STATISTICS MINOR (ASC)

Description
Statistics is the science of data collection, classification, analysis and interpretation. It has evolved into a core discipline for a well-rounded liberal arts education, and is of central importance to nearly all of the biological, physical and social sciences. The Department of Statistics offers introductory courses to acquaint students from all disciplines with the essential elements of statistical thinking.

The department offers a minor in statistics. The minor is a useful complement for many majors. In addition, the minor provides background beneficial for graduate study in statistics. Career opportunities for statisticians with masters and doctoral degrees abound in industry, government and education. Employers include pharmaceutical, health and medical organizations, quality improvement in manufacturing and service, marketing and opinion research, credit and security risk analysis, agribusiness, various governmental agencies including Environmental Protection, Food and Drug Administration, Departments of Census, Energy, Agriculture, and Homeland Security, and emerging fields ranging from bioinformatics to statistical applications in sports.

Graduate Work. The following advanced degrees are offered: master of science and doctor of philosophy in statistics. For details, see the Graduate Catalog.

College Requirements

College Admission

College Admission
The entrance requirements for the College of Arts and Sciences are the same as the UNL General Admission Requirements. Students who are admitted through the Admission by Review process may have certain conditions attached to their enrollment at UNL. These conditions are explained under “Removal of Deficiencies.”

In addition to these requirements, the College of Arts and Sciences strongly recommends a third and fourth year of one foreign language. Four years of high school coursework in the same language will fulfill the College of Arts and Sciences’ language requirement. It will also allow students to continue language study at a more advanced level at UNL, and provide more opportunity to study abroad.

Transfer Students
To be considered for admission as a transfer student, Nebraska resident or nonresident, students 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 graduated from high school January 1997 and after must also meet the UNL General Admission Requirements. Those transfer students who graduated before January 1997 must have completed high school, 3 years of English, 2 years of the same foreign language, 2 years of algebra, and 1 year of geometry. Transfer students who have completed less than 12 credit hours of college study must also submit either their ACT or SAT scores.

Ordinarily, hours earned at a similarly accredited college or university are applicable to the UNL degree. The College, however, will evaluate all hours submitted on an application for transfer, and reserves the right to accept or reject any of them, based upon its exclusion and restriction policies. Sixty is the maximum number of hours the University will accept on transfer from a two-year college or international institution. Transfer credit in the major or minor must be approved by the departmental advisor on a Request for Substitution Form to meet specific course requirements, group requirements, or course level requirements in the major or minor. At least half of the hours in the major field must be completed at the University regardless of the number of hours transferred.

The College of Arts and Sciences will accept no more than 15 semester hours of C- and D grades from other schools. The C- and D grades cannot be applied toward requirements for a major or minor. This policy does not apply to the transfer of grades from UNO or UNK to UNL. All D grades may be transferred from UNO or UNK, but they are not applicable to a major or minor.

Readmitted Students
UNL students who choose not to take courses for more than 2 consecutive terms, must reapply to UNL. Students readmitted to the College of Arts and Sciences will follow the requirements stated in the catalog for the academic year of readmission and re-enrollment as a degree-seeking student in Arts and Sciences. In consultation with advisors, a student may choose to follow a catalog for any academic year in which they are admitted to and enrolled as a degree-seeking student at UNL in the College of Arts and Sciences. Students must complete all degree requirements from a single catalog year. Beginning in 1990-1991, the catalog which a student follows for degree requirements may not be more than 10 years old at the time of graduation.

Admission Deficiencies/Removal of Deficiencies
Students must remove entrance deficiencies in geometry and foreign language as soon as possible, and before graduating from the College of Arts and Sciences. For questions and more information, students should consult a college advisor in the Academic and Career Advising Center in 107 Oldfather Hall.

Removing Foreign Language Deficiencies
Students must complete the second semester of a first year language sequence to clear the deficiency and the second semester of the second year language sequence to complete the college graduation requirement in language.

Removing Geometry Deficiencies
A deficiency of one year of geometry can be removed by taking high school geometry courses through an approved independent study program, or by completing a geometry course from an accredited community college or a four-year institution. Neither of these options will count for college credit.

College Degree Requirements

College Distribution Requirements

Bachelor of Arts or Bachelor of Science (16 hours + Language)
The College of Arts and Sciences distribution requirements are designed to further the purposes of liberal education by encouraging study in several different areas within the College. All requirements are in addition to University ACE requirements. A student may not use a single course to satisfy more than one of the following five distribution requirements. A student cannot use a single course to satisfy both an ACE outcome and a College distribution requirement. A student cannot use a course from their primary major to satisfy the Breadth Requirement (F), but may apply an ancillary requirement of the primary major or a course from their second major toward this requirement. Independent study or reading courses and internships cannot be used to satisfy distribution requirements. To see a complete list of excluded courses, run a degree audit through MyRED.
Courses from interdisciplinary programs will count in the same area as courses from the home/cross-listed department(s).

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
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<tbody>
<tr>
<td>CDR A - Written Communication</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CDR B and BL - Natural, Physical, and Mathematical Sciences with Lab</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>CDR C - Humanities</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CDR D - Social Science</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>CDR E - Language</td>
<td>0-16</td>
<td></td>
</tr>
<tr>
<td>CDR F - Additional Breadth</td>
<td>3</td>
<td></td>
</tr>
</tbody>
</table>

Credit Hours Subtotal: 16-32

1. See degree audit or a College of Arts and Sciences advisor for approved geography and anthropology courses that apply as natural science.
2. Language courses numbered 210 or below apply only for the foreign language requirement.
3. See degree audit or College of Arts and Sciences advisor for list of natural/physical science courses in anthropology, geography, and psychology that do not apply as social science.

The bachelor of science degree requires students to complete 60 hours in mathematical, physical and natural sciences. Approved courses for scientific base credit come from the following College of Arts and Sciences disciplines: actuarial science, anthropology (selected courses), astronomy, biochemistry (excluding BIOL 101), biological sciences (excluding BIOS 203), chemistry (excluding CHEM 101), computer science (excluding CSCE 10), geography (selected courses), geology, life sciences, mathematics (excluding courses below MATH 104), meteorology, microbiology, physics and statistics.

See your degree audit or a College of Arts and Sciences advisor for a complete list including individual classes that fall outside of the disciplines listed above. Up to 12 hours of scientific and technical courses offered by other colleges may be accepted toward this requirement with approval of a college advisor.

Foreign Languages/Language Requirement

Languages Exemption Policy
UNL and the College of Arts and Sciences will exempt or waive students from the UNL entrance requirement of two years of the same foreign language or from the College’s language distribution requirement based on documentation only. The following are the options and procedures for documentation:

High School Transcripts
For the University entrance requirement, students must show an official high school transcript with two or more years of the same foreign language.

For the College of Arts and Sciences College Distribution Requirement E-Language, students must show an official high school transcript with four or more years of the same foreign language in high school, or show evidence of graduation from a non-English-speaking foreign high school. Students whose native language is not English must show English as a Second Language study on an official high school transcript. Four years of ESL at the high school level (9th, 10th, 11th and 12th grades) will be the basis for a waiver of the CDR E Language requirement.

Proficiency Examination at UNL
For the University entrance requirement, students who do not have transcript documentation can request to take a proficiency exam in the language. (This is not the same test as the Modern Languages Placement Exam.) However, UNL will provide testing only in the languages it teaches. Currently, these languages are: Arabic, French, German, Greek, Japanese, Latin, Omaha, Russian, and Spanish. A student who has completed the fourth-year level of one foreign language in high school is exempt from the languages requirement.

The Department of Modern Languages will oversee the test and provide written documentation to the Arts and Sciences Advising Center the level of proficiency passed.

Distance Education
For the University entrance requirement, students without transcript documentation who claim proficiency in a language not taught at UNL, have the option of seeking out a distance education program in languages. If the student completes the equivalent of 102 from an approved distance education program, the student will meet the UNL entrance requirement. The student must have the course work approved before he/she takes/completes the course as equivalent to 102 by a College advisor. The student then completes the course and has the distance education program send the transcript to the Admissions Office.

The Department of Modern Languages will oversee the test and provide written documentation to the Arts and Sciences Advising Center the level of proficiency passed.

For the College of Arts and Sciences College Distribution Requirement E-Language, the student can seek out a distance education program and complete the equivalent of the 202-level course. The student must submit the request on the College Request for Substitution form and have the
course work approved by a College advisor. The student then completes the course and has the distance education program send the transcript to the Admissions Office.

Third Language Option
If a student demonstrates knowledge of two foreign languages at the 102 level, the College of Arts and Sciences may consider waiving two semesters of the four semester College Distribution Requirement E-Languages requirement. If this waiver were granted, the student would then be required to complete 101 and 102 in another, 3rd foreign language at UNL.

Minimum Hours Required for Graduation
A minimum of 120 semester hours of credit is required for graduation from the College of Arts and Sciences. A total grade point average of at least 2.0 is required.

Grade Rules
Restrictions on C- and D Grades
The College will accept no more than 15 semester hours of C- and D grades from other schools except for UNO and UNK. No transfer C- and D grades can be applied toward requirements in a major or a minor. No UNL C- and D grades can be applied toward requirements in a major or a minor.

Pass/No Pass Privilege
University regulations for the Pass/No Pass (P/N) privilege state:

- The Pass/No Pass option is designed for your use by seeking to expand your intellectual horizons by taking courses in areas where you may have had minimal preparation.
- Neither the P nor the N grade contribute to your GPA.
- P is interpreted to mean C or above.
- A change to or from a Pass/No Pass may be made until mid-term (see academic calendar for specific dates per term).
- The Pass/No Pass or grade registration cannot conflict with the policy of the professor, department, college, or University governing the grading option.
- Changing to or from Pass/No Pass requires using the MyRED system to change the grading option or filing a Drop/Add form with the Office of the University Registrar, 107 Canfield Administration Building. After mid-term of the course, a student registered for Pass/No Pass cannot change to a grade registration unless the Pass/No Pass registration is in conflict with the policy of the professor, department, college, or University governing Pass/No Pass.
- The Pass/No Pass grading option cannot be used for the removal of C- or D or F grades.

Pass/No Pass privileges in the College of Arts and Sciences are extended to students according to the following additional regulations:

- The college will permit no more than a total of 24 semester hours of P/N grades to be applied toward degree requirements. This total includes all Pass grades earned at UNL and other U.S. schools. NOTE: This 24-hour limit is more restrictive than the University regulation.

Grading Appeals
A student who feels that he/she has been unfairly graded must ordinarily take the following sequential steps in a timely manner, usually by initiating the appeal in the semester following the awarding of the grade:

1. Talk with the instructor concerned. Most problems are resolved at this point.
2. Talk to the instructor’s department chairperson.
3. Take the case to the Grading Appeal Committee of the department concerned. The Committee should be contacted through the department chairperson.
4. Take the case to the College Grading Appeals Committee by contacting the Dean’s Office, 1223 Oldfather Hall.

Course Level Requirements
Courses Numbered above 299
Thirty of the 120 semester hours of credit must be in courses numbered above 299. Of the 30 hours above 299, 15 hours (1/2) must be completed in residence at UNL.

Graduate Courses
Seniors in the University who have obtained in advance the approval of the dean for Graduate Studies may receive up to 12 hours credit for graduate courses taken in addition to the courses necessary to complete their undergraduate work, provided that such credits are earned within the calendar year prior to receipt of the baccalaureate. For procedures, inquire at the Office of Graduate Studies.

Course work taken prior to receipt of the baccalaureate may not always be accepted for transfer to other institutions as graduate work.

Residency
Residency Requirement and Open Enrollment and Summer Independent Study Courses
Students must complete at least 30 of the 120 total hours for their degree at UNL. Students must complete at least 1/2 of their major course work including 6 hours above 299 in their major, and 15 of the 30 hours required above 299 in residence. Credit earned during education abroad may be used toward the residency requirement if students register through UNL and participate in prior-approved education abroad programs. UNL open enrollment and summer independent study courses count toward residence.

ACE Requirements
Consistent with the mission and values of the University, ACE is based on a shared set of four institutional objectives and ten student learning outcomes. The ACE program was approved by faculty in all eight undergraduate colleges and endorsed by the Faculty Senate, the student government, and the Academic Planning Committee in January 2008 for implementation in the fall 2009. ACE aligns with current national initiatives in general education.

Key characteristics of ACE demonstrate the benefits of the program to students:
Students receive a broad education with exposure to multiple disciplines, critical life skills and important reasoning, inquiry, and civic capacities.

ACE is simple and transparent for students, faculty and advisors. Students complete the equivalent of 3 credit hours for each of the ten student learning outcomes.

Students connect and integrate their ACE experiences with their selected major.

Students can transfer all ACE certified courses across colleges within the institution to meet the ACE requirement and any course from outside the institution that is directly equivalent to a UNL ACE-certified course. Courses from outside institutions without direct equivalents may be considered with appropriate documentation for ACE credit (see academic advisor).

ACE allows faculty to assess and improve their effectiveness and facilitate students’ learning.

ACE Institutional Objectives and Student Learning Outcomes
To meet the ACE Program requirement, a student will complete a minimum of 3 credit hours for each of the ten ACE Student Learning Outcomes (a total of 30 ACE credit hours). See the ACE website at: http://ace.unl.edu for the most current information and the most recently certified courses.

Catalog Rule
Students must fulfill the requirements stated in the catalog for the academic year in which they are first admitted to and enrolled as a degree-seeking student at UNL. 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 UNL in the College of Arts and Sciences. Students must complete all degree requirements from a single catalog year. Beginning in 1990-1991 the catalog which a student follows for degree requirements may not be more than 10 years old at the time of graduation.

Requirements for Minor Offered by Department
Select either Track 1 or Track 2 for completion of the minor.

<table>
<thead>
<tr>
<th>Track 1</th>
<th>STAT 462 Introduction to Mathematical Statistics I: Distribution Theory</th>
<th>4</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>STAT 463 Introduction to Mathematical Statistics II: Statistical Inference</td>
<td>4</td>
</tr>
<tr>
<td>Select at least 6 hours of the following:</td>
<td>STAT 318 Introduction to Statistics II</td>
<td>3</td>
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<td></td>
<td>STAT 380 Statistics and Applications</td>
<td>3</td>
</tr>
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<td></td>
<td>STAT 412 Introduction to Experimental Design</td>
<td>3</td>
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<tr>
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<td>STAT 414 Introduction to Survey Sampling</td>
<td>3</td>
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<td>STAT 450 Introduction to Regression Analysis</td>
<td>3</td>
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<td></td>
<td>STAT 494 Topics in Statistics and Probability</td>
<td>3</td>
</tr>
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<td></td>
<td>STAT 496 Independent Study</td>
<td>3</td>
</tr>
<tr>
<td>Credit Hours Subtotal:</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Total Credit Hours</td>
<td>14</td>
<td></td>
</tr>
</tbody>
</table>

| Track 2          | STAT 218 Introduction to Statistics | 3 |
| Select at least 9 hours of the following: | STAT 412 Introduction to Experimental Design | 3 |
|                  | STAT 414 Introduction to Survey Sampling | 3 |
|                  | STAT 450 Introduction to Regression Analysis | 3 |
|                  | STAT 462 Introduction to Mathematical Statistics I: Distribution Theory | 3 |
|                  | STAT 463 Introduction to Mathematical Statistics II: Statistical Inference | 3 |
|                  | STAT 494 Topics in Statistics and Probability | 3 |
|                  | STAT 496 Independent Study | 3 |
| Credit Hours Subtotal: | 15 |
| Total Credit Hours | 15 |

Alternative classes may be substituted if approved by the Department of Statistics curriculum committee.

Grade Rules
C- and D Grades
A grade of C or better must be earned in all courses in the minor.

Pass/No Pass
No courses taken for Pass/No Pass credit will be applicable to the minor.

STAT 218 Introduction to Statistics
Prerequisites: Removal of all entrance deficiencies in mathematics.
Notes: Credit toward the degree may be earned in only one of: CRIM 300 or ECON 215 or EDPS 459 or SOCI 206. Credit toward the degree cannot be earned in STAT 218 if taken after or taken in parallel with STAT/MATH 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
Format: LEC
Prerequisite for: ABUS 341, MRKT 341, ACCT 308, AECN 436, ASCI 330, BLAW 371; BLAW 371H; BLAW 372; ECON 311; FINA 361; FINA 361H; FORS 411; MNGT 301; MNGT 301H; MRKT 345; MRKT 350; MRKT 446; NUTR 486, NUTR 886; SCMA 331; SCMA 335; SCMA 350; SCMA 350H; SCMA 350L
ACE: ACE 3 Math/Stat/Reasoning

STAT 318 Introduction to Statistics II
Prerequisites: STAT 218 or equivalent.
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
Format: LEC
Prerequisite for: STAT 802
STAT 380 Statistics and Applications
Crosslisted with: MATH 380, MATH 380H, STAT 380H, RAiK 270H
Prerequisites: MATH 107 or 107H
Notes: Credit toward the degree can not be earned in STAT 218 if taken after or taken in parallel with STAT/Math 380.
Description: Probability calculus; random variables, their probability distributions and expected values; t, F and chi-square sampling distributions; estimation; testing of hypotheses; and regression analysis with applications.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: ABUS 341, MRKT 341; BLAW 371; BLAW 371H; BLAW 372; ECEN 325; ECEN 355; ECEN 850; ECEN 450; ECON 311; FINA 361; FINA 361H; MATH 809, MATH 409; MECH 343; MNGT 301; MNGT 301H; MRKT 345; MRKT 350; MRKT 446; SCMA 331; SCMA 335; SCMA 350; SCMA 350H; SCMA 350L
ACE: ACE 3 Math/Stat/Reasoning
Groups: Advanced Mathematics Courses

STAT 380H Statistics and Applications
Crosslisted with: MATH 380, MATH 380H, STAT 380, RAiK 270H
Prerequisites: MATH 107 or 107H
Notes: Credit toward the degree can not be earned in STAT 218 if taken after or taken in parallel with STAT/Math 380.
Description: Probability calculus; random variables, their probability distributions and expected values; t, F and chi-square sampling distributions; estimation; testing of hypotheses; and regression analysis with applications.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: ABUS 341, MRKT 341; BLAW 371; BLAW 371H; BLAW 372; ECEN 325; ECEN 355; ECEN 850, ECEN 450; ECON 311; FINA 361; FINA 361H; MATH 809, MATH 409; MECH 343; MNGT 301; MNGT 301H; MRKT 345; MRKT 350; MRKT 446; SCMA 331; SCMA 335; SCMA 350; SCMA 350H; SCMA 350L
ACE: ACE 3 Math/Stat/Reasoning
Groups: Advanced Mathematics Courses

STAT 412 Introduction to Experimental Design
Prerequisites: STAT 380.
Description: Survey of elementary experimental designs and their analyses completely randomized, randomized block, factorial, and split-plot designs.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

STAT 414 Introduction to Survey Sampling
Prerequisites: STAT/MATH 380 or IMSE 321 or permission.
Description: Sampling Techniques: simple random sampling, sampling proportions, estimation of sample size, stratified random sampling, ratio and regression estimates.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC
Prerequisite for: ACTS 401; STAT 463

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
Format: LEC

STAT 432 Introduction to Spatial Statistics
Prerequisites: STAT 218 or equivalent.
Description: Spatial point patterns, test of randomness, Moran’s I statistic and similar measures, checking assumptions for independence of observations, variography, estimation (point and global), Kriging, nearest neighbor techniques, cokriging, mixed models and their role in designed spatial experiments.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

STAT 442 Computational Biology
Crosslisted with: BIOC 842, STAT 842, BIOC 442
Prerequisites: Any introductory course in biology, or genetics, or mathematics.
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
Format: LEC

STAT 450 Introduction to Regression Analysis
Prerequisites: STAT/MATH 380 or IMSE 321, and knowledge of matrix algebra.
Description: General linear models for estimation and testing problems, analysis and interpretation for various experimental designs.
Credit Hours: 3
Max credits per semester: 3
Max credits per degree: 3
Format: LEC

STAT 462 Introduction to Mathematical Statistics I: Distribution Theory
Prerequisites: MATH 208 or 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
Format: LEC

Prerequisite for: ACTS 401; STAT 463
STAT 463 Introduction to Mathematical Statistics II: Statistical Inference
Prerequisites: 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
Format: LEC

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
Format: LEC

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
Format: IND