



STATISTICS & DATA ANALYTICS

Description

Students in statistics learn how to use data to solve problems in a complex world. The degree program offers students the opportunity to formulate an answerable question, develop methodology for data analysis, collect data appropriately, extract evidence from that data, and use statistical reasoning to transform that evidence into information that can be used by enterprises, government, and other stakeholders. Graduates will be able to adapt to an ever-evolving data landscape and use their knowledge to construct novel solutions to challenges that are meaningful for society.

College Requirements

College Admission

Requirements for admission into the College of Agricultural Sciences and Natural Resources (CASNR) are consistent with general University admission requirements (one unit equals one high school year): 4 units of English, 4 units of mathematics, 3 units of natural sciences, 3 units of social sciences, and 2 units of world language. Students must also meet performance requirements: a 3.0 cumulative high school grade point average OR an ACT composite of 20 or higher, writing portion not required OR a score of 1040 or higher on the SAT Critical Reading and Math sections OR rank in the top one-half of graduating class; transfer students must have a 2.0 (on a 4.0 scale) cumulative grade point average and 2.0 on the most recent term of attendance.

Admission Deficiencies/Removal of Deficiencies

Students who are admitted to CASNR with core course deficiencies must remove these deficiencies within the first 30 credit hours at the University of Nebraska–Lincoln, or within the first calendar year at Nebraska, whichever takes longer. College-level coursework taken to remove deficiencies may be used to meet degree requirements in CASNR.

Deficiencies in the required entrance subjects can be removed by the completion of specified courses in the University or by correspondence.

The Office of Admissions, Alexander Building (south entrance), City Campus, provides information to new students on how deficiencies can be removed.

College Degree Requirements

Curriculum Requirements

The curriculum requirements of the College consist of three areas: ACE (Achievement-Centered Education), College of Agricultural Sciences and Natural Resources Core, and Degree Program requirements and electives. All three areas of the College Curriculum Requirements are incorporated within the description of the Major/Degree Program sections of the catalog. The individual major/degree program listings of classes ensure that a student will meet the minimum curriculum requirements of the College.

World Languages/Language Requirement

Two units of a world language are required. This requirement is usually met with two years of high school language.

Experiential Learning

All undergraduates in the College of Agricultural Sciences and Natural Resources must take an Experiential Learning (EL) designated course. This may include 0-credit courses designed to document co-curricular activities recognized as Experiential Learning.

Minimum Hours Required for Graduation

The College grants the bachelors degree in programs associated with agricultural sciences, natural resources, and related programs. Students working toward a degree must earn at least 120 semester hours of credit. A minimum cumulative grade point average of C (2.0 on a 4.0 scale) must be maintained throughout the course of studies and is required for graduation. Some degree programs have a higher cumulative grade point average required for graduation. Please check the degree program on its graduation cumulative grade point average.

Grade Rules

Removal of C-, D, and F Grades

Only the most recent letter grade received in a given course will be used in computing a student's cumulative grade point average if the student has completed the course more than once and previously received a grade or grades below C in that course.

The previous grade (or grades) will not be used in the computation of the cumulative grade point average, but it will remain a part of the academic record and will appear on any transcript.

A student can remove from their cumulative average a course grade of C-, D+, D, D-, or F if the student repeats the same course at the University of Nebraska and receives a grade other than P (pass), I (incomplete), N (no pass), W (withdrew), or NR (no report). If a course is no longer being offered, it is not eligible for the revised grade point average computation process.

For complete procedures and regulations, see the Office of the University Registrar website at [http://www.unl.edu/regrec/course-repeats/](http://www.unl.edu/regrec/course-repeats).

Pass/No Pass

Students in CASNR may take any course offered on a Pass/No Pass basis within the 24-hour limitation established by the Faculty Senate. However, a department may specify that the Pass/No Pass status of its courses be limited to non-majors or may choose to offer some courses for letter grades only.

GPA Requirements

A minimum cumulative grade point average of C (2.0 on a 4.0 scale) must be maintained throughout the course of studies and is required for graduation. Some degree programs have a higher cumulative grade point average required for graduation. Please check the degree program on its graduation cumulative grade point average.

Transfer Credit Rules

To be considered for admission a transfer student, Nebraska resident or nonresident, must have an accumulated average of C (2.0 on a 4.0 scale) and a minimum C average in the last semester of attendance at another college. Transfer students who have completed less than 12 credit hours of college study must submit either ACT or SAT scores.

Ordinarily, credits earned at an accredited college are accepted by the University. The College, however, will evaluate all hours submitted on an application for transfer and reserves the right to accept or reject any of them. Sixty (60) is the maximum number of hours the University

will accept on transfer from a two-year college. Ninety (90) is the maximum number of hours the University will accept from a four-year college. Transfer credit in the degree program must be approved by the degree program advisor on a Request for Substitution Form to meet specific course requirements, group requirements, or course level requirements in the major. At least 9 hours in the major field, including the capstone course, must be completed at the University of Nebraska–Lincoln regardless of the number of hours transferred.

The College will accept no more than 10 semester hours of C-, D+, D, and D- grades from other schools. The C-, D+, D, and D- grades can only be applied to free electives. This policy does not apply to the transfer of grades from UNO or UNK to the University of Nebraska–Lincoln.

Joint Academic Transfer Programs

The College of Agricultural Sciences and Natural Resources has agreements with many institutions to support joint academic programs. The transfer programs include dual degree programs and cooperative degree programs. Dual degree programs offer students the opportunity to receive a degree from a participating institution and also to complete the requirements for a bachelor of science degree in CASNR. Cooperative programs result in a single degree from either the University of Nebraska–Lincoln or the cooperating institution.

Dual Degree Programs

A to B Programs

The A to B Program, a joint academic program offered by the CASNR and participating community colleges, allows students to complete the first two years of a degree program at the participating community college and continue their education and study in a degree program leading toward a bachelor of science degree.

The A to B Program provides a basic knowledge plus specialized coursework. Students transfer into CASNR with junior standing.

Depending on the community college, students enrolled in the A to B Program may complete the requirements for an associate of science at the community college, transfer to the University of Nebraska–Lincoln, and work toward a bachelor of science degree.

Participating community colleges include:

- Central Community College
- Metropolitan Community College
- Mid-Plains Community College
- Nebraska College of Technical Agriculture
- Nebraska Indian Community College
- Northeast Community College
- Southeast Community College
- Western Nebraska Community College

3+2 Programs

Two specialized degree programs in **animal science** and **veterinary science** are offered jointly with an accredited college or school of veterinary medicine. These two programs permit CASNR animal science or veterinary science students to receive a bachelor of science degree from the University of Nebraska–Lincoln with a degree in animal science or veterinary science after successfully completing two years of the professional curriculum in veterinary medicine at an accredited veterinary school. Students who successfully complete the 3+2 Program, must provide transcripts and complete the Application for Degree form via MyRED. Students without MyRED access may apply for graduation in

person at Husker Hub in the Canfield Administration Building, or by mail. Students should discuss these degree programs with their academic advisor.

Cooperative Degree Programs

Academic credit from the University and a cooperating institution are applied towards a four-year degree from either the University of Nebraska–Lincoln (University degree-granting program) or the cooperating institution (non-University degree-granting program). All have approved programs of study.

UNL Degree-Granting Programs

A University of Nebraska–Lincoln degree-granting program is designed to provide students the opportunity to complete a two-year program of study at one of the four-year institutions listed below, transfer to CASNR, and complete the requirements for a bachelor of science degree.

Chadron State College. Chadron State College offers a 2+2 program leading to a grassland ecology and management degree program and a transfer program leading to a bachelor of science in agricultural education in the teaching option.

Wayne State College. Wayne State College offers a 3+1 program leading to a bachelor of science in plant biology in the ecology and management option and a 3+1 program leading to a bachelor of science in Applied Science.

University of Nebraska at Kearney. Transfer programs are available for students pursuing degree programs leading to a bachelor of science degree.

University of Nebraska at Omaha. Transfer programs are available for students pursuing degree programs leading to a bachelor of science degree.

Non University of Nebraska–Lincoln Degree-Granting Programs

CASNR cooperates with other institutions to provide coursework that is applied towards a degree at the cooperating institution. Pre-professional programs offered by CASNR allow students to complete the first two or three years of a degree program at the University prior to transferring and completing a degree at the cooperating institution.

Chadron State College–Range Science. The 3+1 Program in range science allows Chadron State College students to pursue a range science degree through Chadron State College. Students complete three years of coursework at Chadron State College and one year of specialized range science coursework (32 credit hours) at CASNR.

Residency

Students must complete at least 30 of the total hours for their degree using University of Nebraska–Lincoln credits. At least 18 of the 30 credit hours must be in courses offered through CASNR¹ (>299) including the appropriate ACE 10 degree requirement or an approved ACE 10 substitution offered through another Nebraska college and excluding independent study regardless of the number of hours transferred. Credit earned during education abroad may be used toward the residency requirement if students register through the University of Nebraska–Lincoln and participate in prior-approved education abroad programs. The University of Nebraska–Lincoln open enrollment and summer independent study courses count toward residence.

¹ Includes courses taught by CASNR faculty through interdisciplinary prefixes (e.g., LIFE, MBIO, ENVR, SCIL, EAEP, ENSC) and CASNR crosslisted courses taught by non-CASNR faculty.

Online and Distance Education

There are many opportunities to earn college credit online through the University of Nebraska–Lincoln. Some of these credits may be applicable not only as elective credits but also toward the fulfillment of the College's education requirements. Credits earned online may count toward residency. However, certain offerings may not be counted toward scholarship requirements or academic recognition criteria.

For further information, contact:

Office of Online and Distance Education
University of Nebraska–Lincoln
305 Brace Labs
Lincoln, NE 68588-0109
402-472-4681
<http://online.unl.edu/>

Independent Study Rules

Students wishing to take part in independent studies must obtain permission; complete and sign a contract form; and furnish copies of the contract to the instructor, advisor, departmental office, and the Dean's Office. The contract should be completed before registration. Forms are available in 103 Agricultural Hall or online at the CASNR website.

Independent study projects include research, literature review or extension of coursework under the supervision and evaluation of a departmental faculty member.

Students may only count 12 hours of independent study toward their degrees and no more than 6 hours can be counted during their last 36 hours earned, excluding senior thesis, internships, and courses taught under an independent study number.

Other College Degree Requirements

Capstone Course Requirement

A capstone course is required for each CASNR degree program. A capstone course is defined as a course in which students are required to integrate diverse bodies of knowledge to solve a problem or formulate a policy of societal importance.

ACE Requirements

All students must fulfill the Achievement Centered Education (ACE) requirements. Information about the ACE program may be viewed at ace.unl.edu (<https://ace.unl.edu/>).

The minimum requirements of CASNR reflect the common core of courses that apply to students pursuing degrees in the college. Students should work with an advisor to satisfy ACE outcomes 1, 2, 3, 4, 6, and 10 with the college requirements.

Catalog Rule

Students must fulfill the requirements stated in the catalog for the academic year in which they are first admitted to the University of Nebraska–Lincoln or when they were first admitted to a Joint Academic Transfer Program. Students transferring from a community college, but without admission to a Joint Academic Transfer Program, 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 academic advisors, provided the student a) was enrolled in a community college during the catalog year they are utilizing, b) maintained continuous enrollment at the previous institution for 1 academic year or more, and c) continued enrollment at the University of Nebraska–Lincoln within 1 calendar year from their last term at the previous institution. 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 the University of Nebraska–Lincoln in the College of Agricultural Sciences and Natural Resources. 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.

Learning Outcomes

Graduates of statistics and data analytics will be able to:

1. Identify the question to be answered, and design an appropriate data collection strategy.
2. Appropriately analyze data to solve complex problems.
3. Understand the underlying assumptions and theoretical properties of the analysis.
4. Use appropriate computing applications to pre-process, organize, visualize, and analyze data.
5. Demonstrate an understanding of how statistical procedures are computationally implemented, including awareness of when a procedure has failed and what to do about it.
6. Communicate statistical concepts and interpretation of data and results with collaborators in conversation, and through visual summaries and written reports.

Major Requirements

Core Requirements

College Integrative Course and ACE 8

SCIL 101	Science and Decision-Making for a Complex World	3
Credit Hours Subtotal:		3

Communications

Written Communication (ACE 1)	3
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ENGL 150	Writing and Inquiry	
ENGL 151	Writing for Change	
ENGL 254	Writing and Communities	

JGEN 120	Basic Business Communication	
JGEN 200	Technical Communication I	
JGEN 300	Technical Communication II	

Oral Communication (ACE 2)	3
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ALEC 102	Interpersonal Skills for Leadership	
COMM 101	Communication in the 21st Century	
COMM 209	Public Speaking	

COMM 210	Communicating in Small Groups	
COMM 283	Interpersonal Communication	
COMM 286	Business and Professional Communication	

JGEN 300	Technical Communication II	
NRES 301	Environmental Communication Skills	

TMFD 121	Visual Communication with Animation	STAT 301	Mathematical Statistics and Modeling I	3	
Credit Hours Subtotal:	6	STAT 302	Mathematical Statistics and Modeling II	3	
Mathematics (ACE 3)		STAT 325	Statistical Collaboration I	3	
MATH 106	Calculus I	5	STAT 349	Technical Skills for Statisticians	3
MATH 107	Calculus II	4	STAT 351	Statistical Computing II: Data Management and Visualization	3
or MATH 107H Honors: Calculus II					
MATH 208	Calculus III	4	STAT 464	Model Selection and Prediction	3
or MATH 208H Honors: Calculus III			Credit Hours Subtotal:	36	
MATH 314	Linear Algebra	3	Capstone Course (ACE 10)		
or MATH 314H Honors: Linear Algebra			Complete one of the following ACE 10 courses:	3	
Credit Hours Subtotal:	16	STAT 425	Statistical Collaboration II		
Natural Sciences (ACE 4)		STAT 451	Development of Statistical Software		
Select one each from two of the following areas:	8	STAT 471	Analysis of Messy Data		
Select from CASNR Approved Life Sciences:		STAT 499	Undergraduate Thesis		
BIOS 101	General Biology	Credit Hours Subtotal:		3	
& 101L	and General Biology Laboratory		Statistics Electives		
ENTO 115	Insect Biology	Select 12 hours of Statistics courses at the 300 level or		12	
& ENTO 116	and Insect Identification	higher, excluding STAT 318, STAT 380, STAT 430, STAT 462			
LIFE 120	Fundamentals of Biology I	and STAT 463			
& 120L	and Fundamentals of Biology I laboratory	Credit Hours Subtotal:		12	
LIFE 121	Fundamentals of Biology II	Focused Electives			
& 121L	and Fundamentals of Biology II Laboratory	In consultation with their advisor, students will formulate		12	
PLAS 131	Plant Science	an individualized 12-credit plan to enhance the student's			
& PLAS 134	and Plant Sciences Laboratory	educational goals. These credits will often be applied to an			
Select from the following:		undergraduate minor.			
CHEM 105A	Chemistry in Context I	Credit Hours Subtotal:		12	
& CHEM 105L	and Chemistry in Context I Laboratory	Free Electives			
CHEM 109A	General Chemistry I	Select 12 hours		12	
& CHEM 109L	and General Chemistry I Laboratory	Credit Hours Subtotal:		12	
Select from the following:		Total Credit Hours		120	
AGST 109	Physical Principles in Agriculture and Life Sciences				
PHYS 141	Physics for Life Sciences I	Grade Rules			
PHYS 151	Elements of Physics	Pass/No Pass			
PHYS 211	General Physics I	Students may not take STAT courses as Pass/No Pass credit for the			
Credit Hours Subtotal:	8	degree program.			
Economics (ACE 6)		Requirements for Minor Offered by Department			
Select one of the following:	3				
AECN 141	Introduction to the Economics of Agriculture	Select from the Theoretical Statistics Minor, Applied Statistics Minor, or			
ECON 211	Principles of Macroeconomics	Statistics for Data Science Minor.			
ECON 212	Principles of Microeconomics				
Credit Hours Subtotal:	3	Theoretical Statistics Minor			
ACE Requirement		STAT 462	Introduction to Mathematical Statistics I: Distribution Theory	4	
Select one course each from ACE outcomes 5, 7 and 9	9	STAT 463	Introduction to Mathematical Statistics II: Statistical Inference	4	
Credit Hours Subtotal:	9	Select at least 6 hours from the following:		6	
Statistics and Data Analytics Core Requirements		STAT 212	Principles of Study Design		
STAT 100	Career Explorations in Statistics	STAT 251	Statistical Computing I: Data Wrangling		
STAT 101	Introduction to Data	STAT 301	Mathematical Statistics and Modeling I		
STAT 102	Principles of Statistical Analysis	STAT 302	Mathematical Statistics and Modeling II		
STAT 151	Introduction to Statistical Computing	STAT 318	Introduction to Statistics II		
STAT 212	Principles of Study Design	STAT 351	Statistical Computing II: Data Management and Visualization		
STAT 251	Statistical Computing I: Data Wrangling				
STAT 262	Probability for Statisticians				

STAT 380	Statistics and Applications		or STAT 462	Introduction to Mathematical Statistics I: Distribution Theory
STAT 412	Advanced Statistical Design		STAT 301	Mathematical Statistics and Modeling I 3
STAT 414	Introduction to Survey Sampling		Select at least 6 hours from the following:	6
STAT 432	Introduction to Spatial Statistics		STAT 251	Statistical Computing I: Data Wrangling
STAT 443	Statistical Analysis of Genomics Data		STAT 302	Mathematical Statistics and Modeling II
STAT 450	Introduction to Regression Analysis		STAT 351	Statistical Computing II: Data Management and Visualization
STAT 451	Development of Statistical Software		STAT 412	Advanced Statistical Design
STAT 452	Advanced Computational Statistics		STAT 414	Introduction to Survey Sampling
STAT 464	Model Selection and Prediction		STAT 432	Introduction to Spatial Statistics
STAT 471	Analysis of Messy Data		STAT 443	Statistical Analysis of Genomics Data
STAT 474	Introduction to Nonparametric Statistics		STAT 450	Introduction to Regression Analysis
STAT 475	Introduction to Categorical Data Analysis		STAT 451	Development of Statistical Software
STAT 478	Introduction to Time Series Analysis		STAT 452	Advanced Computational Statistics
STAT 485	Statistical Learning		STAT 464	Model Selection and Prediction
STAT 486	Introduction to Bayesian Analysis		STAT 471	Analysis of Messy Data
Credit Hours Subtotal:	14		STAT 474	Introduction to Nonparametric Statistics
Total Credit Hours	14		STAT 475	Introduction to Categorical Data Analysis
Applied Statistics Minor			STAT 478	Introduction to Time Series Analysis
STAT 218	Introduction to Statistics	3	STAT 485	Statistical Learning
STAT 318	Introduction to Statistics II	3	STAT 486	Introduction to Bayesian Analysis
Select at least 9 hours from the following:	9		Credit Hours Subtotal:	16-17
STAT 212	Principles of Study Design		Total Credit Hours	16-17
STAT 251	Statistical Computing I: Data Wrangling		NOTE: Alternative classes may be substituted if approved by the	
STAT 262	Probability for Statisticians		Department of Statistics curriculum committee.	
STAT 301	Mathematical Statistics and Modeling I		Grade Rules	
STAT 302	Mathematical Statistics and Modeling II		C- and D Grades	
STAT 351	Statistical Computing II: Data Management and Visualization		A grade of C or better must be earned in all courses in the minor.	
STAT 412	Advanced Statistical Design		Pass/No Pass	
STAT 414	Introduction to Survey Sampling		No courses taken for Pass/No Pass credit will be applicable to the minor.	
STAT 432	Introduction to Spatial Statistics		STAT 100 Career Explorations in Statistics	
STAT 443	Statistical Analysis of Genomics Data		Description: Introduction to the field of statistics, and exploration of careers available to those trained in statistics.	
STAT 450	Introduction to Regression Analysis		Credit Hours: 1	
STAT 451	Development of Statistical Software		Max credits per semester: 1	
STAT 452	Advanced Computational Statistics		Max credits per degree: 1	
STAT 462	Introduction to Mathematical Statistics I: Distribution Theory		Grading Option: Graded	
STAT 463	Introduction to Mathematical Statistics II: Statistical Inference		STAT 101 Introduction to Data	
STAT 464	Model Selection and Prediction		Notes: Removal of all entrance deficiencies in mathematics.	
STAT 471	Analysis of Messy Data		Description: An introduction to statistics through exploratory data analysis and data visualization. Topics include data types, chart types, methods for working with and reducing data, simple regression, regression diagnostics. Focuses on how to communicate statistical information and how to critically consume statistical information presented in the media and popular press.	
STAT 474	Introduction to Nonparametric Statistics		Credit Hours: 3	
STAT 475	Introduction to Categorical Data Analysis		Max credits per semester: 3	
STAT 478	Introduction to Time Series Analysis		Max credits per degree: 3	
STAT 485	Statistical Learning		Grading Option: Graded	
STAT 486	Introduction to Bayesian Analysis		Prerequisite for: STAT 102	
Credit Hours Subtotal:	15			
Total Credit Hours	15			
Statistics for Data Science Minor				
STAT 212	Principles of Study Design	4		
STAT 262	Probability for Statisticians	3-4		

STAT 102 Principles of Statistical Analysis**Prerequisites:** STAT 101**Description:** Introduction to formal statistical inference and elementary probability for statistics majors. Explores the practical application of statistical techniques to meaningful scientific problems. Inference topics will be implemented using both simulation-based approaches and classical, theory-based methods.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded**Prerequisite for:** STAT 212; STAT 262; STAT 349**STAT 151 Introduction to Statistical Computing****Description:** Introduction to programming for statistical analysis. Covers basic programming concepts necessary for statistics, good computing practice, and use of built-in functions to complete basic statistical analyses.**Credit Hours:** 1**Max credits per semester:** 1**Max credits per degree:** 1**Grading Option:** Graded**Prerequisite for:** STAT 251; STAT 349**STAT 212 Principles of Study Design****Prerequisites:** STAT 102 or STAT 318**Description:** Introduction to statistical aspects of study design. Both designed experiments and observational studies are covered. Sampling techniques, major experimental and treatment design structures, as well as power and sample size considerations.**Credit Hours:** 4**Max credits per semester:** 4**Max credits per degree:** 4**Grading Option:** Graded**Prerequisite for:** STAT 301; STAT 325; STAT 412**Experiential Learning:** Research**STAT 218 Introduction to Statistics****Prerequisites:** Removal of all entrance deficiencies in mathematics.

Credit towards the degree may be earned in only one of CRIM 300 or ECON 215 or ECON 215H or EDPS 459 or STAT 218

Notes: Credit toward the degree cannot be earned in STAT 218 if taken after or taken in parallel with STAT 380.**Description:** The practical application of statistical thinking to contemporary issues; collection and organization of data; probability distributions; statistical inference; estimation; and hypothesis testing.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**Prerequisite for:** ACCT 308; AECN 340; AECN 436; ASCI 330; BLAW 371H; BLAW 372; ECON 311A; ECON 311B; ECON 312A; ECON 312B; ECON 315; ECON 417; ECON 448; ECON 452; FDST 369; FINA 361; FINA 361A; FINA 361H; FORS 411; MNGT 430; MRKT 345; MRKT 350; MRKT 446; SCMA 331; SCMA 350; SCMA 350H; SOCI 333; STAT 318**ACE:** ACE 3 Math/Stat/Reasoning**STAT 251 Statistical Computing I: Data Wrangling****Prerequisites:** STAT 151**Description:** Techniques for processing, cleaning, and visualizing messy data. Topics include data reduction strategies, data transformations, combining multiple data sources, and special types of data (text, spatial, dates and times, hierarchical).**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded**Prerequisite for:** STAT 325; STAT 351; STAT 443; STAT 452; STAT 485**STAT 262 Probability for Statisticians****Prerequisites:** STAT 102; MATH 208**Description:** Probabilistic undergirding of statistical procedures including moments, common parametric families, marginal and conditional densities, sufficient statistics, modes of convergence, laws of large numbers and the central limit theorem and how they apply to estimators.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded**Prerequisite for:** STAT 301; STAT 414**STAT 301 Mathematical Statistics and Modeling I****Prerequisites:** MATH 314, STAT 212, STAT 262**Description:** Essential statistical theory and methods for professional statistical practice. Broad statistical topics include estimation and hypothesis testing, elementary Bayesian concepts, multiple linear regression, linear mixed effects models, analysis of variance (ANOVA), logistic regression, Poisson regression, and nonparametric methods.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded**Prerequisite for:** STAT 302; STAT 452; STAT 475; STAT 478**STAT 302 Mathematical Statistics and Modeling II****Prerequisites:** STAT 301**Notes:** A continuation of STAT 301.**Description:** Essential statistical theory and methods for professional statistical practice. Topics include data transformation, multiple sources of error, elementary model selection, generalized linear mixed models, Bayesian models, and other theory and methods deemed appropriate as statistical science continues to evolve.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded**Prerequisite for:** STAT 432; STAT 443; STAT 451; STAT 464; STAT 471; STAT 474; STAT 485; STAT 486**STAT 318 Introduction to Statistics II****Prerequisites:** STAT 218 or STAT 380**Description:** Tests for means/proportions of two independent groups, analysis of variance for completely randomized design, contingency table analysis, correlation, single and multiple linear regression, nonparametric procedures, design of experiments.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**Prerequisite for:** STAT 212; STAT 412; STAT 414; STAT 450

STAT 325 Statistical Collaboration I**Prerequisites:** STAT 212, STAT 251

Description: Introduction to the role and purpose of statistical consulting and interdisciplinary collaboration. Covers processes for successful interdisciplinary collaboration, including asking good questions, dealing with difficult clients, communicating statistics to non-statisticians, working in teams and determining solutions to answer the client's research question.

Credit Hours: 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded**Prerequisite for:** STAT 425**STAT 349 Technical Skills for Statisticians****Prerequisites:** STAT 151, STAT 102

Description: Creation of research reports, business reports, and executive summaries. Presentation strategies, consequences of statistical modeling for real-world decision making, and countering common misconceptions and errors in statistical reasoning. Focus on real-world applications in research, business, and public service.

Credit Hours: 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded**Prerequisite for:** STAT 351**STAT 351 Statistical Computing II: Data Management and Visualization****Prerequisites:** STAT 251, STAT 349

Description: Computational skills for management, visualization and analysis of large and complex data which are necessary for modern statistics. Includes a wide range of topics necessary for data analytics, including harvesting data from websites and common data structures, setting up and working with databases, and designing interactive data displays.

Credit Hours: 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded**Prerequisite for:** STAT 425; STAT 451; STAT 471**STAT 380 Statistics and Applications****Crosslisted with:** RAIK 270H

Prerequisites: A grade of P, C, or higher in MATH 107 or MATH 107H.

Notes: Credit toward the degree can not be earned in STAT 218 if taken after or taken in parallel with RAIK 270H/STAT 380.

Description: Probability calculus; random variables, their probability distributions and expected values; t, F and chi-square sampling distributions; estimation; testing of hypothesis; and regression analysis with applications.

Credit Hours: 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option

Prerequisite for: BLAW 371H; BLAW 372; BSAD 371H, RAIK 371H; CIVE 950; ECEN 850, ECEN 450; ECON 311A; ECON 311B; ECON 312A; ECON 312B; ECON 315; ECON 417; ECON 448; ECON 452; ENVE 430; FINA 361; FINA 361A; FINA 361H; MECH 343; MECH 380; MRKT 345; MRKT 350; MRKT 446; RAIK 370H, CSCE 370H; SCMA 331; SCMA 350; SCMA 350H; STAT 318; STAT 414

ACE: ACE 3 Math/Stat/Reasoning

STAT 412 Advanced Statistical Design**Prerequisites:** STAT 212 or STAT 318

Description: Advanced statistical designs, including complex treatment and experimental designs and analyses. Incomplete Blocks, Response Surfaces, Advanced Row-Column designs, Split-Plots, Repeated Measures, Crossover designs, Analysis of Covariance, and Meta-analysis.

Credit Hours: 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**STAT 414 Introduction to Survey Sampling****Prerequisites:** STAT 262 or STAT 318 or STAT 380

Description: Sampling frames, sampling methodology, questionnaire design. Basics of standard sampling plans including simple random sampling, ratio estimators, stratified sampling, and cluster sampling. More advanced topics may include complex surveys, nonresponse, confidentiality problems, and adaptive methods.

Credit Hours: 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**STAT 425 Statistical Collaboration II****Prerequisites:** STAT 325; STAT 351

Description: Practical experience in applying collaboration skills, working with domain experts to strategically plan and analyze the domain experts' research data. Collaboration with the domain expert will include proposing a design and sample size for a research study, determination and implementation of appropriate statistical analyses, and summarization and presentation of analysis results.

Credit Hours: 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded**ACE:** ACE 10 Integrated Product**STAT 430 Sensory Evaluation****Crosslisted with:** FDST 430, FDST 830, STAT 830**Prerequisites:** Introductory course in statistics.

Description: Food evaluation using sensory techniques and statistical analysis.

Credit Hours: 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**Course and Laboratory Fee:** \$10**STAT 432 Introduction to Spatial Statistics****Prerequisites:** STAT 302 or STAT 463 (could be concurrent to either)

Description: Introduces statistical analysis of spatial and spatiotemporal data. Topics include statistical theory, methods and applications for geostatistical, lattice and point processes. The focus is on methods and applications, but necessary and essential theories and proofs will also be covered.

Credit Hours: 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option

STAT 442 Computational Biology**Crosslisted with:** BIOC 842, STAT 842, BIOC 442**Prerequisites:** Any introductory course in biology, or genetics, or statistics.**Description:** Databases, high-throughput biology, literature mining, gene expression, next-generation sequencing, proteomics, metabolomics, system biology and biological networks.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**STAT 443 Statistical Analysis of Genomics Data****Prerequisites:** STAT 251, STAT 302**Notes:** Familiarity with R or Python highly recommended**Description:** Introduction to basic statistical analyses in bioinformatics. Techniques for processing and analysis of commonly occurring genomic data types such as GWAS, micro-arrays, mass. spec, and RNAseq. Estimation of gene networks and visualization of data and results from analysis.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**STAT 450 Introduction to Regression Analysis****Prerequisites:** STAT 301 or STAT 463**Notes:** Previous knowledge of matrix algebra is beneficial.**Description:** Practical tools and techniques for building linear regression models using real-world data and assessing their validity; necessary theory and supporting proofs will also be covered. Topics include introduction of simple/multiple linear regression, parameter estimation and inference in both frequentist and Bayesian frameworks, model diagnostics, and variable selection.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**Prerequisite for:** STAT 475; STAT 478**STAT 451 Development of Statistical Software****Prerequisites:** STAT 302, STAT 351**Notes:** ACE 10 scholarly product will be a statistical software package which fills a need in the ecosystem.**Description:** Advanced statistical software development. Packaging code into functions, intelligent software design, compiled languages to speed up code, development and release cycles.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded**ACE:** ACE 10 Integrated Product**STAT 452 Advanced Computational Statistics****Prerequisites:** STAT 251, STAT 301**Description:** Comprehensive treatment of modern and classical computational statistics, including algorithms for statistical prediction, inference, numerical optimization, Markov Chain Monte Carlo methods, bootstrapping and computing tools for big data problems.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**STAT 462 Introduction to Mathematical Statistics I: Distribution Theory****Prerequisites:** Grade of C or better in MATH 208 or MATH 107H.**Notes:** STAT 380 or equivalent is strongly recommended.**Description:** Sample space, random variable, expectation, conditional probability and independence, moment generating function, special distributions, sampling distributions, order statistics, limiting distributions, and central limit theorem.**Credit Hours:** 4**Max credits per semester:** 4**Max credits per degree:** 4**Grading Option:** Graded with Option**Offered:** FALL**Prerequisite for:** STAT 463**STAT 463 Introduction to Mathematical Statistics II: Statistical Inference****Prerequisites:** C or better in STAT 462**Description:** Interval estimation; point estimation, sufficiency, and completeness; Bayesian procedures; uniformly most powerful tests, sequential probability ratio test, likelihood ratio test, goodness of fit tests; elements of analysis of variance and nonparametric tests.**Credit Hours:** 4**Max credits per semester:** 4**Max credits per degree:** 4**Grading Option:** Graded with Option**Offered:** SPRING**Prerequisite for:** STAT 432; STAT 450; STAT 486**STAT 464 Model Selection and Prediction****Prerequisites:** STAT 302**Description:** Methods for selecting models applicable to real-world problems. Prediction as a modeling goal, models for prediction as opposed to inference. Methods for emerging data types, such streaming data, social network data, censored data, and others.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded**STAT 471 Analysis of Messy Data****Prerequisites:** STAT 302, STAT 351**Description:** Analysis of complex, real-world data sets. Analysis techniques will vary depending on interest and availability of data sets.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded**ACE:** ACE 10 Integrated Product**STAT 474 Introduction to Nonparametric Statistics****Prerequisites:** STAT 302**Description:** Most commonly used nonparametric techniques in statistics including rank-based methods for testing and estimation, nonparametric estimators of parameters, distributions, and curves, assessing the properties of data, and permutation tests including how to cope with multiple comparisons. Comparisons between methods will be emphasized throughout.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option

STAT 475 Introduction to Categorical Data Analysis**Prerequisites:** STAT 301 or STAT 450**Description:** Introduction to methodology for analyzing categorical data, including contingency table methods, binary regression, multinomial regression, and loglinear regression.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**STAT 478 Introduction to Time Series Analysis****Prerequisites:** STAT 301 or STAT 450**Description:** A basic introduction to modern time series analysis including time series regression and exploratory data analysis, the classical decomposition, ARIMA models, model identification/estimation/forecasting, seasonality, Fourier analysis, spectral estimation, and state space models.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**STAT 485 Statistical Learning****Prerequisites:** STAT 251, STAT 302**Notes:** Proficiency in a statistical computing language may replace

STAT 251

Description: An introduction to supervised and unsupervised methods for statistical learning and data mining. Bias-variance trade-off, classification, regression, factor analysis, and neural networks for modeling and prediction.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**STAT 486 Introduction to Bayesian Analysis****Prerequisites:** STAT 302 or STAT 463**Description:** Principles of Bayesian analysis including forming posteriors from priors and likelihoods. Bayesian estimation, testing, linear regression, and hierarchical models. Computing posterior distributions using existing software and standard classes of algorithms such as MCMC.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded with Option**STAT 494 Topics in Statistics and Probability****Prerequisites:** Permission.**Description:** Special topics in either statistics or the theory of probability.**Credit Hours:** 1-5**Min credits per semester:** 1**Max credits per semester:** 5**Max credits per degree:** 24**Grading Option:** Graded with Option**STAT 496 Independent Study****Prerequisites:** Prior arrangement with a faculty member and submission of proposed study plan to department office.**Credit Hours:** 1-5**Min credits per semester:** 1**Max credits per semester:** 5**Max credits per degree:** 5**Grading Option:** Graded with Option**STAT 499 Undergraduate Thesis****Prerequisites:** Permission**Description:** Independent research project carried out under the guidance of a faculty member in the Department of Statistics. Culminates in the presentation of a thesis to the department.**Credit Hours:** 3**Max credits per semester:** 3**Max credits per degree:** 3**Grading Option:** Graded**ACE:** ACE 10 Integrated Product