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 non-engineering students to earn a dual degree in data science and their chosen discipline's degree program. In addition, students may choose to add a minor that both complements and enhances the data science major.

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
eyear 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

<table>
<thead>
<tr>
<th>Data Science Foundations</th>
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<tbody>
<tr>
<td>CSCE 155T</td>
</tr>
<tr>
<td>CSCE 311</td>
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<tr>
<td>CSCE 320</td>
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<tr>
<td>MATH 104</td>
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<tr>
<td>or MATH 106</td>
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<tr>
<td>MATH 203</td>
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<td>or MATH 203J</td>
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<td>or MATH 207</td>
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<td>MATH 315</td>
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<td>STAT 101</td>
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<td>STAT 102</td>
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<td>Credit Hours Subtotal:</td>
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<table>
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<tr>
<th>Data Science Professional Experience</th>
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<tbody>
<tr>
<td>CSCE 386</td>
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<tr>
<td>or CSCE 492</td>
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<tr>
<td>or CSCE 495</td>
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| Specific Major Requirements |

Data Science Focus Areas
Select 4 courses from 2 of the focus areas below for at least
12 credit hours

<table>
<thead>
<tr>
<th>Artificial Intelligence</th>
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<tbody>
<tr>
<td>CSCE 421</td>
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<td>CSCE 472</td>
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<td>CSCE 474</td>
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<td>CSCE 475</td>
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<td>CSCE 478</td>
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<td>CSCE 479</td>
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<table>
<thead>
<tr>
<th>Applied Computing: Sociology</th>
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<tbody>
<tr>
<td>SOCI 310A</td>
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<tr>
<td>SOCI 310B</td>
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<tr>
<td>SOCI 333</td>
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<tr>
<td>SOCI 362</td>
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<td>SOCI 407</td>
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<td>SOCI 430</td>
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<td>SOCI 465</td>
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<tr>
<th>Software Development</th>
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<tbody>
<tr>
<td>CSCE 361</td>
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<td>CSCE 378</td>
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<td>CSCE 412</td>
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<td>CSCE 460</td>
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<td>CSCE 464</td>
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<td>CSCE 466</td>
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<td>CSCE 468</td>
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<tr>
<th>Data Pipeline</th>
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<tbody>
<tr>
<td>STAT 251</td>
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<tr>
<td>STAT 351</td>
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<td>CSCE 411</td>
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<td>CSCE 413</td>
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<td>CSCE 436</td>
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<td>CSCE 438</td>
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<td>CSCE 458</td>
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<tr>
<td>CSCE 463</td>
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<td>CSCE 465</td>
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**Statistical Modeling**

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<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>STAT 212</td>
<td>Principles of Study Design</td>
</tr>
<tr>
<td>STAT 301</td>
<td>Mathematical Statistics and Modeling I</td>
</tr>
<tr>
<td>STAT 302</td>
<td>Mathematical Statistics and Modeling II</td>
</tr>
<tr>
<td>STAT 325</td>
<td>Statistical Collaboration I</td>
</tr>
<tr>
<td>STAT 412</td>
<td>Advanced Statistical Design</td>
</tr>
<tr>
<td>STAT 414</td>
<td>Introduction to Survey Sampling</td>
</tr>
<tr>
<td>STAT 432</td>
<td>Introduction to Spatial Statistics</td>
</tr>
<tr>
<td>STAT 443</td>
<td>Statistical Analysis of Genomics Data</td>
</tr>
<tr>
<td>STAT 450</td>
<td>Introduction to Regression Analysis</td>
</tr>
<tr>
<td>STAT 462</td>
<td>Introduction to Mathematical Statistics I: Distribution Theory</td>
</tr>
<tr>
<td>STAT 463</td>
<td>Introduction to Mathematical Statistics II: Statistical Inference</td>
</tr>
<tr>
<td>STAT 464</td>
<td>Model Selection and Prediction</td>
</tr>
<tr>
<td>STAT 474</td>
<td>Introduction to Nonparametric Statistics</td>
</tr>
<tr>
<td>STAT 475</td>
<td>Introduction to Categorical Data Analysis</td>
</tr>
<tr>
<td>STAT 478</td>
<td>Introduction to Time Series Analysis</td>
</tr>
<tr>
<td>STAT 486</td>
<td>Introduction to Bayesian Analysis</td>
</tr>
<tr>
<td>SOCI 465</td>
<td>Survey Design and Analysis</td>
</tr>
<tr>
<td>PLAS 420</td>
<td>Bioinformatics Applications in Agriculture</td>
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**Mathematical Modeling**

<table>
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<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>MATH 208</td>
<td>Calculus III</td>
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<tr>
<td>MATH 221</td>
<td>Differential Equations</td>
</tr>
<tr>
<td>MATH 415</td>
<td>Theory of Linear Transformations</td>
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<tr>
<td>MATH 424</td>
<td>Introduction to Partial Differential Equations</td>
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<tr>
<td>MATH 428</td>
<td>Principles of Operations Research</td>
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<tr>
<td>MATH 433</td>
<td>Nonlinear Optimization</td>
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<tr>
<td>MATH 440</td>
<td>Numerical Analysis I</td>
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<tr>
<td>MATH 447</td>
<td>Numerical Methods for Applied Math</td>
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<tr>
<td>MATH 450</td>
<td>Combinatorics</td>
</tr>
<tr>
<td>MATH 452</td>
<td>Graph Theory</td>
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<tr>
<td>MATH 471</td>
<td>Introduction to Topology</td>
</tr>
<tr>
<td>MATH 487</td>
<td>Probability Theory</td>
</tr>
<tr>
<td>MATH 489</td>
<td>Stochastic Processes</td>
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**Applied Computing: Journalism & Humanities**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>ADPR 358</td>
<td>UX/UI Design</td>
</tr>
<tr>
<td>HIST 461</td>
<td>Geospatial Approaches in Digital Humanities and Social Sciences</td>
</tr>
<tr>
<td>HIST 470</td>
<td>Digital History</td>
</tr>
<tr>
<td>JOUR 307</td>
<td>Data Journalism</td>
</tr>
<tr>
<td>JOUR 407</td>
<td>Data Visualization</td>
</tr>
<tr>
<td>NSST 376</td>
<td>Analysis for the National Security Establishment</td>
</tr>
<tr>
<td>SPMC 350</td>
<td>Sports Data Visualization and Analytics</td>
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**Applied Computing: Natural Resources**

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<th>Course Code</th>
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<tbody>
<tr>
<td>NRES 218</td>
<td>Introduction to Geospatial Technologies</td>
</tr>
<tr>
<td>NRES 415</td>
<td>GIS for Agriculture and Natural Resources</td>
</tr>
<tr>
<td>NRES 418</td>
<td>Introduction to Remote Sensing</td>
</tr>
<tr>
<td>AECN 401</td>
<td>Advanced Farm Management and Linear Programming</td>
</tr>
<tr>
<td>AECN 436</td>
<td>Commodity Price Forecasting</td>
</tr>
<tr>
<td>PLAS 420</td>
<td>Bioinformatics Applications in Agriculture</td>
</tr>
<tr>
<td>PLAS 431</td>
<td>Site-specific Crop Management</td>
</tr>
<tr>
<td>AGST 431</td>
<td>Equipment and Tractor Testing</td>
</tr>
</tbody>
</table>

**Ancillary Requirements**

**BREADTH COURSES - ARTS, HUMANITIES AND SOCIAL SCIENCES**

Complete 3 credits in Arts, Humanities and Social Science Courses.

Select any course from AHIS, ANTH, CLAS, COMM, ECON, ENGL, ETHN, GEOG, HIST, PHIL, POLS, PSYC, RELG, SOCI, GREK, LATN, FREN, GERM, SPAN, JAPN, RUSS, HEBR, CHIN, CZEC, ARAB, WMNS.

Complete 3 credits in “Diversity in U.S. Communities”.

Select from a list of approved courses listed in the “CDR: Human Diversity in U.S. Communities” section of the catalog at https://catalog.unl.edu/undergraduate/arts-sciences/#text.

**Technical Writing**

JGEN 200 Technical Communication I (ACE 1) or BSAD 220H Honors Business Writing.

**Science (ACE 4)**

Select 6 credit hours of courses intended for science or engineering majors including at least one laboratory. Acceptable disciplines and courses are (not an exhaustive list):

**Chemistry**

- CHEM 109A General Chemistry I
- CHEM 109L General Chemistry I Laboratory
- CHEM 110A General Chemistry II
- CHEM 110L General Chemistry II Laboratory
- CHEM 221A Elementary Quantitative Analysis
- CHEM 221L Elementary Quantitative Analysis Laboratory
- CHEM 113A Fundamental Chemistry I
- CHEM 113L Fundamental Chemistry I Laboratory
- CHEM 114 Fundamental Chemistry II

**Physics and Astronomy**

- PHYS 141 Elementary General Physics I
- PHYS 142 Elementary General Physics II
<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>PHYS 211</td>
<td>General Physics I</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 212</td>
<td>General Physics II</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 221</td>
<td>General Physics Laboratory I</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 222</td>
<td>General Physics Laboratory II</td>
<td>3</td>
</tr>
<tr>
<td>PHYS 213</td>
<td>General Physics III</td>
<td>3</td>
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<tr>
<td>PHYS 223</td>
<td>General Physics Laboratory III</td>
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</tr>
<tr>
<td>ASTR 204</td>
<td>Introduction to Astronomy and Astrophysics</td>
<td>3</td>
</tr>
<tr>
<td>ASTR 224</td>
<td>Astronomy and Astrophysics Laboratory</td>
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**Biological Sciences**

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<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>BIOS 111</td>
<td>Introduction to Microbiology and Human Health</td>
<td>3</td>
</tr>
<tr>
<td>BIOS 205</td>
<td>Genetics, Molecular and Cellular Biology Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>BIOS 206</td>
<td>General Genetics</td>
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<tr>
<td>BIOS 207</td>
<td>Ecology and Evolution</td>
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</tr>
<tr>
<td>LIFE 120</td>
<td>Fundamentals of Biology I</td>
<td>3</td>
</tr>
<tr>
<td>LIFE 120L</td>
<td>Fundamentals of Biology I Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>LIFE 121</td>
<td>Fundamentals of Biology II</td>
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<tr>
<td>LIFE 121L</td>
<td>Fundamentals of Biology II Laboratory</td>
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**Earth and Atmospheric Sciences**

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<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>GEOG 155</td>
<td>Elements of Physical Geography</td>
<td>3</td>
</tr>
<tr>
<td>GEOL 101</td>
<td>Dynamic Earth</td>
<td>3</td>
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<tr>
<td>GEOL 103</td>
<td>Earth Through Time</td>
<td>3</td>
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<tr>
<td>GEOL 410</td>
<td>Geochemistry</td>
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<tr>
<td>METR 100</td>
<td>Weather and Climate</td>
<td>3</td>
</tr>
<tr>
<td>METR 205</td>
<td>Introduction to Atmospheric Science</td>
<td>3</td>
</tr>
<tr>
<td>METR 370</td>
<td>Applied Climatology</td>
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**Anthropology**

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<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>ANTH 242</td>
<td>Introduction to Biological Anthropology</td>
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</tr>
<tr>
<td>ANTH 242L</td>
<td>Introduction to Biological Anthropology Laboratory</td>
<td>3</td>
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</tbody>
</table>

Credit Hours Subtotal: 6

**ACE Requirements**

Select one course each from ACE outcomes 2, 5, 6, 7, and 9 15

Credit Hours Subtotal: 15

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1. ARAB, CHIN, CZEC, FREN, GERM, GREK, HEBR, JAPN, LATN, RUSS, and SPAN courses must be numbered 300 or above. ENGL courses must be 170, 180, or 200 level and above.

2. Excluded courses: CLAS 116, ENGL 254, ENGL 300, ENGL 354, SPAN 300A, SPAN 303, and SPAN 304, ANTH 242/ANTH 242L, GEOG 155, GIST 111, GIST 311, POLS 101, POLS 250, PSYC 100, PSYC 273. Internship (395 or 495), independent study or readings (396 or 496), research (398 or 498), and thesis (399, 399H, 499, or 499H) will not satisfy the requirement. Other courses with a 9 in the middle number (ex. PSYC 292) will not satisfy the requirement unless approved by an advisor.

3. Indicates a lab course or that a lab is included with the course.