STATISTICS

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Programs Offered

Bachelor of Science in Statistics

Bachelor of Arts in Applied Statistics

Minor in Applied Statistics

Minor in Statistics

Preparation for Actuarial Examinations

Mathematics and statistics are rapidly growing disciplines whose concepts and applications play an ever-increasing part in modern life. Statistics has long been an essential tool in the physical sciences and has more recently been applied extensively in such diverse areas as medical and biological research, environmental studies, management science, behavioral and social sciences, and economics. Our basic curriculum is designed to give students the skills necessary for success in business, industry, government, and teaching. In addition, these degrees will provide a sound background for continuation of study toward advanced degrees in statistics, or a quantitative foundation for graduate school in disciplines such as business, economics, biology, or other fields.

The B.A. in applied statistics is intended for students pursuing a degree in another discipline such as economics, psychology, biology, or others. These students may be interested in taking more statistics classes to prepare themselves for jobs in industry or success in graduate school in another field. The B.A. allows upper-division units from another major to count as part of the "area of concentration," and is focused on developing practical skills such as regression analysis and ANOVA, and on gaining proficiency with statistical software packages such as SAS and SPSS. Students are strongly encouraged to earn the B.A. as part of a double major in a complementary field.

The B.S. in statistics is a rigorous program for students who intend to pursue a career as a statistician or who wish to go to graduate school in statistics or mathematics. Students earning the B.S. will learn the same practical skills as those taking the B.A. Additionally, they will take theoretical courses in linear algebra, analysis, mathematical statistics, and stochastic processes. This program follows the guidelines proposed by the American Statistical Association in the Curriculum Guidelines for Undergraduate Programs in Statistical Science.

Both programs will prepare students for work in areas including government and industry, biostatistics, actuarial work, and consultative problem-solving in modern industry.

Careers in Statistics and Actuarial Sciences

According to the American Statistical Association the demand for statisticians in the workforce is dramatically increasing. Statisticians can find employment in a variety of fields. Biomedical, pharmaceutical, engineering and marketing companies, and government agencies seek employees with statistical skills to analyze large data sets. Many students find lucrative jobs as SAS programmers.

In addition, statistics students with an interest in finance or economics will be interested in pursuing a career as an actuary. The courses in both the B.A. and B.S. provide a solid preparation for the first actuarial exam and the Applied Statistical Methods educational experience credit. Actuaries have been ranked in the top 5 careers in the US for salary and job satisfaction since 1988.

Learning Objectives for the B.A. and B.S.

- Describe data sets using appropriate numerical and graphical techniques;

- Develop mathematical tools necessary to perform statistical calculations and to understand distributions and statistical theory;

- Design experiments and survey sampling methods that allow results to be statistically analyzed to test hypotheses of interest;

- Determine which statistical analyses are suitable, perform the analyses using technology, and assess the validity of necessary assumptions and interpret the results;

- Construct and apply probability models for both discrete and continuous random variables; and
- Communicate with non-statisticians in written and oral formats to learn what a client is interested in ascertaining and to present the results from a statistical analysis.

Additionally, for the B.S. in statistics:

- Construct and verify mathematical proofs;
- Discuss properties of estimators and explain the rationale and assumptions behind statistical procedures; and
- Apply stochastic models to solve real-world problems.

B.S. in Statistics

(See page 237 for a sample four-year program.)

Degree Requirements	Units
General education (50 units, 8 units covered by major requirements)	42
Major (includes 8 units in GE)	52
Electives	26
Total units needed for graduation	**120**

MATH 161 Differential and Integral Calculus I (B4)	4
MATH 165 Elementary Applied Statistics	4
MATH 211 Differential and Integral Calculus II	4
MATH 220 Reasoning and Proof (A3)	4
MATH 241 Linear Algebra with Applications in Differential Equations	4
MATH 261 Multivariable Calculus	4
MATH 265 Intermediate Applied Statistics with SPSS	4
MATH 322 Linear Algebra	4
MATH 340 Real Analysis I	4
MATH 345 Probability Theory	4
MATH 367 Statistical Consulting and Communication	2
MATH 381 Computing for Statistics: SAS Programming Language	2
MATH 445 Mathematical Statistics and Operations Research	4
MATH 465 Experimental Design and Regression Analysis	4
Total units in B.S. program	**52**

B.A. in Applied Statistics

(See page 238 for a sample four-year program.)

Degree Requirements	Units
General education (50 units, 4 units covered by major requirements)	46
Major (includes 4 units in GE)	38
Required Area of Concentration	12
Electives	24
Total units needed for graduation	**120**

MATH 161 Differential and Integral Calculus I (B4)	4
MATH 165 Elementary Applied Statistics	4
MATH 211 Differential and Integral Calculus II	4
MATH 241 Linear Algebra with Applications in Differential Equations	4
MATH 261 Multivariable Calculus	4

MATH 265 Intermediate Applied Statistics with SPSS	4
MATH 345 Probability Theory	4
MATH 367 Statistical Consulting and Communication	2
MATH 381 Computing for Statistics: SAS Programming Language	2
MATH 465 Experimental Design and Regression Analysis	4
MATH 467 Statistical Consulting, Communication, and Project Management	2
Total units in applied statistics program	**38**

Required Area of Concentration:

Upper-division courses in one other field chosen in consultation with and approved by an advisor in the Department of Mathematics and Statistics	12
Total units in B.A. program	**50**

Minor in Applied Statistics

Twenty units are required. These must include MATH 165, MATH 265, MATH 367, MATH 381, MATH 467, and at least 6 units from statistically relevant courses in the department or elsewhere at Sonoma State University chosen in consultation with and approved by an advisor in the Department of Mathematics and Statistics.

Minor in Statistics

Twenty units of mathematics or statistics are required, at least 6 of which must be at the upper-division level, not including MATH 300A, 300B, 330, 375, 395, or 399. Courses required for the minor are MATH 165, MATH 265, either MATH 367 or MATH 381, and either MATH 445 or MATH 465. Note that both MATH 445 and MATH 465 have multiple semesters of calculus as pre-requisites. Also note that students pursuing more than one minor offered by the Department of Mathematics and Statistics may not apply the units earned in a given course towards satisfying the requirements of more than one minor. Anyone who plans to pursue the Minor in Statistics should consult with an advisor no later than the end of the sophomore year in order to plan properly.

Actuarial Science Career Preparation

Students interested in a career in actuarial science can prepare for the first two actuarial examinations by taking the following courses:

1. For Actuarial Exam 1: MATH 161, MATH 211, MATH 261, and MATH 345.
2. For Actuarial Exam 2: MATH 303, BUS 370, BUS 470, and ECON 375.

Entry-Level Mathematics (ELM) Requirement

Unless exempted, the Entry-Level Mathematics Examination must be taken within the past two years before enrollment in any general education course or developmental mathematics course (MATH 35 or 45). The ELM results will place the student in the appropriate level of mathematics courses. Note that if placement in the developmental mathematics sequence is necessary, satisfactory completion of MATH 45 is required for placement in MATH 103, 104, 105, 111, 131, 141, 150, 160, 161, and 165. Please consult the Schedule of Classes or contact the Office of Testing Services for times and places of examination. The examination will be given in conjunction with the English Placement Test. For additional information, please see the Admissions section of this catalog.

Grading Policy in the Department of Mathematics and Statistics

Non-majors

All mathematics and statistics courses except MATH 35, 45, 103, 104, 105, 111, 131, 141, 150, 160, 161, and 165 are available in the Cr/NC grading mode to non-mathematics majors.

All Students

MATH 160w, 161w, 175, 210, 211w, 295, 330, 390, 395, and 499 are available only as Cr/NC.

Mathematics and Statistics Majors and Minors

A statistics major or minor must take all mathematics and statistics courses in the traditional grading mode, with the exceptions of courses offered only in the Cr/NC modes and any course taken as credit by challenge examination (please see more information on this in the Admissions section of this catalog).

Statistics Courses

Please see course titles and descriptions under the Mathematics section of this catalog.

Sample Four-Year Program for Bachelor of Science in Statistics

FRESHMAN YEAR: 31 Units

Fall Semester (16 Units)	*Spring Semester (15 Units)*
MATH 161 (B4) (4)	MATH 211 (4)
MATH 165 (4)	MATH 265 (4)
Freshman Learning Community (GE) (5)	Freshman Learning Community (GE) (4)
GE (3)	GE (3)

SOPHOMORE YEAR: 31 Units

Fall Semester (16 Units)	*Spring Semester (15 Units)*
MATH 241 (4)	MATH 261 (4)
MATH 367 (2)	MATH 322 (4)
MATH 220 (A3) (4)	GE (4)
GE (6)	Elective (3)

JUNIOR YEAR: 30 Units

Fall Semester (15 Units)	*Spring Semester (15 Units)*
MATH 345 (4)	MATH 381 (2)
Elective (4)	MATH 445 (4)
GE (4)	Elective (6)
UD GE (3)	UD GE (3)

SENIOR YEAR: 28 Units

Fall Semester (14 Units)	*Spring Semester (14 Units)*
MATH 340 (4)	MATH 465 (4)
UD GE (3)	Elective (6)
Elective (7)	GE (4)

TOTAL UNITS: 120

Sample Four-Year Program for
Bachelor of Arts in Applied Statistics

FRESHMAN YEAR: 28 Units

Fall Semester (13 Units)	*Spring Semester (15 Units)*
MATH 161 (B4) (4)	MATH 211 (4)
MATH 165 (4)	MATH 265 (4)
Freshman Learning	Freshman Learning
Community (GE) (5)	Community (GE) (4)
	GE (3)

SOPHOMORE YEAR: 31 Units

Fall Semester (15 Units)	*Spring Semester (16 Units)*
MATH 241 (4)	MATH 261 (4)
MATH 367 (2)	GE (9)
GE (6)	Elective (3)
Elective (3)	

JUNIOR YEAR: 31 Units

Fall Semester (16 Units)	*Spring Semester (15 Units)*
MATH 345 (4)	MATH 381 (2)
Area of Concentration (3)	MATH 465 (3)
Elective (6)	Area of concentration (3)
UD GE (3)	GE (3)
	UD GE (4)

SENIOR YEAR: 30 Units

Fall Semester (15 Units)	*Spring Semester (15 Units)*
MATH 467 (4)	Area of Concentration (3)
Area of Concentration (3)	GE (7)
UD GE (3)	Elective (5)
Elective (5)	

TOTAL UNITS: 120