) learning experience
One S2 to meet the University Mathematics Requirement
(http://catalog.uwec.edu/undergraduate/graduation-
requirements/#header11)

Skills Outcome 3 (S3): Creativity (http://catalog.uwec.edu/
undergraduate/attribute-s3/)
One (1) learning experience

**Responsibility Goal**

Responsibility Outcome 1 (R1): Equity, Diversity, and Inclusivity
(http://catalog.uwec.edu/undergraduate/attribute-r1/)
Two (2) learning experiences
One R1 must satisfy Design for Diversity (http://
catalog.uwec.edu/undergraduate/attribute-DDIV/
#header13)

Responsibility Outcome 2 (R2): Global Perspectives (http://
catalog.uwec.edu/undergraduate/attribute-r2/)
One (1) learning experience

Responsibility Outcome 3 (R3): Civic and Environmental Issues
(http://catalog.uwec.edu/undergraduate/attribute-r3/)
One (1) learning experience

**Integration Goal**

Integration Outcome 1 (I1): Integration (http://
catalog.uwec.edu/undergraduate/attribute-i1/)
Two (2) learning experiences

**Service-Learning Goal**

Service-Learning (http://catalog.uwec.edu/undergraduate/attribute-SL/#header13)
30 hours

**College Degree Requirements**

**Bachelor of Arts or Bachelor of Science Degree**

**B.A./B.S.**

**University Graduation Requirements.** All candidates for degrees must
fulfill the requirements for credits, curriculum, GPA, and University residency
as specified in the section of this catalog titled University Graduation
Requirements (http://catalog.uwec.edu/undergraduate/graduation-
requirements/).

**College Graduation Requirements: Grade Point Averages.** All candidates for
degrees in the College of Arts and Sciences must earn minimum resident and
total GPAs of 2.00 in the major, the minor, and the certificate. The resident and
total GPAs for the major are computed using all attempted credits applicable
to the major including those offered by departments other than the major
department. The resident and total GPAs for the minor and the certificate are
computed similarly.

**Major-Minor and Major-Certificate Requirements.** A standard major (a
minimum of 36 credits) must be supplemented by a minor (a minimum of 24
credits) or by a certificate (12 to 18 credits) to meet graduation requirements
for completing a first and second degree program. No minor or certificate is
required with a Comprehensive Major (60 or more credits) or with two majors
of 36 or more credits each.

Certain degree programs, which include Comprehensive Majors, may require
more than the minimum of 120 credits for graduation.

Acceptable academic program combinations are determined at the college
level. A major and a minor or a major and certificate or two majors (if available)
may not be elected in the same department or program, except in the
approved combinations listed here (http://catalog.uwec.edu/undergraduate/
arts-sciences/#academicprogramstext).

**College Credits.** Earn at least 90 credits in courses offered by the College
of Arts and Sciences.

**Bachelor of Arts Degree in the College of Arts and
Sciences (B.A.)**

Fulfillment of all University Graduation Requirements (which includes the
Liberal Education Core); all College-level degree requirements (major and
minor/certificate emphases, GPAs, earning at least 90 credits in Arts and
Sciences course work); foreign language competency at the 102 level. Foreign
language competency may be met in one of two ways: (1) Achieve a score on
the foreign language placement test that qualifies the student to enter the
201-level course in a foreign language. (2) Earn a grade of at least C (not C-)
or a mark of S in a 102-level foreign language course (or AIS 112 or AIS 122 /
LANG 122 or CSD 103).

**Bachelor of Science Degree in the College of Arts and
Sciences (B.S.)**

Fulfillment of all University Graduation Requirements (which includes the
Liberal Education Core); all College-level degree requirements (major and
minor/certificate emphases, GPAs, earning at least 90 credits in Arts and
Sciences course work); mathematics competency at the MATH 111, MATH 112
or MATH 113 level. Mathematics competency can be met in one of three ways:
(1) Achieve a score on the mathematics placement test that qualifies the
student to enter MATH 114. (2) Earn a grade of at least C (not C-) or a mark of S
in MATH 111, MATH 112, or MATH 113. (3) Achieve a satisfactory score on the
MATH 112 competency test. This test may be attempted no more than two times.

## Major Requirements

**Liberal Arts (Code 183-001)**

Advisors: A. Brisbin (Mathematics), D. Gingerich (Biology), R. Gomes (Computer Science), N. Mitchell (Biology), A. Smith (Mathematics).

The comprehensive major in bioinformatics will prepare students to solve problems involving large biological data sets through interdisciplinary skills and knowledge in biology, computer science, data science, and mathematics. Through conceptual understanding and hands-on experience with real data, this program will prepare students for jobs or graduate school in bioinformatics.

### Code | Title | Credits
--- | --- | ---
A minimum of 60 semester credits, including:
MATH 114 | Calculus I | 4
MATH 215 | Calculus II | 4
MATH 246 | Elementary Statistics | 4
MATH 314 | Discrete Mathematics | 3
BIOL 221 | Foundations of Biology I | 4
BIOL 222 | Foundations of Biology II | 3
BIOL 223 | Foundations of Biological Inquiry | 2
BIOL 323 | Genetics | 3
BIOL 324 | Genetics Inquiry | 2
CHEM 115 | Chemical Principles | 6
CHEM 325 | Organic Chemistry I with Laboratory | 4
BIOL 149 | The Big Picture in Bioinformatics | 1
DS 150 | Computing in Python: Fundamentals and Procedural Programming | 4
DS 250 | Data Structures and Algorithms in Bioinformatics | 4
BIOL 342 | Applied Bioinformatics I | 4
BIOL 343 | Applied Bioinformatics II | 4
CS 388 | UNIX Systems Programming | 3
BIOL 393 | UNIX Systems Programming | 1

1. In place of MATH 246, students may take either MATH 345 or BIOL 383 or the sequence of MATH 346 and MATH 347.
2. In place of CHEM 115, students may take the sequence of CHEM 105, CHEM 106, and CHEM 109.
3. Course in development.

### Program Learning Outcomes

Students completing this program will be expected to meet the following learning outcomes:

- Explain and apply core concepts in biology, computer science, and mathematics, especially as they apply to data analysis.
- Explain and apply the chemical principles that underlie biochemistry, molecular biology, and genomics.
- Use software to extract information from large databases and use that information in computer modeling and data analysis.
- Use problem-solving skills, including the ability to develop new algorithms and methods of data analysis.
- Explain and apply fundamental methods in probability and statistics to the analysis of biological datasets.
- Explain the intersection of life and information sciences, the core of shared concepts, language, and skills.
- Understand terminology used in molecular biology, genetics, evolutionary biology, information theory, and database management.
- Explain the construction of predictive mathematical models of biological systems.

### Sample Degree Plan

**Bioinformatics, Comprehensive Major, B.S.**

The following is a sample degree plan, based on the 2023-2024 catalog. It is based on the 120-credit graduation requirement and assumes no transferred credits, no requirements waived by placement tests, no courses taken in the summer or winter, no repeated courses, and no remedial courses that may be required. This sample degree plan is intended for first-year students entering UW-Eau Claire in the fall semester. Your own degree plan may differ depending on the course of study selected (second major, minor, etc.). UW-Eau Claire cannot guarantee all courses will be offered as shown, but will provide a range of courses that may enable prepared students to fulfill their requirements in a timely period. This sample degree plan is just a guide. Please consult your advisor, your degree audit, and the catalog to create your own degree plan. Note: In order to earn the required minimum of 120 credits for the degree in four years, you should plan to take 15 credits each semester or 30 credits each year.

To earn a degree, students must fulfill all University Graduation Requirements, including the Liberal Education (LE) Core. LE Core course work in the following sample degree plan uses abbreviations such as LE-K1, LE-S2, LE-R3, and LE-I1 to represent the learning outcomes students will meet via completion of their liberal education course work. Please click here (https://catalog.uwec.edu/undergraduate/graduation-requirements/#header1) for a description of the
Liberal Education Core outcomes and requirements. Note that the LE Core may be completed through both course and non-course experiences.

Students in this major have the option to pursue either a Bachelor of Arts (B.A.) or a Bachelor of Science (B.S.) degree. The degrees are distinguished by foreign language competency for the B.A. and a higher level of mathematics competency for the B.S.

### FIRST YEAR

#### FIRST SEMESTER

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<th>Course</th>
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<th>Credits</th>
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<td>CHEM 105</td>
<td>General Chemistry I Lecture</td>
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<td>CHEM 106</td>
<td>General Chemistry I Laboratory (LE-K1L)</td>
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<tr>
<td>MATH 109</td>
<td>Algebra for Calculus (LE-S2)</td>
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<tr>
<td>BIOL 149</td>
<td>The Big Picture in Bioinformatics</td>
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<tr>
<td>WRIT 114</td>
<td>Intensive Blugold Seminar in Critical Reading and Writing (LE-S1)</td>
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<tr>
<td>OR</td>
<td>WRIT 116 Blugold Seminar in Critical Reading and Writing (LE-S1)</td>
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#### SECOND SEMESTER

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<th>Title</th>
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<td>CHEM 109</td>
<td>General Chemistry II with Lab</td>
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<tr>
<td>MATH 113</td>
<td>Trigonometry (LE-S2)</td>
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</tr>
<tr>
<td>BIOL 221</td>
<td>Foundations of Biology I (LE-K1L)</td>
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<td>LE Core Elective- Global Perspective (LE-R2) with (K2), (K3), or (K4)</td>
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<tr>
<td>LE Option: Skills 1 (LE-S1) Written and Oral Communication</td>
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#### SECOND YEAR

##### FIRST SEMESTER

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<tbody>
<tr>
<td>DS 150</td>
<td>Computing in Python: Fundamentals and Procedural Programming</td>
<td>4</td>
</tr>
<tr>
<td>MATH 114</td>
<td>Calculus I (LE-S2)</td>
<td>4</td>
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<tr>
<td>BIOL 222</td>
<td>Foundations of Biology II</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 223</td>
<td>Foundations of Biological Inquiry (LE-S3)</td>
<td>2</td>
</tr>
<tr>
<td>LE Core Elective- Social Science (K2), Humanities (K3) or Fine Arts (K4)</td>
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##### SECOND SEMESTER

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<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>BIOL 323</td>
<td>Genetics</td>
<td>3</td>
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<tr>
<td>MATH 215</td>
<td>Calculus II</td>
<td>4</td>
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<tr>
<td>DS 250</td>
<td>Data Structures and Algorithms in Bioinformatics</td>
<td>4</td>
</tr>
<tr>
<td>LE Core Elective- Equity, Diversity, Inclusivity (R1) with (K2) or (K3)</td>
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#### THIRD YEAR

##### FIRST SEMESTER

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<td>Genetics Inquiry</td>
<td>2</td>
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<tr>
<td>BIOL 342</td>
<td>Applied Bioinformatics I</td>
<td>4</td>
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<tr>
<td>MATH 314</td>
<td>Discrete Mathematics</td>
<td>3</td>
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<tr>
<td>LE Option: Responsibility 1 (LE-R1, DDIV) Equity, Diversity, and Inclusivity with Design for Diversity</td>
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<tr>
<td>Major Elective-Upper Division BIOL, CS, DS or MATH</td>
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##### SECOND SEMESTER

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<tr>
<td>BIOL 393</td>
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<tr>
<td>MATH 246</td>
<td>Elementary Statistics</td>
<td>4</td>
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<tr>
<td>LE Option: Responsibility 3 (LE-R3) Civic and Environmental Issues</td>
<td>3</td>
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<tr>
<td>LE Core Elective- Social Science (K2), Humanities (K3) or Fine Arts (K4)</td>
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<td></td>
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<tr>
<td>Total</td>
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### FOURTH YEAR

#### FIRST SEMESTER

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<tr>
<td>CS 388</td>
<td>UNIX Systems Programming</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 325</td>
<td>Organic Chemistry I with Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>LE Option: Integration (LE-I1)</td>
<td>3</td>
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<tr>
<td>Major Elective-Upper Division BIOL, CS, DS or MATH</td>
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<tr>
<td>Total</td>
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### Minimum total for the baccalaureate degree = 120 credits

- In this 4 year plan, the experiences for (K2), (K3), and (K4) are listed together. The appropriate number of experiences from each learning outcome will be required.
- Course in development.

### Notes:

- Must maintain a 2.0 GPA in major program.
- All students must complete the 30-hour Service-Learning Requirement via a non-credit or credit option (see University Graduation Requirements (http://catalog.uwec.edu/undergraduate/graduation-requirements/)).

### RECOMMENDATIONS FOR HIGH IMPACT PRACTICES (HIPs)

The University of Wisconsin-Eau Claire encourages all students to participate in High Impact Practices. The following information identifies any specific recommendations that faculty in this major have concerning which HIPs might be most beneficial to students, and any recommendations about when those HIPs best fit into the degree plan. Students should also consult their faculty advisor for information on HIPs. There are many additional high impact opportunities available. Talk to your academic advisor for more information about incorporating HIPs like Study Abroad (https://studyabroad.apps.uwec.edu/), Intercultural Immersion (https://www.uwec.edu/immersion/), Internship (https://www.uwec.edu/career-services/info-students/internships/), and/or Student/Faculty Collaborative Research (https://www.uwec.edu/orsp/students/student-faculty-collaborative-research-guide/) into your time at UW-Eau Claire.

Students in the Bioinformatics major are encouraged to participate in student-faculty research related to bioinformatics. Consult with professors in the bioinformatics program in the spring before the year in which you would like to do research (for example, in spring of the first year to plan a research project for sophomore year).
Liberal Education (LE) Core Guidance

Liberal Education Core (LE Core)

The LE Core comprises 17 learning experiences across 11 learning outcomes. Students must complete a minimum of 36 credits in courses approved for the LE Core.

- **K1** – Natural Sciences; two experiences (one lab science experience is required in K1 or K2).
- **K2** – Social Sciences; two experiences (one lab science experience is required in K1 or K2).
- **K3** – Humanities; two experiences.
- **K4** – Fine Arts; one experience.
- **S1** – Written and Oral Communication; two experiences (one experience must satisfy the University writing requirement).
- **S2** – Mathematics; one experience (must satisfy the University math competency requirement).
- **S3** – Creativity; one experience (can be fulfilled in a student’s major).
- **R1** – Equity, Diversity, and Inclusivity; two experiences (one experience must meet the UW System Design for Diversity (DD) requirement).
- **R2** – Global Perspectives; one experience.
- **R3** – Civic and Environmental Issues; one experience.
- **I1** – Integration; two experiences (one experience can be fulfilled in a student’s major).
- **SL** – Service Learning; 30 hours

Additional LE Core Information

- Most LE Core learning experiences are course based, and many courses meet more than one learning outcome (e.g., K3 and R2 or K1 and R3).
- Some learning experiences can also be met outside of a traditional course (e.g., undergraduate research (S3), study abroad (I1)).
- **S1** – An English placement score that fulfills the University writing requirement fulfills one S1 experience.
- **S1** – A foreign Language placement score that qualifies the student to enter the 102 level satisfies one S1 experience.
- **S1, R2** – A foreign language placement score that qualifies the student to enter the 202 level satisfies one experience in S1 and the R2 experience.
- **S2** – A math placement score that qualifies the student to enter Math 111, 112, 113 or 114 fulfills the S2 experience.
- **S3** – Completion of two credits from any approved music ensemble fulfills the S3 experience.
- **I1** – Any semester long study abroad program can fulfill one I1 experience.