COMPUTATIONAL BIOLOGY & BIOINFORMATICS MINOR (ENGR)

Description
This interdisciplinary minor prepares students to understand, use, and develop advanced computational methods and tools for processing, visualizing, and analyzing biological data and for modeling biological processes. Studies in computational biology and bioinformatics involve biosciences, computer science, engineering, mathematics, and statistics. Students will be prepared for careers in biomedical, biotechnology, agricultural, pharmaceutical, and engineering fields and for related graduate studies.

College Requirements
College Admission
College Entrance Requirements
Students must have high school credit for (one unit is equal to one high school year):

1. 4 units of mathematics: 2 of algebra, 1 of geometry, 1 of precalculus and trigonometry.
2. 4 units of English.
3. 3 units of natural science that must include 1 unit of physics and 1 unit of chemistry (chemistry requirement waived for students in construction management).
4. 2 units of a single foreign language.
5. 3 units of social studies.
6. Students having a composite ACT score of 28 or greater (or equivalent SAT score) will be admitted to the College of Engineering even if they lack any one of the following: trigonometry, chemistry, or physics.
7. Students having an ACT score of 19 or less in English (or equivalent SAT score) must take ENGL 150 Writing and Inquiry or ENGL 151 Writing and Argument.

A total of 16 units is required for admission.

Students must have an ACT (enhanced) score of 24 or greater (or equivalent SAT). Students who lack entrance requirements may be admitted based on ACT scores, high school rank and credits, or may be admitted to pre-engineering status in the Exploratory and Pre-Professional Advising Center. Pre-engineering students are advised within the College of Engineering.

Students for whom English is not their language of nurture must meet the minimum English proficiency requirements of the University.

Students who lack entrance units may complete precollege training by Independent Study through the UNL Office of On-line and Distance Education, in summer courses, or as a part of their first or second semester course loads while in the Exploratory and Pre-Professional Advising Center or other Colleges at UNL.

Students should consult their advisor, their department chair, or Engineering Student Services if they have questions on current policies.

Other Admission Requirements
Students who transfer to the University of Nebraska–Lincoln from other accredited colleges or universities and wish to be admitted to the College of Engineering (COE) must meet COE freshman entrance requirements and have a minimum cumulative GPA of 2.5 for Nebraska residents or 3.0 for non-residents, and be calculus-ready. Students not meeting either of these requirements must enroll in the Explore Center or another UNL college until they meet COE admission requirements.

The COE accepts courses for transfer for which a C or better grade was received. Although UNL accepts D grades from the University of Nebraska at Kearney and at Omaha, not all majors in the COE accept such low grades. Students must conform to the requirements of their intended major and, in any case, are strongly encouraged to repeat courses with a grade of C- or less.

All transfer students must adopt the curricular requirements of the undergraduate catalog current at the time of transfer to the COE—not that in use when they entered UNL. Upon admission to UNL, students wishing to pursue degree programs in the COE will be classified and subject to the policies defined in the subsequent section.

College Degree Requirements
Grade Rules
Grade Appeals
In the event of a dispute involving any college policies or grades, the student should appeal to his/her instructor, and appropriate department chair or school director (in that order). If a satisfactory solution is not achieved, the student may appeal his/her case through the College Academic Appeals Committee on his/her campus.

Catalog Rule
Students must fulfill the requirements stated in the catalog for the academic year in which they are first admitted at UNL. In consultation with advisors, a student may choose to follow a subsequent catalog for any academic year in which they are admitted to and enrolled as a degree-seeking student at UNL in the College of Engineering. Students must complete all degree requirements from a single catalog year. The catalog which a student follows for degree requirements may not be more than 10 years old at the time of graduation.

Requirements for Minor Offered by Department
Eighteen (18) hours (not including prerequisites) of core courses and additional courses.

Prerequisite Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 109</td>
<td>General Chemistry I (or equivalent)</td>
<td>4</td>
</tr>
<tr>
<td>LIFE 120</td>
<td>Fundamentals of Biology I</td>
<td>4</td>
</tr>
<tr>
<td>&amp; LIFE 120L</td>
<td>and Fundamentals of Biology I laboratory</td>
<td></td>
</tr>
<tr>
<td>LIFE 121</td>
<td>Fundamentals of Biology II</td>
<td>4</td>
</tr>
<tr>
<td>&amp; LIFE 121L</td>
<td>and Fundamentals of Biology II laboratory</td>
<td></td>
</tr>
<tr>
<td>MATH 106</td>
<td>Calculus I (or equivalent)</td>
<td>5</td>
</tr>
</tbody>
</table>

Credit Hours Subtotal: 17

Core Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Description</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSCE 155T</td>
<td>Computer Science I: Informatics Focus</td>
<td>3</td>
</tr>
<tr>
<td>CSCE 311</td>
<td>Data Structures and Algorithms for Informatics</td>
<td>3</td>
</tr>
<tr>
<td>BIOS 237</td>
<td></td>
<td>4</td>
</tr>
</tbody>
</table>
Computational Biology & Bioinformatics Minor (ENGR)

STAT 218  Introduction to Statistics 2
or STAT 380 / MATH 380

Credit Hours Subtotal: 3

Life Science Course 3
Select a course from either LS 1 or LS 2 choices, depending on your major. 3-4

LS 1 - for students in life science majors.
- BIOS 427  Practical Bioinformatics Laboratory
- BIOS 428  Perl Programming for Biological Applications
- BIOS 456 / NRES 456  Mathematical Models in Biology
- BIOS 477  Bioinformatics and Molecular Evolution
- STAT 442 / BIOS 442  Computational Biology

LS 2
- BIOS 431 / BIOS 431 / CHEM 431  Structure and Metabolism
- BIOS 432 / BIOS 432 / CHEM 432  Metabolism and Biological Information
- BIOT 434 / AGRO 434 / BIOS 434 / CHEM 434  Plant Biochemistry
- BIOS 420 / MBIO 420  Molecular Genetics
- BIOS 425  Plant Biotechnology
- BIOS 429  Phylogenetic Biology
- BIOS 472  Evolution

Credit Hours Subtotal: 3-4

Computer Science/Math/Statistics/Engineering (CMSE) Course 4
Select a course from either CMSE 1 or CMSE 2 choices, depending on your major. 3

CMSE 1 - for students in computer science, math, engineering and related majors.
- CSCE 471  Introduction to Bioinformatics

CMSE 2
- BSEN 414  Medical Imaging Systems
- CHME 473  Biochemical Engineering
- CHME 474  Advanced Biochemical Engineering
- CSCE 410  Information Retrieval Systems
- CSCE 413  Database Systems
- CSCE 421  Foundations of Constraint Processing
- CSCE 423  Design and Analysis of Algorithms
- CSCE 435  Cluster and Grid Computing
- CSCE 456  Parallel Programming
- CSCE 472  Digital Image Processing
- CSCE 474  Introduction to Data Mining
- CSCE 476  Introduction to Artificial Intelligence
- CSCE 478  Introduction to Machine Learning
- CSCE 479  Introduction to Neural Networks
- ECEN 450  Bioinformatics
- MATH 439  Mathematical Models in Biology
- MATH 452  Graph Theory
- STAT 412  Introduction to Experimental Design
- STAT 450  Introduction to Regression Analysis

Credit Hours Subtotal: 3

Total Credit Hours 19-20

1 These requirements can be replaced with equivalent courses upon approval except for BIOS 237, which cannot be replaced.
2 Students are strongly encouraged to take STAT 218 or STAT 380. However, ECEN 305 can be used to satisfy this requirement, subject to approval.
3 For life science major students, those courses listed as LS Elective 2 cannot be used for CBB requirements.
4 For students in computer science, mathematics, engineering, and related majors, those courses listed as CMSE Elective 2 cannot be used for CBB requirements.

Grade Rules

C- and D Grades
A grade of C or above is required for all courses in the minor.

Pass/No Pass
No course taken Pass/No Pass will be counted toward the minor.