

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.

Note that the College Entrance Requirements shown below apply only to students in the College of Engineering.

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 or computer science)
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. Students without test scores who are missing a full unit of trigonometry/pre-calculus/calculus or chemistry or physics will be evaluated through College Review.
7. Students having an ACT score of 19 or less in English (or equivalent SAT score) or a grade lower than B in high school English, must take ENGL 150 Writing and Inquiry or ENGL 151 Writing and Argument.

A total of 16 units is required for admission.

Engineering requires that student performance meet one of the following standards: composite ACT of 24, SAT of 1180, ACT Math subscore of 24, SAT Math subscore of 580, or a 3.5 cumulative GPA.

Any domestic first-year student who does not gain admission to Engineering but does gain admission to the University of Nebraska-Lincoln (UNL) will be reviewed through College Review. College Review is conducted through the College Review Committee which considers factors beyond standardized testing. Any first-year student who is not admitted through college review is placed in Pre-Engineering (PENG) with the Exploratory and Pre-Professional Advising Center (Explore Center). Students in the Explore Center can transfer to the College of Engineering once college admission requirements are met.

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 Explore Center or other colleges at UNL.

Students should consult their advisor, their department chair, or Engineering Student Services (ESS) 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 first-year student entrance requirements, 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 Kearney and the University of Nebraska 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.

Students who were previously admitted to COE and are returning to the College of Engineering must demonstrate a cumulative GPA of 2.5 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 their instructor, and appropriate department chair or school director (in that order). If a satisfactory solution is not achieved, the student may appeal their case through the College Academic Appeals Subcommittee.

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 degree requirements may not be more than 10 years old at the time of graduation.

Students who have transferred from a community college may be eligible to fulfill the requirements as stated in the catalog for an academic year in which they were enrolled at the community college prior to attending the University of Nebraska-Lincoln. This decision should be made in consultation with the student's College of Engineering academic advising team (e.g., ESS professional advisor and the chief faculty advisor for the student's declared degree program). The chief faculty advisor has the

final authority for this decision. Eligibility is based on a) enrollment in a community college during the catalog year the student wishes to utilize, b) maintaining continuous enrollment of at least 12 credit hours per semester at the previous institution for at least 2 semesters, and c) continuous enrollment at the University of Nebraska-Lincoln within 1 calendar year from the student's last term at the previous institution. #Students must complete all degree requirements from a single catalog year and within the timeframe allowable for that catalog year.

Requirements for Minor Offered by Department

Eighteen (18) hours (not including prerequisites) of core courses and additional courses.

Prerequisite Courses

CHEM 109A & CHEM 109L	General Chemistry I and General Chemistry I Laboratory	4
LIFE 120 & LIFE 120L	Fundamentals of Biology I and Fundamentals of Biology I laboratory	4
MATH 106	Calculus I (or equivalent)	5
Credit Hours Subtotal:		13

Core Courses ¹

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 or STAT 380	Introduction to Statistics ² Statistics and Applications	3
Credit Hours Subtotal:		13

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 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 / BIOS 431 / CHEM 431	Biochemistry I: Structure and Metabolism
BIOC 432 / BIOS 432 / CHEM 432	Biochemistry II: Metabolism and Biological Information
BIOC 434 / BIOS 434 / CHEM 434 / PLAS 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 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	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 Biology
MATH 452	Graph Theory
STAT 412	Advanced Statistical 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.