PH.D. IN CHEMICAL ENGINEERING

Requirements
Effective Fall 2025

Code	Title	Credits
Core Courses:		**8-13**
CBE 693	Research Conduct and Practices	
Option (1): chemical engineering principles and mathematical modeling		12
CBE 501	Chemical Engineering Thermodynamics	
CBE 502	Advanced Reactor Design	
CBE 503	Transport Phenomena Fundamentals	
CBE 521	Mathematical Modeling for Chemical Engineers	
OR Option (2): chemical and biological engineering principles [1]		7
CBE 500	Chem & Biological Engineering Fundamentals	
CBE 504/ BIOM 504	Fundamentals of Biochemical Engineering	
Advanced Mathematics, Statistics, and Data Science		**3**
Select 3 credits in the category of Advanced Mathematics:		3
MATH 535	Foundations of Applied Mathematics	
MATH 540	Dynamical Systems	
MATH 545	Partial Differential Equations I	
MATH 546	Partial Differential Equations II	
MATH 550/ ENGR 550	Numerical Methods in Science and Engineering	
PH 571	Mathematical Methods for Physics I	
PH 572	Mathematical Methods for Physics II	
OR 3 credits in Advance Statistics, Data Science, or Modeling. Examples:		3
BIOM 422	Quantitative Systems and Synthetic Biology	
BIOM 526/ ECE 526	Biological Physics	
BIOM 537/ ECE 537	Biomedical Signal Processing	
BIOM 570/ MECH 570	Bioengineering	
BIOM 576/ MECH 576	Quantitative Systems Physiology	
BZ 548	Theory of Population and Evolutionary Ecology	
BZ 562	Computational Approaches in Molecular Ecology	
CS 528/ECE 528	Embedded Systems and Machine Learning	
CS 535	Big Data	
CS 540	Artificial Intelligence	
CS 545	Machine Learning	
DSCI 445	Statistical Machine Learning	
DSCI 511	Genomics Data Analysis in Python	
DSCI 512	RNA-Sequencing Data Analysis	
ENGR 478	Applied Engineering Data Analytics	
ERHS 535	R Programming for Research	
HORT 579	Mass Spectrometry Omics-Methods and Analysis	
MIP 545	Microbial Metagenomics/Genomics Data Analysis	
MIP 570	Functional Genomics	
SOCR 545	Current Methods in Microbial Genomics	
STAR 511	Design and Data Analysis for Researchers I	
STAR 512	Design and Data Analysis for Researchers II	
STAT 520	Introduction to Probability Theory	
STAT 540	Data Analysis and Regression	
STAT 544/ ERHS 544	Biostatistical Methods for Quantitative Data	
STAT 547/ CIVE 547	Statistics for Environmental Monitoring	
STAT 560	Applied Multivariate Analysis	
SYSE 541	Engineering Data Design and Visualization	
Biomolecular Engineering Electives [1]		**0-6**
CBE 522/ BIOM 522	Bioseparation Processes	
CBE 524	Bioremediation	
CBE 540/CIVE 540	Advanced Biological Wastewater Processing	
CBE 560	Engineering of Protein Expression Systems	
CBE 570	Biomolecular Engineering/Synthetic Biology	
Biomolecular Engineering Laboratory [1]		**0-1**
CBE 505	Biochemical Engineering Laboratory	
Electives: 5XX - 7XX courses with the course following prefixes: CBE, BIOM, MSE, CIVE, ECE, MECH, SYSE, ENGR, AB, AHS, ANEQ, BC, BMS, BTEC, BZ, CM, CHEM, CS, DSCI, ECOL, ESS, ERHS, FSHN, FTEC, GEOL, GES, GRAD, HORT, LIFE, MATH, MIP, NB, PH, SOCR, STAR, STAA, STAT [2]		**10-12**
Dissertation (maximum) [3]		**44**
CBE 799	Dissertation	
Program Total Credits		**72**

A minimum of 72 credits are required to complete this program.

[1] Students who choose option (2) in the core courses must take 6 credits in Biomolecular Engineering Electives and 1 credit in Biomolecular Engineering Laboratory

[2] For students who choose option (1) in the core courses, take 12 credits of electives, including any additional courses in the categories listed above.
For students who choose option (2) in the core courses, take 10 credits of electives, including any additional courses in the categories listed above
Any elective courses with prefixes other than those listed above must be approved by the advisor and the PhD committee of the student.

[3] A maximum of 44 dissertation research credits (CBE 799) may be counted toward the degree requirements.

Credit and Coursework Requirements

A minimum of 40 semester credits beyond the bachelor's degree must be at or above the 500 level.

Department Seminar Attendance

Ph. D. Students are also required to attend the department seminars whenever they are held as a condition of making satisfactory progress towards their degree, except when regular coursework conflicts with the time.

Examinations and Dissertation

All CBE Ph.D. students must pass a preliminary examination as a requirement for continuing in the program. This should be completed no later than the student's third semester. At the end of the Ph.D. program, an acceptable dissertation must be submitted to and approved by the student's graduate committee. Satisfactory performance on a final oral examination, which includes a defense of the dissertation, is required. **The oral presentation is open to the public.** It is expected that the student's Ph.D. research will result in at least two refereed publications or other high-caliber technical publications.