DATA SCIENCE (ENGR)

Description

The data science major prepares students with skills and competency in data analysis and interpretation, algorithm design and implementation, and helps them develop aptitudes for interdisciplinary problem-solving. The interdisciplinary program enables students to take advantage of career and employment opportunities across diverse fields involving data-rich, data-driven systems and applications. Ultimately, this will help address the increasing societal and economic need for a qualified workforce in our digital age.

Students can select a major in data science through one of three colleges: Arts and Sciences (Department of Mathematics), Engineering (School of Computing), or Agricultural Science and Natural Resources (Department of Statistics). Students in the College of Engineering (COE) will have the opportunity to investigate and learn about the various aspects of data science from data collection to data visualization, from foundations of computational methodologies to software and hardware applications in data science. In particular, students in the COE track will have a year-long senior capstone and a practicum to enrich their experience in building Data Science solutions and working with research and development in data science. The data science program offers flexibility for students to earn a dual degree in Data Science and their chosen discipline's degree program. However, students who do not double major are required to add a minor that both complements and enhances the Data Science major.

College Requirements

College Admission

College Entrance Requirements

Students must meet both the University and College of Engineering entrance requirements. The following includes both the University and College of Engineering 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 for Change.

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 from colleges outside of the NU system. Although the University of Nebraska–Lincoln and the College of Engineering in general accepts C- and 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.

Learning Outcomes

The primary student learning outcomes of the interdisciplinary data science major are:

1. Foundational knowledge and expertise in the analysis of large-scale data sources from the interdisciplinary perspectives of applied computer science, data modeling, mathematics, and statistics.
2. Foundational knowledge and expertise in the application of computing, informatics, and modeling to solve multidisciplinary problems.
3. Abilities and professional skills to solve multidisciplinary data science problems as a member of an interdisciplinary team.
4. Familiarity with ethical challenges in data science, including ethical collection of data, responsible use of data and algorithmic bias.

Major Requirements

Complete the data science foundations

Core Requirements

Data Science Foundations		
CSCE 10	Introduction to the School of Computing [5]	0
or ENGR 10	Freshman Engineering Seminar	
or ENGR 30	Transfer Student Engineering Seminar	
CSCE 155T	Computer Science I: Informatics Focus [1]	3
CSCE 311	Data Structures and Algorithms for Informatics [2]	3
or RAIK 283H	Honors: Software Engineering III	
CSCE 320	Data Analysis	3
or RAIK 370H	Honors: Data and Models II: Data Science Fundamentals	
MATH 104	Applied Calculus (ACE 3)	3-5
or MATH 106	Calculus I	
MATH 203	Contemporary Mathematics	3-4
or MATH 107	Calculus II	
MATH 315	Linear Algebra for Data Science [6]	3
Credit Hours Subtotal:		18-21
Statistics		
Select one of the following:		6
Option 1		
STAT 218	Introduction to Statistics	
or STAT 380	Statistics and Applications	
or RAIK 270H	Statistics and Applications	
STAT 318	Introduction to Statistics II	
Option 2		*6*
STAT 101	Introduction to Data	
STAT 102	Principles of Statistical Analysis	
Credit Hours Subtotal:		12
Data Science Professional Experience [3]		
CSCE 386	Practice and Professional Development: Design and Implementation	3
or CSCE 492	Special Topics in Computer Science	
or CSCE 495	Internship in Computing Practice	
CSCE 486	Computer Science Professional Development (ACE 8) [4]	3
or CSCE 486H	Honors Computer Science Professional Development	
CSCE 487	Computer Science Senior Design Project (ACE 10)	3
or CSCE 487H	Honors Computer Science Senior Design Project	
or CSCE 402H	Honors: RAIK Design Studio II	
or RAIK 402H	Honors: RAIK Design Studio II	
or CSCE 493A	Interdisciplinary Capstone	
or MATH 435	Math in the City	
Credit Hours Subtotal:		9

[1] CSCE 155T *is recommended, but any of the CSCE 155 courses may be used.*
[2] CSCE 311 *is recommended, but* CSCE 310 *may be used.*
[3] CSCE 492 *may be used only if topic is related to Data Science.*
[4] *May be replaced by a student's second major's capstone course.*
[5] ENGR 193 *may apply for* ENGR 10 *(students must be in the Kiewit Scholars Program to take the course).*
[6] MATH 314 *is an acceptable substitute.*

Specific Major Requirements

Data Science Focus Areas		
Select 4 courses from 2 of the focus areas below for at least 12 credit hours		12
Artificial Intelligence		
CSCE 417	Artificial Intelligence For Social Good	
CSCE 420	Introduction to Natural Language Processing	
CSCE 421	Foundations of Constraint Processing	
CSCE 472	Digital Image Processing	
CSCE 473	Computer Vision	

CSCE 474	Introduction to Data Mining
CSCE 475	Multiagent Systems
CSCE 476	Introduction to Artificial Intelligence
CSCE 478	Introduction to Machine Learning
CSCE 479	Introduction to Deep Learning
CSCE 480H	Honors: Generative AI - Applications, Ethics, and Research
Applied Computing: Sociology	
SOCI 333	Applied Research in Public Opinion
SOCI 362	Ethics and the Responsible Conduct of Research
SOCI 407	Strategies of Social Research: Qualitative Methods
SOCI 430	Advanced Social Network Analysis
SOCI 465	Survey Design and Analysis
Software Development	
CSCE 361	Software Engineering
CSCE 378	Human-Computer Interaction
CSCE 403H / RAIK 403H & CSCE 404H / RAIK 404H	Honors: RAIK Design Studio III and Honors: RAIK Design Studio IV
or CSCE 405 & CSCE 406H	Honors: RAIK Research Studio I and Honors: RAIK Research Studio II
or RAIK 405H & RAIK 406H	Honors: RAIK Research Studio I and Honors: RAIK Research Studio II
CSCE 412	Data Visualization
CSCE 453H / RAIK 453H	Honors: User Interfaces
CSCE 460	Software Engineering for Robotics
CSCE 461	Advanced Topics in Software Engineering
CSCE 464	Internet Systems and Programming
CSCE 466	Software Design and Architecture
CSCE 467	Testing, Verification and Analysis
CSCE 468	Requirements Elicitation, Modeling and Analysis
SOFT 261	Software Engineering IV
or RAIK 284H	Software Engineering IV
Data Pipeline	
CSCE 411	Data Modeling for Systems Development
CSCE 413	Database Systems
CSCE 436	Advanced Embedded Systems
CSCE 438	Internet of Things
CSCE 458	Molecular and Nanoscale Communication
CSCE 463	Data and Network Security
CSCE 465	Wireless Communication Networks
STAT 251	Statistical Computing I: Data Wrangling
STAT 351	Statistical Computing II: Data Management and Visualization
Statistical Modeling	
PLAS 420	Bioinformatics Applications in Agriculture
SOCI 465	Survey Design and Analysis
STAT 212	Principles of Study Design
STAT 301	Mathematical Statistics and Modeling I
STAT 302	Mathematical Statistics and Modeling II
STAT 325	Statistical Collaboration I
STAT 412	Advanced Statistical Design
STAT 414	Introduction to Survey Sampling
STAT 432	Introduction to Spatial Statistics
STAT 443	Statistical Analysis of Genomics Data
STAT 450	Introduction to Regression Analysis
STAT 462	Introduction to Mathematical Statistics I: Distribution Theory
STAT 463	Introduction to Mathematical Statistics II: Statistical Inference
STAT 464	Model Selection and Prediction
STAT 474	Introduction to Nonparametric Statistics
STAT 475	Introduction to Categorical Data Analysis
STAT 478	Introduction to Time Series Analysis
STAT 486	Introduction to Bayesian Analysis
Mathematical Modeling	
MATH 208	Calculus III
MATH 221	Differential Equations
MATH 415	Theory of Linear Transformations
MATH 424	Introduction to Partial Differential Equations
MATH 428	Principles of Operations Research
MATH 433	Nonlinear Optimization
MATH 440	Numerical Analysis I
MATH 447	Numerical Methods for Applied Math
MATH 450	Combinatorics
MATH 452	Graph Theory
MATH 471	Introduction to Topology
MATH 487	Probability Theory
MATH 489	Stochastic Processes
Applied Computing: Journalism & Humanities	
ADPR 358	UX/UI Design
HIST 461	Geospatial Approaches in Digital Humanities and Social Sciences
HIST 470	Digital History
JOUR 307	Data Journalism
JOUR 407	Data Visualization
SPMC 350	Sports Data Visualization and Analytics
Applied Computing: Natural Resources	
AECN 401	Advanced Farm Management and Linear Programming
AECN 436	Commodity Price Forecasting
AGST 433	Equipment and Tractor Testing
NRES 218	Introduction to Geospatial Technologies
NRES 415	GIS for Agriculture and Natural Resources
NRES 418 / GEOG 418	Introduction to Remote Sensing
PLAS 420	Bioinformatics Applications in Agriculture

PLAS 431 / AGEN 431 / AGST 431	Site-specific Crop Management	
Credit Hours Subtotal:		12

Ancillary Requirements

Breadth Course- Arts, Humanities, & Social Sciences		
Complete 3 credits from ACE 5, 6, or 7 approved courses		3
Credit Hours Subtotal:		3
Breadth Course- Global Awareness/Human Diversity		
Complete 3 credits from ACE 9 approved courses		3
Credit Hours Subtotal:		3
Written Communication (ACE 1)		
Complete 3 credits from ACE 1 approved courses		3
Credit Hours Subtotal:		3
SCIENCE (ACE 4)		
Select 8 credit hours of courses intended for science or engineering majors including at least one laboratory. Acceptable disciplines and courses are (not an exhaustive list):		8
Chemistry		
CHEM 109A & CHEM 109L	General Chemistry I and General Chemistry I Laboratory [1]	
CHEM 110A & CHEM 110L	General Chemistry II and General Chemistry II Laboratory [1]	
CHEM 113A & CHEM 113L	Fundamental Chemistry I and Fundamental Chemistry I Laboratory [1]	
CHEM 114	Fundamental Chemistry II	
CHEM 221A & CHEM 221L	Elementary Quantitative Analysis and Elementary Quantitative Analysis Laboratory [1]	
Physics and Astronomy		
ASTR 204	Introduction to Astronomy and Astrophysics	
ASTR 224	Astronomy and Astrophysics Laboratory [1]	
PHYS 141	Physics for Life Sciences I [1]	
PHYS 142	Physics for Life Sciences II [1]	
PHYS 211	General Physics I	
PHYS 212	General Physics II	
PHYS 221	General Physics Laboratory I [1]	
PHYS 222	General Physics Laboratory II [1]	
PHYS 213	General Physics III	
PHYS 223	General Physics Laboratory III [1]	
Biological Sciences		
BIOS 201	General Genetics	
BIOS 202	Genetics, Molecular and Cellular Biology Laboratory [1]	
BIOS 207	Ecology and Evolution [1]	
BIOS 111	Introduction to Microbiology and Human Health [1]	
LIFE 120 & 120L	Fundamentals of Biology I and Fundamentals of Biology I laboratory [1]	
LIFE 121 & 121L	Fundamentals of Biology II and Fundamentals of Biology II Laboratory [1]	
Earth and Atmospheric Sciences		
GEOG 155	Elements of Physical Geography [1]	
GEOL 101	Dynamic Earth [1]	
GEOL 103	Earth Through Time [1]	
GEOL 410	Geochemistry	
METR 100	Weather and Climate [1]	
METR 205	Introduction to Atmospheric Science [1]	
METR 370	Applied Climatology	
Anthropology		
ANTH 242	Introduction to Biological Anthropology	
ANTH 242L	Introduction to Biological Anthropology Laboratory [1]	
Credit Hours Subtotal:		8
ACE Requirements		
Select one course each from ACE outcomes 2, 5, 6, 7, and 9		15
Credit Hours Subtotal:		15

[1] *Indicates a lab course or that a lab is included with the course.*

Minor Requirement

Complete at least one minor or a second major.

Additional Major Requirements

Grade Rules

C- and D Grades

A grade of C or above is required for all courses in the major (core requirements and focus areas), excluding ancillary courses.

Pass/No Pass

No course taken Pass/No Pass will be counted toward the major (core requirements and focus areas), unless offered exclusively with a grade option of Pass/No Pass.

Course Level Requirement

Thirty (30) of the 120 credit hours must be in courses numbered at the 300 or 400 level. Of those 30 hours, 15 credit hours must be completed in residence at the University of Nebraska–Lincoln.

Residency Requirement

Students must complete at least 30 of the 120 total hours for their degree at the University of Nebraska–Lincoln. Students must complete at least 17 hours of their major coursework and 15 of the 30 credit hours required at the 300 or 400 level in residence. Credit earned during education abroad may be used toward the residency requirement only if students register through the University of Nebraska–Lincoln.