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. Mathematics – 4 units: 2 of algebra, 1 of geometry, and 1 of precalculus and trigonometry
2. English – 4 units
3. Natural sciences – 3 units that must include 1 unit of physics and 1 unit of chemistry (chemistry requirement waived for students in construction management)
4. Foreign language – 2 units of a single foreign language
5. Social studies – 3 units
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 Exploratory and Pre-Professional Advising Center.

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 University of Nebraska–Lincoln 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 Nebraska.

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 and be calculus-ready. Students not meeting either of these requirements must enroll in the Explore Center or another University college until they meet COE admission requirements. Students transferring from UNO, UNL, or UNK to the College of Engineering must be in good academic standing with their institution.

The COE accepts courses for transfer for which a C or better grade was received. Although the University of Nebraska–Lincoln 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 the University of Nebraska–Lincoln. Upon admission to Nebraska, students wishing to pursue degree programs in the COE will be classified and subject to the policies defined in the subsequent section.

Students who were previously admitted to COE and are returning to the College of Engineering must demonstrate a cumulative GPA of 2.5 in order to be readmitted to COE.

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 the University of Nebraska–Lincoln. 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 Nebraska in the College of Engineering. Students must complete all degree requirements from a single catalog year. The catalog which a student follows for 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>Title</th>
<th>Units</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>
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</tbody>
</table>
MATH 106  Calculus I (or equivalent)  5
Credit Hours Subtotal:  13

Core Courses
CSCE 155T  Computer Science I: Informatics Focus  3
CSCE 311  Data Structures and Algorithms for Informatics  3
BIOS 337  Applications of Bioinformatics  4
STAT 218  Introduction to Statistics  2
or STAT 380  Statistics and Applications  3
Credit Hours Subtotal:  13

Life Science Course
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 426  Systems Biology
BIOS 427  Practical Bioinformatics Laboratory
BIOS 456 / NRES 456  Mathematical Models in Biology
BIOS 477  Bioinformatics and Molecular Evolution
LS 2
BIOC 431 / CHEM 431  Biochemistry I: Structure and Metabolism
BIOC 432 / CHEM 432  Biochemistry II: Metabolism and Biological Information
BIOC 434 / AGRO 434 / BIOS 434 / CHEM 434  Plant Biochemistry
BIOS 418  Advanced Genetics
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
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  Computational Methods in Bioinformatics
CMSE 2
BSEN 414  Medical Imaging Systems
CHME 473  Biochemical Engineering
CHME 474  Advanced Biochemical Engineering
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 Deep Learning
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 337, 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.