

# DEPARTMENT OF STATISTICS AND DATA SCIENCE

## Mission Statement

The mission of the Department of Statistics and Data Science is to offer both undergraduate and graduate educational programs that are of high quality and meet the changing needs of the global community; to provide a supportive learning environment for students; to foster the success of our students in their professional careers; and to create an academic environment that stresses excellence in teaching, intellectual contributions, and service. The Department contributes to the missions of the College and the University through research and education in the quantitative sciences. Theory and analysis are applied to a variety of interdisciplinary problems to discover new approaches for meeting the challenges of decision-making in a global arena of expanding technology and information.

## Department Information

The disciplines of Statistics and Data Science are integral to modern decision-making processes. These interdisciplinary fields emphasize the use of quantitative methods and computers for analyzing, understanding, visualizing, and interpreting data. Statistical methods provide analytical tools for research in high-technology and biomedical industries, insurance, and government agencies. The Department of Statistics and Data Science offers a Bachelor of Science (B.S.) degree in Statistics and Data Science. The department also offers a minor in Statistics, which is open to all majors in the University.

## Degree-Specific Requirements

All program requirements should be unchanged from previous versions of the 2024-2026 Undergraduate Catalog. To confirm your degree requirements, you can visit DegreeWorks (<https://dworkswebprod.sis.utsa.edu/>) or consult your Advisor (<https://www.utsa.edu/advising/advisor/>).

All degree programs in the Department of Statistics and Data Science (p. 1) must complete all graduation requirements and adhere to department and college policies for the Carlos Alvarez College of Business (<http://catalog.utsa.edu/undergraduate/business/>) within the 2024-2026 undergraduate catalog.

- B.S. degree in Statistics and Data Science (p. 1)
  - Accelerated M.S. in Statistics and Data Science (p. 3)
- Accelerated M.S. in Data Analytics (p. 3)

## Bachelor of Science Degree in Statistics and Data Science

Statistics is a science that deals with principles and procedures for obtaining and processing information in order to make decisions in the face of uncertainty. In particular, it deals with collection, organization, analysis, and interpretation of numerical information to answer questions in almost every aspect of modern-day life. Statistical methods are used to address complex questions common in business, government, and science. Employers such as research divisions in pharmaceutical companies, clinical research units at medical centers, quality control or reliability departments in manufacturing companies, corporate planning

and financial analysis units, and government agencies require persons with advanced quantitative skills.

The Bachelor of Science (B.S.) degree in Statistics and Data Science provides students with access to such skills preparing them for careers as statistical analysts or for further graduate academic training. The minimum number of semester credit hours required for the Bachelor of Science degree in Statistics and Data Science is 120, at least 39 of which must be at the upper-division level.

## Core Curriculum Requirements (42 semester credit hours)

Students seeking the B.S. degree in Statistics and Data Science must fulfill University Core Curriculum requirements. The courses listed below satisfy both degree requirements and Core Curriculum requirements.

MAT 1213 Calculus I should be used to satisfy the core requirement in Mathematics (020). ECO 2023 Introductory Microeconomics should be used to satisfy the core requirement in Social and Behavioral Sciences (080).

This degree requires 120 hours. If students elect to take a course that satisfies both a Core and degree requirement, students may need to take an additional course to meet the 120 hours.

For a complete listing of courses that satisfy the Core Curriculum requirements, see Core Curriculum Component Area Requirements.

## Core Curriculum Component Area Requirements (<http://catalog.utsa.edu/undergraduate/bachelorsdegreeregulations/degreerequirements/corecurriculumcomponentarearequirements/>)

First Year Experience Requirement	3
Communication	6
Mathematics	3
Life and Physical Sciences	6
Language, Philosophy and Culture	3
Creative Arts	3
American History	6
Government-Political Science	6
Social and Behavioral Sciences	3
Component Area Option	3
<b>Total Credit Hours</b>	<b>42</b>

## Degree Requirements

Code	Title	Credit Hours
<b>A. Major Requirements</b>		<b>63</b>
1. Required courses in the computational and mathematical sciences		
MAT 1213	Calculus I <sup>1</sup>	
MAT 1223	Calculus II	
MAT 2213	Calculus III	
MAT 2233	Linear Algebra	
2. Required statistics courses		
STA 3003	Statistical Methods and Applications	
STA 3013	Applied Multivariate Analysis	
STA 3513	Probability and Statistics	
STA 3523	Mathematical Statistics for Inference	
STA 4713	Applied Regression Analysis	

3. Computational and Statistical Software Courses: (Choose 2 out of 3)

STA 4133	Introduction to Programming and Data Management in SAS
STA 4233	Introduction to Programming and Data Management in R
STA 4243	Data Exploratory Methods with Python

4. Select ten of the following

CS 4013 or CS 4023	Fundamentals of Software Fundamentals of Systems
STA 3313	Statistical Sampling
STA 4133	Introduction to Programming and Data Management in SAS
STA 4143	Data Mining and Predictive Modeling
STA 4233	Introduction to Programming and Data Management in R
STA 4243	Data Exploratory Methods with Python
STA 4643	Introduction to Stochastic Processes
STA 4723	Introduction to the Design of Experiments
STA 4753	Time-Series Analysis
STA 4803	Statistical Quality Control
STA 4903	Applied Survival Analysis
STA 4913	Independent Study in Statistics and Data Science
STA 4933	Internship in Statistics and Data Science
STA 4953	Special Topics in Statistics and Data Science
STA 4963	Actuarial Science Examination Preparation

**B. Support Work 18**

18 semester credit hours of electives in disciplines where statistics is actively applied and practiced, of which at least nine (9) semester credit hours must be upper division. Students can use these credit hours to complete a minor or finish a specialization. Students are encouraged to discuss their interests in specializations with the academic advisor. Some examples (but not limited to these) of such specializations are shown below.

1. Specialization in Actuarial Science:

ACC 2013	Principles of Accounting I
ECO 2013	Introductory Macroeconomics
ECO 2023	Introductory Microeconomics
FIN 3013	Principles of Business Finance
FIN 3063	Computer Modeling of Financial Applications
STA 4963	Actuarial Science Examination Preparation

2. Specialization in Biology:

BIO 2313	Genetics
BIO 3283	Ecology
BIO 3323	Evolution
BIO 3333	Plants and Society
BIO 4033	Conservation Biology
NDRB 3433	Neurobiology

**Total Credit Hours 81**

<sup>1</sup> This course also fulfills the university's core course requirement.

## Course Sequence Guide for B.S. Degree in Statistics and Data Science

This course sequence guide is designed to assist students in completing their UTSA undergraduate business degree requirements. This is a term-by-term sample course guide. Students must satisfy other requirements in their catalog and meet with their academic advisor for an individualized degree plan. Progress within this guide depends upon such factors as course availability, individual student academic preparation, student time management, work obligations, and individual financial considerations. Students may choose to take courses during Summer terms to reduce course loads during long semesters.

### Recommended Four-Year Academic Plan

#### First Year

Fall		Credit Hours
MAT 1213	Calculus I (core and major)	3
AIS 1233	AIS: Business (core)	3
WRC 1013	Freshman Composition I (core)	3
American History (core)		3
Life & Physical Sciences (core)		3
<b>Credit Hours</b>		<b>15</b>

#### Spring

MAT 1223	Calculus II (major)	3
STA 3003	Statistical Methods and Applications (major)	3
WRC 1023	Freshman Composition II (core)	3
American History (core)		3
Life & Physical Sciences (core)		3
<b>Credit Hours</b>		<b>15</b>

#### Second Year

##### Fall

MAT 2213	Calculus III (major)	3
STA 3513	Probability and Statistics (major)	3
Language, Philosophy & Culture (core)		3
Creative Arts (core)		3
Course option in computational and statistical software (major)		3
<b>Credit Hours</b>		<b>15</b>

##### Spring

MAT 2233	Linear Algebra (major)	3
STA 3523	Mathematical Statistics for Inference (major)	3
ECO 2023	Introductory Microeconomics (suggested core)	3
Government-Political Science (core)		3
Course option in computational and statistical software (major)		3
<b>Credit Hours</b>		<b>15</b>

#### Third Year

##### Fall

STA 3013	Applied Multivariate Analysis (major)	3
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Upper-division Statistics elective (major)	3
Upper-division Statistics elective (major)	3
Course option in specialization track (elective or support work)	3
Government-Political Science (core)	3
<b>Credit Hours</b>	<b>15</b>
<b>Spring</b>	
Upper-division Statistics elective (major)	3
Upper-division Statistics elective (major)	3
Upper-division Statistics elective (major)	3
Course option in specialization track (elective or support work)	3
Component Area Option (core)	3
<b>Credit Hours</b>	<b>15</b>
<b>Fourth Year</b>	
<b>Fall</b>	
STA 4713 Applied Regression Analysis (major)	3
Upper-division Statistics elective (major)	3
Upper-division Statistics elective (major)	3
Course option in specialization track (elective or support work)	3
Course option in specialization track (elective or support work)	3
<b>Credit Hours</b>	<b>15</b>
<b>Spring</b>	
Upper-division Statistics elective (major)	3
Upper-division Statistics elective (major)	3
Upper-division Statistics elective (major)	3
Course option in specialization track (elective or support work)	3
Course option in specialization track (elective or support work)	3
<b>Credit Hours</b>	<b>15</b>
<b>Total Credit Hours</b>	<b>120</b>

## Accelerated Master of Science in Statistics and Data Science

The Department of Statistics and Data Science and the College of AI, Cyber and Computing (CAICC) offer an Accelerated Statistics and Data Science Program tailored to UTSA students with exceptional motivation and qualifications. Designed to facilitate a seamless transition into a master's program and provide an expedited admission process, this program allows participants to initiate their graduate studies as early as the senior year of their undergraduate education.

The benefit of the accelerated program is it allows students to complete some graduate courses while still earning their undergraduate degree. In addition, students have the potential to reduce their time until graduation (e.g., students can start completing their graduate-level coursework during their senior year) and save money (e.g., students are not charged an application fee and potentially could double count one course), and creates an easier transition into graduate school (i.e., a known admission into graduate school while in their undergraduate education and a constant connection with the UTSA faculty and staff).

## Program Admission Requirements

Applications to the Accelerated Program in Statistics and Data Science must meet the following criteria<sup>1</sup>: 1) a current UTSA student, 2) completion of 90 semester credit hours in the semester of application, 3) a minimum grade point average of 3.0, and 4) earn a bachelor's degree in a relevant STEM or business domains. Applicants must apply online<sup>2</sup> for the Accelerated Statistics and Data Science Program and will be provided additional information upon submission.

This program is tailored to cater to the following individuals:

- UTSA students who aspire to pursue a bachelor's degree with a strong mathematical (e.g., complete Calculus III and Linear Algebra) background and a Master of Science (M.S.) in Statistics and Data Science. After appropriate consultation and approval from the program advisor, these students could replace some of the required M.S. courses with graduate electives. This would remove unnecessary course repetition and allow students to customize the program to serve their professional needs better.

## Degree Requirements

### Bachelor's Degree Requirement

Students accepted into the Accelerated Statistics and Data Science Program must complete all the degree requirements associated with their bachelor's degree.

### M.S. Degree Requirement

Students accepted into the Accelerated Program in Statistics and Data Science are required to complete the standard degree requirement of the M.S. in Statistics and Data Science as listed in the Graduate Catalog (<http://catalog.utsa.edu/graduate/business/managementssciencestatistics/#degreestext>).

### Bachelor's/M.S. Classification

Upon acceptance into the Accelerated Statistics and Data Science Program, students are granted permission to enroll in graduate-level courses while still classified as undergraduates. Upon completing their bachelor's degree, students will receive a Keep Running with Us (KRWU) application to transition from undergraduate to graduate student status.

<sup>1</sup> These are the minimum criteria to be accepted into the Accelerated Program in Statistics and Data Science. After completing the online survey, a Statistics and Data Science faculty member will meet with each student to discuss their degree plan and the required expectations to be accepted into the program.

<sup>2</sup> Completing the survey is the first of two steps of the application process for the Accelerated Program in Statistics and Data Science. It connects students who are interested in the program with Statistics and Data Science faculty members, offers details about the program and the second step of the application process, fosters mentoring connections with Statistics and Data Science faculty members, and ultimately compiles a roster of students eligible for automatic admission into the M.S. in Statistics and Data Science program through KRWU.

## Accelerated Masters of Science in Data Analytics

The Accelerated Data Analytics Program is tailored to UTSA students with exceptional motivation and qualifications. Designed to facilitate a

seamless transition into a master's program and provide an expedited admission process, this program allows participants to initiate their graduate studies as early as the senior year of their undergraduate education.

The benefit of the accelerated program is it allows students to complete some graduate courses while still earning their undergraduate degree. In addition, students have the potential to reduce their time until graduation (e.g., students can start completing their graduate-level coursework during their senior year) and save money (e.g., students are not charged an application fee and potentially could double count one course), and creates an easier transition into graduate school (i.e., a known admission into graduate school while in their undergraduate education and a constant connection with the UTSA faculty and staff).

### Program Admission Requirements

Applications to the Accelerated Program in Data Analytics must meet the following criteria<sup>1</sup>: 1) a current UTSA student, 2) completion of 90 semester credit hours in the semester of application, 3) a minimum grade point average of 3.0, and 4) earn a bachelor's degree in a relevant STEM or business domains. Applicants must apply online<sup>2</sup> for the Accelerated Program in Data Analytics and will be provided additional information upon receipt of their submission.

This program is tailored to cater to the following individuals:

- UTSA students interested in enhancing their undergraduate education in business or STEM fields and gaining expertise in Data Analytics via a Master's degree. After appropriate consultation and approval from the program advisor, these students could replace some of the required Master of Science (M.S.) in Data Analytics courses with graduate electives. This would remove unnecessary course repetition and allow students to customize the program to better serve their professional needs.

### Degree Requirements

#### Bachelor's Degree Requirement

Students accepted into the Accelerated Program in Data Analytics are required to complete all the degree requirements associated with their bachelor's degree.

#### M.S. Degree Requirement

Students accepted into the Accelerated Program in Data Analytics are required to complete the standard degree requirement of the M.S. in Data Analytics as outlined in the Graduate Catalog (<http://catalog.utsa.edu/graduate/aicybercomputing/statisticsdatascience/>).

#### Bachelor's/M.S. Classification

Upon acceptance into the Accelerated Program in Data Analytics, students are granted permission to enroll in graduate-level courses while still classified as undergraduates. Upon completing their bachelor's degree, students will receive a Keep Running with Us (KRWU) application to transition from undergraduate to graduate student status.

<sup>1</sup> These are the minimum criteria to be accepted into the Accelerated Program in Data Analytics. After completing the online survey, a Data Analytics faculty member will meet with each student to discuss their degree plan and the required expectations to be accepted into the Accelerated Program in Data Analytics.

<sup>2</sup> Completing the survey is the first of two steps of the application process for the Accelerated Program in Data Analytics. It connects students who are interested in the program with Data Analytics faculty members, offers details about it and the second step of the application

process, fosters mentoring connections with Data Analytics faculty members, and ultimately compiles a roster of students eligible for automatic admission into the M.S. in Data Analytics program through KRWU.

## Minor in Statistics

The Minor in Statistics is open to all majors in the University. All students pursuing the minor must complete 18 semester credit hours.

Code	Title	Credit Hours
<b>A. Sequence options</b>		<b>6</b>
Select two courses from the following:		
1. Option 1		
STA 1403	Probability and Statistics for the Biosciences	
STA 3003	Statistical Methods and Applications	
2. Option 2		
POL 2703	Scope and Methods	
PSY 2073	Statistics for Psychology	
3. Option 3		
MS 1023	Business Statistics with Computer Applications I	
MS 3043	Business Statistics with Computer Applications II	
4. Option 4		
STA 3003	Statistical Methods and Applications	
and one of the following:		
STA 2303	Applied Probability and Statistics for Engineers	
STA 3513	Probability and Statistics	
<b>B. Select four of the following courses</b>		<b>12</b>
MS 3073	Business Intelligence and Analytics	
STA 3013	Applied Multivariate Analysis	
STA 3313	Statistical Sampling	
STA 3523	Mathematical Statistics for Inference	
STA 4133	Introduction to Programming and Data Management in SAS	
STA 4143	Data Mining and Predictive Modeling	
STA 4233	Introduction to Programming and Data Management in R	
STA 4713	Applied Regression Analysis	
STA 4723	Introduction to the Design of Experiments	
STA 4753	Time-Series Analysis	
STA 4803	Statistical Quality Control	
or MS 4363	Quality Management and Control	
STA 4903	Applied Survival Analysis	
STA 4933	Internship in Statistics and Data Science	
STA 4953	Special Topics in Statistics and Data Science	
<b>Total Credit Hours</b>		<b>18</b>

To declare a Minor in Statistics, obtain advice, and seek approval of substitutions for course requirements, students must consult with their academic advisor or the designated statistics faculty member.

## Statistics (STA) Courses

### **STA 1053. Basic Statistics. (3-0) 3 Credit Hours. (TCCN = MATH 1342)**

Prerequisite: Satisfactory performance on placement examination. Descriptive statistics; histograms; measures of location and dispersion; elementary probability theory; random variables; discrete and continuous distributions; interval estimation and hypothesis testing; simple linear regression and correlation; one-way analysis of variance, and applications of the chi-square distribution. May be applied toward the core curriculum requirement in Mathematics. Generally offered: Fall, Spring, Summer. Course Fees: BISP \$10; BTSI \$15.41; DL01 \$75; LRB1 \$15.41; LRC1 \$12.

### **STA 1403. Probability and Statistics for the Biosciences. (3-0) 3 Credit Hours.**

Prerequisite: A grade of "C-" or better in MAT 1193 or an equivalent. Probability and statistics from a dynamical perspective, using discrete-time dynamical systems and differential equations to model fundamental stochastic processes such as Markov chains and the Poisson processes important in biomedical applications. Specific topics to be covered include probability theory, conditional probability, Markov chains, Poisson processes, random variables, descriptive statistics, covariance and correlations, the binomial distribution, parameter estimation, hypothesis testing and regression. (Formerly STA 1404. Credit cannot be earned for both STA 1403 and STA 1404.) Generally offered: Fall, Spring, Summer. Course Fees: BISP \$10; BTSI \$15.41; LRB1 \$15.41; DL01 \$75.

### **STA 2303. Applied Probability and Statistics for Engineers. (3-0) 3 Credit Hours.**

Prerequisite: MAT 1223. Fundamental concepts of probability and statistics with practical applications to engineering problems. Emphasis on statistical distribution models used in reliability and risk analysis of engineering design; probabilistic reasoning; Bayes' theorem; bivariate and multivariate distributions and their applications. Generally offered: Fall, Spring. Course Fee: BISP \$10; BTSI \$15.41; LRB1 \$15.41; DL01 \$75.

### **STA 3003. Statistical Methods and Applications. (3-0) 3 Credit Hours.**

Prerequisite: Completion of MAT 1093 (or equivalent). Introduction to the Scientific Method, principles of sampling and experimentation, scales of measurement, summary statistics, introduction to basic probability, models for discrete and continuous data, simple simulations, fundamentals of hypothesis testing and confidence intervals, and introduction to analysis of variance and linear regression model. The course will emphasize data analysis and interpretation, and effective communication of results through reports or presentations. Generally offered: Fall, Spring, Summer. This course has Differential Tuition. Course Fee: DL01 \$75.

### **STA 3013. Applied Multivariate Analysis. (3-0) 3 Credit Hours.**

Prerequisite: MAT 2233, STA 3003, or equivalents. This course emphasizes application of statistics in organizations. Topics include but are not limited to multivariate normal distribution, tests on means, discriminant analysis, cluster analysis, principal components, and factor analysis. Use of software packages will be emphasized. Open to students of all disciplines. Generally offered: Spring. This course has Differential Tuition.

### **STA 3023. Mathematics for Statistics. (3-0) 3 Credit Hours.**

Prerequisite: MAT 1223 or an equivalent. This course discusses and reviews the classic mathematical methods and techniques to comprehend the advanced statistical concepts. Concepts include sequences, series, convergence, limit, continuity, derivative, optimization, the fundamental theorem of calculus, methods of integration, Taylor expansions, function of several variables, partial derivatives, and multivariate transformations. Other topics include vector and matrix algebra, determinants, inverse matrix, solving linear equations, orthogonality (projections, least-squares, Gram-Schmidt), eigenvalues and eigenvectors (diagonalization, symmetric/positive definite matrices), and singular value decomposition. (Formerly titled Statistical Mathematics.) This course has Differential Tuition.

### **STA 3313. Statistical Sampling. (3-0) 3 Credit Hours.**

Prerequisite: One of the following: MS 1023, STA 1053, STA 2303, STA 3003, or an equivalent. Research techniques for collecting quantitative data: sample surveys, designed experiments, simulations, and observational studies; development of survey and experimental protocols; measuring and controlling sources of measurement error. Generally offered: Fall. This course has Differential Tuition. Course Fee: DL01 \$75.

### **STA 3333. Introduction to Data Science and Analytics. (3-0) 3 Credit Hours.**

Prerequisite: One of the following: MS 1023, STA 1053, STA 1403, STA 2303, or an equivalent. Data science and analytics aim to harness the power of data and statistics for new insights. This course introduces the concepts and principles of data science and analytics through software-aided applications of common statistics-based methods, tools and techniques in various practical case studies. This course also provides students an opportunity to understand the data-driven decision making process, an overview of the data science lifecycle, and the Big Data ecosystem. Topics include popular statistical techniques and algorithms under the current paradigm of analytics (descriptive/diagnostic, predictive/prognostic, and prescriptive/optimization) and machine learning (supervised and unsupervised), applied in a wide variety of fields as demonstrated through case studies. With the application-oriented focus, students will gain hands-on experiences and develop essential skills in discovering, analyzing, visualizing, interpreting data, presenting and communicating results. This course has Differential Tuition.

### **STA 3513. Probability and Statistics. (3-0) 3 Credit Hours.**

Prerequisite: STA 3003, MAT 1223 or STA 3023, and completion of or concurrent enrollment in MAT 2213. Axiomatic probability, random variables, discrete and continuous distributions, bivariate and multivariate distributions and their applications, mixture distributions, moments and generating functions, and bivariate transformations. Generally offered: Fall, Spring, Summer. This course has Differential Tuition. Course Fee: DL01 \$75.

### **STA 3523. Mathematical Statistics for Inference. (3-0) 3 Credit Hours.**

Prerequisite: STA 3513 or an equivalent. Sampling distributions and the Central Limit Theorem; order statistics; estimation including method of moments and maximum likelihood; properties of estimators; hypothesis testing including likelihood ratio tests; introduction to ANOVA and regression. Generally offered: Fall, Spring. This course has Differential Tuition. Course fee: DL01 \$75.

**STA 4133. Introduction to Programming and Data Management in SAS. (3-0) 3 Credit Hours.**

This course introduces essential programming concepts using the statistical software package SAS (Enterprise Guide and Base SAS) with a focus on data management and the preparation of data for statistical analyses. Topics include reading raw data, creating temporary and permanent datasets, manipulating datasets, data prompts, summarizing data, displaying data using tables, charts, and plots. Conducting basic statistical analyses using the SAS Enterprise Guide and the Base SAS procedures are also discussed with the examples selected from regression analysis, analysis of variance, and categorical analysis. This course also demonstrates how to write, generate, and modify SAS code and procedures within the SAS Enterprise Guide and the Base SAS environments. This course has Differential Tuition. Course fee: DL01 \$75.

**STA 4143. Data Mining and Predictive Modeling. (3-0) 3 Credit Hours.**

Prerequisite: STA 4133 or equivalent. Acquisition, organization, exploration, and interpretation of large data collections. Data cleaning, representation and dimensionality, multivariate visualization, clustering, classification, and association rule development. A variety of commercial and research software packages will be used. This course has Differential Tuition. Course fee: DL01 \$75.

**STA 4233. Introduction to Programming and Data Management in R. (3-0) 3 Credit Hours.**

This course introduces statistical computing and programming using the R language. Topics include preprocessing/manipulating datasets, summarizing/visualizing data, and conducting basic statistical analyses using R. Other topics include writing R functions, object oriented programming, statistical simulation and resampling, interfacing R with other programming language environments such as SQL, Python, C++, and Hadoop. Techniques for efficient programming will be stressed. The concept of high-performance computing (multi-core/parallel-processing) is also demonstrated. (Formerly titled Statistical Applications Using SAS Software.) Generally offered: Spring. This course has Differential Tuition. Course fee: DL01 \$75.

**STA 4243. Data Exploratory Methods with Python. (3-0) 3 Credit Hours.**

This course provides an overview of Exploratory Data Analysis (EDA), including the cleaning, preparation, exploration, and visualization of data. Students will learn how to source, manage, transform, and explore a wide variety of data types. Students will also master the fundamental concepts for visualizing and communicating information contained in raw data. Python software is used for the course. Prior knowledge of a programming language and basic statistics is beneficial but is not required. This course has Differential Tuition.

**STA 4643. Introduction to Stochastic Processes. (3-0) 3 Credit Hours.**

Prerequisite: MAT 2233 and STA 3513 (or equivalents). Probability models, Poisson processes, finite Markov chains, including transition probabilities, classification of states, limit theorems, queuing theory, and birth and death processes. Generally offered: Summer. This course has Differential Tuition. Course Fees: BISP \$10; BTSI \$15.41; LRB1 \$15.41.

**STA 4713. Applied Regression Analysis. (3-0) 3 Credit Hours.**

Prerequisite: Completion of or concurrent enrollment in STA 3523, or consent from instructor. An introduction to regression analysis, with emphasis on practical aspects, fitting a straight line, examination of residuals, matrix treatment of regression analysis, fitting and evaluation of general linear models, and nonlinear regression. Generally offered: Fall. This course has Differential Tuition.

**STA 4723. Introduction to the Design of Experiments. (3-0) 3 Credit Hours.**

Prerequisite: STA 3513, or equivalents. General concepts in the design and analysis of experiments. Emphasis will be placed on both the experimental designs and analysis, and tests of the validity of assumptions. Topics covered include completely randomized designs, randomized block designs, complete factorials, fractional factorials, and covariance analysis. The use of computer software packages will be stressed. This course has Differential Tuition. Course Fee: DL01 \$75.

**STA 4753. Time-Series Analysis. (3-0) 3 Credit Hours.**

Prerequisite: STA 3003 and STA 3513, or equivalents. Development of descriptive and predictive models for time-series phenomena. A variety of modeling approaches will be discussed: decomposition, moving averages, time-series regression, ARIMA, and forecasting errors and confidence intervals. Generally offered: Spring. This course has Differential Tuition.

**STA 4803. Statistical Quality Control. (3-0) 3 Credit Hours.**

Prerequisite: STA 3003, STA 3513, (or equivalents). Statistical methods are introduced in terms of problems that arise in manufacturing and their applications to the control of manufacturing processes. Topics include control charts and acceptance sampling plans. (Same as MS 4363 and MAT 4803. Credit cannot be earned for more than one of the following: STA 4803, MS 4363, or MAT 4803.) This course has Differential Tuition.

**STA 4903. Applied Survival Analysis. (3-0) 3 Credit Hours.**

Prerequisite: STA 3513 or an equivalent. Measures of survival, hazard function, mean residual life function, common failure distributions, procedures for selecting an appropriate model, the proportional hazards model. Emphasis on application and data analysis using SAS. This course has Differential Tuition.

**STA 4911. Independent Study. (0-0) 1 Credit Hour.**

Prerequisite: A 3.0 Carlos Alvarez College of Business grade point average, permission in writing (form available) from the instructor, the student's advisor, the Department Chair, and the Dean of the College in which the course is offered. Independent reading, research, discussion, and/or writing under the direction of a faculty member. May be repeated for credit, but not more than 6 semester credit hours, regardless of discipline, will apply to a bachelor's degree. This course has Differential Tuition. Course Fee: BISP \$10; BTSI \$15.41.

**STA 4913. Independent Study in Statistics and Data Science. (0-0) 3 Credit Hours.**

Prerequisites: A 3.0 Carlos Alvarez College of Business grade point average, permission in writing (form available) from the instructor, the student's advisor, the Department Chair, and the Dean of the College in which the course is offered. Independent reading, research, discussion, and/or writing under the direction of a faculty member. May be repeated for credit, but not more than 6 semester credit hours, regardless of discipline, will apply to a bachelor's degree. This course has Differential Tuition.

**STA 4933. Internship in Statistics and Data Science. (0-0) 3 Credit Hours.**

Prerequisites: A 2.5 grade UTSA point average, and approval in writing from the instructor, the Department Chair, and the Associate/Assistant Dean of Undergraduate Studies in the Carlos Alvarez College of Business (see academic advisor for required forms and additional requirements). Supervised full- or part-time work experience in statistics. Offers opportunities for applying statistics in private businesses or public agencies. A written report is required. May be repeated for credit, but not more than 6 semester credit hours will apply to a bachelor's degree. This course has Differential Tuition.

**STA 4953. Special Topics in Statistics and Data Science. (3-0) 3 Credit Hours.**

Prerequisite: Consent from the instructor, Department Chair, and Dean of the College. An organized course offering the opportunity for specialized study not normally or not often available as part of the regular course offerings. Special Topics may be repeated for credit when the topics vary, but not more than 6 semester credit hours, regardless of discipline, will apply to a bachelor's degree. This course has Differential Tuition.

**STA 4961. Actuarial Science Examination Preparation. (1-0) 1 Credit Hour.**

An organized course offering specialized study for Actuarial Science Examinations. Topics covered include General Probability, Random Variables and Probability Distributions, Multivariate Distributions, and Risk Management and Insurance. May be repeated twice for credit. Generally offered: Fall, Spring. This course has Differential Tuition. Course Fee: BISP \$10; BTSI \$15.41; LRB1 \$15.41.

**STA 4963. Actuarial Science Examination Preparation. (3-0) 3 Credit Hours.**

Prerequisite: STA 3513. An organized course offering specialized study for Actuarial Science Examination. Topics covered include General Probability, Random Variables and Probability Distributions, Multivariate Distributions, and Stochastic Processes. This course has Differential Tuition. Course Fee: DL01 \$75.

**STA 4993. Honors Thesis. (0-0) 3 Credit Hours.**

Prerequisites: STA 3523 and consent from instructor, Department Chair and Dean of the College; enrollment limited to students applying for Honors in Management Science and Statistics. Supervised research and preparation of an honors thesis. May be repeated once for credit with advisor's approval. Generally offered: Spring. This course has Differential Tuition.