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 field of knowledge 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 offers a Master of Science degree in Data Analytics with an Accelerated Master's option, a Master of Science degree in Statistics and Data Science with an Accelerated Master's option, a Doctor of Philosophy degree in Applied Statistics, a Graduate Certificate in Data Engineering, a Graduate Certificate in Data Science, and a Graduate Certificate in Predictive Analytics and Modeling.

Degree-Specific Requirements

All program requirements should be unchanged from previous versions of the 2025-2027 Graduate Catalog. To confirm your degree requirements, you can visit DegreeWorks (https://dworkswebprod.sis.utsa.edu/) or consult your Graduate Advisor of Record.

Master of Science Degree in Data Analytics

The Master of Science in Data Analytics (M.S.D.A.) program focuses on data science and big data-based business intelligence-oriented analytics algorithms, tools, techniques, and technologies. The plan of study features cohort classes, with students participating in formal internships and practical projects in a wide variety of application areas, including, but not limited, to business analytics. The program, including admission, is supervised by the Graduate Program Committee in M.S.D.A. General requirements for completion of the program consist of required business courses.

Program Admission Requirements

For admission to the M.S.D.A. program, applicants must meet University-wide graduate admission requirements. A degree of B.A. or B.S. in statistics, mathematics, engineering, computer science, information systems, information technology, or a closely related field is highly recommended. Applicants will be evaluated for success in the program based on demonstrable academic preparation and/or experience with respect to mathematics, statistics, and information technology. Some mathematical background is preferred (e.g., calculus and linear algebra), but it is not required. Information systems/technology courses, computer science courses, and/or professional experience related to databases, networks, distributed and cloud infrastructures, and programming are not required, but show foundational information technology preparation and are preferred in some combination.

Applicants will be considered on the basis of demonstrated potential for success in graduate study in business as indicated by a combination of prior academic achievement, personal statement, résumé, and letters of recommendation.

The M.S.D.A. Program Committee will evaluate each applicant individually based on the complete package of submitted materials.

A complete application package will include:

- A completed application form.
- Transcripts from all universities attended.
- A personal statement#of academic history and personal goals.
- Letters of recommendation (optional).
- A current résumé with employment or other experience.

Graduate admission test scores are no longer required. However, please note that competitive GMAT/GRE scores may help your chances of admission because, in addition to your GPA, the GMAT or GRE provides a quantitative metric for the M.S.D.A. Programs Committee to evaluate you as a candidate.

Degree Options

The M.S.D.A. offers both a 12-month and 21-month program. Both programs begin in the Fall semester. The 21-month program will have all classes in the evening.

Degree Requirements

M.S.D.A. students are required to complete 24 hours of required courses plus 6 hours of required practicum courses.

Code	Title	Credit Hours
A. Master's Level Courses		**27**
IS 6503	Principles of Database Management	
DA 6213	Data-Driven Decision Making and Design	
DA 6233	Data Analytics Visualization and Communication	
DA 6813	Data Analytics Applications	
DA 6833	Data Analytics Practicum	
IS 6713	Data Foundations	
IS 6733	Deep Learning on Cloud Platforms	
STA 6443	Statistical Modeling	
STA 6543	Predictive Modeling	

B. Elective Course		**3**
Select an elective course from the list below:		
DA 6223	Data Analytics Tools and Techniques	
IS 5203	Networking and Telecommunication Systems	
STA 6013	Regression Analysis	
STA 6033	SAS Programming and Data Management	
STA 6133	Simulation and Statistical Computing	
STA 6253	Time Series Analysis and Applications	
STA 6813	Multivariate Analysis	
STA 6833	Design and Analysis of Experiments	
STA 6903	Survival Analysis	
STA 6923	Introduction to Statistical Learning	
Total Credit Hours		**30**

Accelerated Master of Science in Data Analytics

The College of AI, Cyber and Computing (CAICC) offers an Accelerated Data Analytics Program tailored to UT San Antonio 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); the program also 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 UT San Antonio faculty and staff).

Program Admission Requirements

Applications to the Accelerated Program in Data Analytics must meet the following criteria[1]: 1) a current UT San Antonio 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 domain. Applicants must apply online[2] 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:

- UT San Antonio 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.

[1] 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.

[2] 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.

Degree Requirements

Bachelor's Degree Requirements

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 Requirements

Students accepted into the Accelerated Program in Data Analytics are required to complete the standard degree requirement of the M.S. in Data Analytics.

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.

Master of Science Degree in Statistics and Data Science

In today's data-driven world, there is a soaring demand for professionals skilled in both statistics and data science. Organizations across various industries seek individuals adept at collecting, analyzing, and interpreting data, and effectively communicating findings. Statisticians and data scientists play a crucial role in addressing diverse challenges, from drug development and health-related issues in biomedical fields to environmental studies focusing on pollution and contamination. Moreover, they are instrumental in internet traffic management, fraud detection, cybersecurity, and national defense, providing accurate predictions and insights derived from data mining. Statisticians and data scientists find employment opportunities in sectors such as insurance, healthcare, information technology, finance, biomedical research, manufacturing, and services.

Recognizing the need for professionals capable of designing experiments, making predictions, and analyzing large and complex datasets, the Master of Science degree in Statistics and Data Science at UT San Antonio offers comprehensive training in applied statistical methods, computational tools, data manipulation techniques, and statistical and machine learning methods. This program prepares students for diverse career paths, including roles in government, industry, academia, or further study at the doctoral level in statistics and data science.

Program Admission Requirements

All application materials must be submitted using the University's online application system and received by the program-specific Fall deadline. Degree-seeking students are only admitted in the Fall semester of each academic year.

In addition to satisfying the University-wide graduate admission requirements, a B.A. or B.S. in statistics, mathematics, engineering, business, or a closely related field is highly recommended as preparation. In particular, the Admissions Committee requires applicants to complete Calculus I, II, and III, and a course in Matrix Theory/Linear Algebra prior to applying for the program. However, if necessary, the Linear Algebra/ Matrix Theory course may be taken during the first semester of the program (in addition to degree requirements).

A complete application package will include:

- A completed application form
- Transcripts from all universities attended
- English Language Proficiency Test (If applicable)
- Foreign Credential Evaluation (If applicable)

Graduate admission test scores are no longer required. However, please note that competitive GRE scores may help your chances of admission because, in addition to your GPA, the GRE provides a quantitative metric for the Master of Science degree in Statistics and Data Science Programs Committee to evaluate you as a candidate.

Current résumé, letters of recommendation, and statement of purpose are optional for this program.

Degree Requirements

Candidates for this degree are required to successfully complete 33 semester credit hours as specified below:

Code	Title	Credit Hours
A. All candidates for the Master of Science in Statistics and Data Science must complete the following 12 semester credit hours of coursework:		**12**
STA 5093	Introduction to Statistical Inference	
STA 5103	Applied Statistics	
STA 5503	Mathematical Statistics I	
STA 5513	Mathematical Statistics II	
B. A candidate for the Master of Science degree in Statistics and Data Science must complete 15 semester credit hours of coursework chosen from one or a combination of the following focus areas:		**15**
Biostatistics:		
STA 6033	SAS Programming and Data Management	
STA 6233	R Programming for Data Science	
STA 6243	Exploratory Data Analysis with Python	
STA 6413	Nonparametric Statistics	
STA 6813	Multivariate Analysis	
STA 6833	Design and Analysis of Experiments	
STA 6853	Categorical Data Analysis	
STA 6863	Spatial Statistics	
STA 6903	Survival Analysis	
STA 6923	Introduction to Statistical Learning	
Industrial Statistics:		
MS 5453	Management and Control of Quality	
STA 5313	Theory of Sample Surveys with Applications	
STA 6013	Regression Analysis	
STA 6033	SAS Programming and Data Management	
STA 6113	Applied Bayesian Statistics	
STA 6133	Simulation and Statistical Computing	
STA 6233	R Programming for Data Science	
STA 6243	Exploratory Data Analysis with Python	
STA 6833	Design and Analysis of Experiments	
STA 6843	Computer Aided Optimal Design	
Management Science:		
MS 5453	Management and Control of Quality	
MS 5463	Lean Operations and Six Sigma	
STA 6013	Regression Analysis	
STA 6033	SAS Programming and Data Management	
STA 6133	Simulation and Statistical Computing	
STA 6233	R Programming for Data Science	
Financial Modeling:		
ECO 6103	Applied Econometrics I	
FIN 6313	Modeling of Financial Decision Making	
STA 6013	Regression Analysis	
STA 6033	SAS Programming and Data Management	
STA 6113	Applied Bayesian Statistics	
STA 6133	Simulation and Statistical Computing	
STA 6233	R Programming for Data Science	
STA 6253	Time Series Analysis and Applications	
Big Data and Analytics		
IS 6713	Data Foundations	
STA 6013	Regression Analysis	
STA 6033	SAS Programming and Data Management	
STA 6233	R Programming for Data Science	
STA 6243	Exploratory Data Analysis with Python	
STA 6253	Time Series Analysis and Applications	
STA 6813	Multivariate Analysis	
STA 6923	Introduction to Statistical Learning	
STA 6933	Advanced Topics in Statistical Learning	
General Applied Statistics		
Any 15 hours of 5000- or 6000-level courses in Statistics or other disciplines as approved by the Graduate Advisor of Record.		
C. A candidate for the Master of Science degree in Statistics and Data Science must complete 6 semester credit hours of graduate-level courses in Statistics, Engineering, Biology or other disciplines as approved by the Graduate Advisor of Record.		**6**
D. Comprehensive Examination: Each candidate for the degree is required to pass a comprehensive examination in Statistics that will cover material in the following courses: STA 5093, STA 5103, STA 5503 and STA 5513. The comprehensive examination will be offered once a year during each summer.		
Total Credit Hours		**33**

Accelerated Master of Science in Statistics and Data Science

The Department of Statistics and Data Science in the College of AI, Cyber and Computing (CAICC) offers an Accelerated Statistics and Data Science Program tailored to UT San Antonio 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); the program also 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 UT San Antonio faculty and staff).

Program Admission Requirements

Applications to the Accelerated Program in Statistics and Data Science must meet the following criteria[1]: 1) a current UT San Antonio 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[2] 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:

- UT San Antonio 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.

[1] 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.

[2] 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.

Degree Requirements

Bachelor's Degree Requirements

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 Requirements

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.

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.

Doctor of Philosophy Degree in Applied Statistics

In this age of advanced technology and big data, there is an increasing demand for individuals with expertise in designing experiments and analyzing large complex data sets via the latest advances in statistical methods and computing technology. In particular, there is a high demand for professionals with a Ph.D. in Applied Statistics to solve real-world problems faced by various areas of scientific study. For example, in the biomedical field, they are needed to develop methods for evaluating the efficacy and safety of new medications/drugs, surgeries, and other treatments. In the bioinformatics area, they address topics such as gene therapy, genomic research, and disease mapping. In environmental studies, statisticians are needed to detect the exposure of the human population to particulate matter based on air quality, to identify polluted areas based on soil samples, and to model areal data. Statisticians are also needed to model and analyze big data, especially in areas of fraud detection, cybersecurity, and defense-related issues. Statisticians are being recruited in academic institutions and a variety of industries, including insurance and finance institutions, manufacturing and service businesses. The Ph.D. in Applied Statistics combines advanced statistical analysis and theory with practical applications to prepare students with these essential skills to pursue careers in academia, research organizations, government, and private industry.

Program Admission Requirements

In addition to satisfying the University-wide graduate admission requirements, a B.A., B.S., M.A., or M.S. in mathematics, statistics, or a closely related field is required. Students who have not taken mathematical statistics courses at the undergraduate level may be required to complete the equivalent courses in the appropriate background areas before taking graduate courses. The admission requirements consist of:

- A cumulative grade point average of 3.3 or higher in the last 60 hours of coursework
- A Graduate Record Examination (GRE) score from a recent (no more than five years prior to the application date) administration of the exam
- Official transcripts of all undergraduate and graduate coursework completed
- Three letters of recommendation from academic or professional sources familiar with the applicant's background
- A curriculum vita and a statement of experiences, interests, and goals
- International students from non-English speaking countries must also submit a score of at least 79 on the Test of English as a Foreign Language (TOEFL) iBT. TOEFL scores may not be more than two years old.
- Evaluated copies of transcripts from foreign countries
- Applicants may be asked to appear before the admissions committee for a personal interview.

Degree Requirements

Candidates with an M.S. in Statistics or a related field are required to successfully complete a minimum of 57 credit hours of course work at the 6000- or 7000-level, starting from item C below. However, those who do not have the foundation courses listed in item A are required to complete these courses in addition to the 57 credit hours required for the degree. Candidates with a bachelor's degree are required to successfully complete a minimum of 87 semester credit hours of graduate coursework as specified below:

Code	Title	Credit Hours
A. Foundation Courses		12
All candidates entering the program with only a bachelor's degree or with a non-quantitative master's degree must complete the following 12 semester credit hours of coursework:		
STA 5093	Introduction to Statistical Inference	
STA 5103	Applied Statistics	
STA 5503	Mathematical Statistics I	
STA 5513	Mathematical Statistics II	
B. All candidates entering the program with a bachelor's degree must complete 18 semester credit hours of 6000- or 7000-level Statistics courses approved by the Graduate Advisor of Record.		18
C. All candidates must complete the following 12 semester credit hours of advanced coursework:		12
STA 6133	Simulation and Statistical Computing	
STA 6713	Linear Models	
STA 7503	Advanced Inference I	
STA 7513	Advanced Inference II	
D. 9 semester credit hours of graduate courses at the 6000-level or higher within the Department of Management Science and Statistics, as approved by the Graduate Advisor of Record.		9
E. A minimum of 6 semester credit hours of graduate elective courses approved by the Graduate Advisor of Record.		6
F. A minimum of 15 semester credit hours of Doctoral Research.		15
G. A minimum of 15 semester credit hours of Doctoral Dissertation.		15
Total Credit Hours		**87**

All students in the program will be required to complete a degree plan specifying the courses they will complete. This degree plan must be approved by the Ph.D. Program Committee before the end of the second semester of enrollment.

Advancement to Candidacy

Advancement to candidacy requires a student to complete University and Applied Statistics program requirements. After completing the required coursework, all candidates for the Ph.D. degree must pass written qualifying examinations and oral defense of the dissertation proposal before being admitted to candidacy for the degree. Unless otherwise approved by the Ph.D. Program Committee, all students should take both parts of the written qualifying examination by the end of the Summer term of their first or second year in the program. Students who do not pass one part of the exam will have to retake the same part of the exam in the immediate next Summer term. The written examinations are administered by the graduate committee members and are scheduled once a year during the Summer term. Those who do not pass the qualifying examination may not continue in the Doctoral Program but may qualify for the M.S. degree. The oral proposal defense is administered at the discretion of the student's Dissertation Committee. It serves as a hearing for the student's dissertation proposal. Students will be provided no more than two attempts to pass the written qualifying examination and two attempts to pass the oral proposal defense examination. A majority approval of the dissertation examination committee is required to pass the oral proposal defense. Results of the written and oral qualifying examinations must be reported to the Dean of the Graduate School.

Dissertation

Candidates must demonstrate the ability to conduct independent research by completing and defending an original dissertation. The research topic is determined by the student in consultation with his or her supervising professor. A Dissertation Committee selected by the student and supervising professor guides and critiques the candidate's research. The completed dissertation must be formally presented to and approved by the Dissertation Committee.

Following an open presentation of the dissertation findings, the Dissertation Committee conducts a closed meeting to determine the adequacy of the research and any further requirements for completion of the dissertation. Results of the meeting must be reported to the Dean of the College and to the Dean of the Graduate School.

Awarding of the degree is based on the approval of the Dissertation Committee and the approval of the Dean of the College. The UT San Antonio Dean of the Graduate School certifies the completion of all University-wide requirements.

- Graduate Certificate in Data Engineering (p. 5)
- Graduate Certificate in Data Science (p. 6)
- Graduate Certificate in Predictive Analytics and Modeling (p. 6)

Graduate Certificate in Data Engineering

The Data Engineering Certificate program is designed to meet the growing demand for skilled data engineers in various industries. It aims to equip students with the essential knowledge and hands-on skills needed to excel in the field of data engineering, focusing on areas such as data ingestion, storage, transformation, and pipeline architecture. The program integrates both theoretical and practical components to ensure students gain a comprehensive understanding of data engineering principles and applications.

Admissions Requirements

- Applicant should have a Bachelor of Science (B.S.) degree or be in their junior year of a B.S. degree in closely related fields in Engineering, Computer Science, Statistics, Cyber Security, Math, Information Systems, and Physics with a minimum GPA of 3.00 in relevant courses, such as programming, algorithms, etc.
- Applicants without a B.S. or degrees unrelated to the mentioned fields may be eligible based on relevant work experience (subject to review).
- Applicants should acquire or already possess coding skills, particularly in Python programming, through UT San Antonio courses or online platforms. DataCamp (https://www.datacamp.com/blog/how-to-get-10-years-of-free-datacamp-if-youre-a-teacher-or-student/?utm_source=linkedin&utm_medium=organic_social&utm_campaign=230820_1-blog_2-mix_3-all_4-na_5-na_6-classrooms_7-le_8-ogsl-li_9-na_10-bau_11-na) is a free online resource for those who are interested.
- Applicants should submit a Resume and a Statement of Purpose with their Application.

Certificate Program Requirements

To earn the Graduate Certificate in Data Engineering, students must complete 15 semester credit hours as follows.

Code	Title	Credit Hours
Core Courses		**9**
CS 5443	Database Management Systems	
or IS 6503	Principles of Database Management	
DE 5103	Introduction to Data Engineering	
DE 6123	Advanced Topics in Data Engineering	
Electives		**6**
Select two courses from the following.		
IS 6713	Data Foundations	
or ME 6543	Machine Learning and Data Analytics	
IS 6973	Special Problems	
or CS 5573	Cloud Computing	
or EE 5523	Introduction to Cloud Computing	
CS 6243	Machine Learning	
or DS 5033	Data Mining and Machine Learning	
DS 5023	Data Organization and Visualization	
Total Credit Hours		**15**

Graduate Certificate in Data Science

The graduate certificate in Data Science is a 15-semester-credit-hour program designed for individuals from all academic disciplines to build an analytical and computational foundation to investigate data science problems. This certificate program is designed to fill the industry need for more data science-capable professionals and to prepare individuals for a career in data science-related fields. Individuals completing this certificate will gain practical data science knowledge, as well as hands-on skills in data organization, data visualization, data analytics, data mining, and machine learning. The certificate is administered in conjunction with the School of Data Science.

The graduate certificate in Data Science is offered in a 100 percent online format.

Admission Requirements

The certificate is open to all UT San Antonio graduate students, including non-degree seeking students, regardless of their college or major. Applicants who are currently enrolled in a graduate degree program at UT San Antonio have already met University requirements for admission.

Applicants who are not currently enrolled in a graduate degree program at UT San Antonio will be required to apply for admission to UT San Antonio as a special (non-degree-seeking) graduate student and to indicate their intent to seek admission into a certificate program (see Certificate Program Regulations in this catalog). Students who meet general UT San Antonio admission requirements are eligible for admission to this certificate program.

As part of their application to the Graduate Certificate in Data Science program, students must submit a current résumé.

Certificate Program Requirements

To earn the Graduate Certificate in Data Science, students must complete 15 semester credit hours as follows:

Code	Title	Credit Hours
A. Required Courses (15 semester credit hours)		15
DS 5003	Introduction to Data Science	
DS 5013	Programming for Data Science	
DS 5023	Data Organization and Visualization	
DS 5033	Data Mining and Machine Learning	
STA 6003	Statistical Methods in Research and Practice I	
Total Credit Hours		**15**

Graduate Certificate in Predictive Analytics and Modeling

The Graduate Certificate in Predictive Analytics and Modeling is a 15-semester-credit-hour program offered by the Department of Management Science and Statistics. This certificate is designed to provide specialized training to enhance students' expertise in the rapidly growing field of predictive analytics, learn about cutting-edge developments, and augment their professional skills. It also offers a credential that helps advance their careers by certifying to employers that the student has completed advanced coursework in data-driven decision-making and statistical modeling techniques.

The coursework equips students with the tools to address a wide range of real-world problems through predictive analytics, enabling them to analyze large data sets, identify patterns, and make informed predictions. Topics covered include statistical learning, machine learning, data mining, and offering solutions for decision-making in diverse industries such as finance, healthcare, marketing, and technology. Moreover, this certificate program will help students discover state-of-the-art techniques and best practices to leverage data for strategic advantage.

The predictive analytics and modeling certificate provides specialized skills for:

- Students seeking foundational knowledge of predictive modeling and data-driven decision-making as well as a strong understanding of how businesses use analytics to gain competitive insights.
- Experienced professionals who wish to update their knowledge of current analytical tools and best practices through interaction with expert faculty.
- Working professionals who want to supplement their undergraduate or graduate degree with specialized courses in predictive analytics and statistical modeling.

Predictive analytics is a versatile and high-demand field where professionals are involved in a variety of functions across industries, including marketing, financial forecasting, operations, healthcare analysis, and technology. This certificate program provides students with a thorough understanding of analytical techniques and data-driven strategies while emphasizing skills in problem-solving, communication, and teamwork.

Certificate Program Requirements

To earn a Graduate Certificate in Predictive Analytics and Modeling, students must complete five courses, totaling 15 semester credit hours. These courses will be offered during Fall and Spring, with some available in the Summer. In the first semester, students will learn foundational concepts in statistical inference, data visualization, and programming.

In the second semester, they will expand these skills by focusing on predictive modeling and statistical and machine learning techniques. The certificate can be completed in two semesters, but students also have the flexibility to enroll part-time and extend the completion timeline. Throughout the program, students will apply statistical methods, analytical skills, predictive modeling, and machine learning across a wide array of disciplines.

Code	Title	Credit Hours
Required Courses		**15**
STA 6003	Statistical Methods in Research and Practice I	
STA 6103	Statistical Methods in Research and Practice II	
STA 6233	R Programming for Data Science	
STA 6243	Exploratory Data Analysis with Python	
STA 6543	Predictive Modeling	
Total Credit Hours		**15**

Data Analytics (DA) Courses

DA 6213. Data-Driven Decision Making and Design. (3-0) 3 Credit Hours.
This course introduces students to the process of making organizational decisions using data-driven techniques. Specifically, this course emphasizes question formulation, hypothesis development, data analysis, model building, and model testing using business case studies. The first component of this course focusses on data-driven decision making using linear and logistic regression analysis. The second component of this course focusses on time series analysis using regression, Exponential Smoothing, ARIMA, ARIMAX, and Unobserved Component modeling-based approaches. The third component of this course focusses on survival analysis using non-parametric, semi-parametric, and parametric methods. Appropriate statistical software will be used throughout this course to demonstrate various methods. This course has Differential Tuition.

DA 6223. Data Analytics Tools and Techniques. (3-0) 3 Credit Hours.
This course offers an introduction to big data analytics using the SAS Enterprise Guide and SQL procedure, essential tools for today's analytical industry. Students will be provided with the opportunity to gain education and experience in managing real-world, complex datasets, addressing challenges such as missing values and data errors. The curriculum covers data importation from various sources, effective data merging, table restructuring, data recoding, conditional processing, summary statistics, and data visualization. Designed for those new to data analytics, this course emphasizes practical skills over programming formalisms, preparing students for applied data analysis tasks. This course has Differential Tuition.

DA 6233. Data Analytics Visualization and Communication. (3-0) 3 Credit Hours.
Since the purpose data analytics is to inform and facilitate better data-driven decisions, and transform data to information and knowledge, the ability to effectively communicate data aggregations, summarizations, and analytic findings to decision makers is very important. The ability to communicate highly complex analyses and scientific findings to a non-technical audience is challenging. This course will educate students on common mistakes and success factors in technical communication, and give them experience communicating findings orally and in writing. The course will also focus heavily on data analytics visualization approaches and tools. Students will be provided the opportunity to learn common methods for data visualization for a wide variety of data types and data analytics applications. This course has Differential Tuition.

DA 6813. Data Analytics Applications. (3-0) 3 Credit Hours.
Students will be presented a big picture understanding of data analytics, including its purpose, common benefits and challenges, important analytic processes, and what is needed to perform data analytics, such as skills, tools, technology, etc. Students will be introduced to a wide variety of data analytics applications in a wide variety of fields, which may include some of the topics from fields such as information technology, cybersecurity, bioinformatics, biomedical/health, insurance and risk, finance, economics, accounting, business intelligence, crime and fraud detection, marketing and customer analytics, energy and environment, manufacturing and operations, and logistics and supply chain. This course has Differential Tuition.

DA 6821. Data Analytics Practicum I. (1-0) 1 Credit Hour.
This course presents students with practical knowledge, skills, and experience needed to conduct real-world, high-quality data analytics in an application area of interest. Students will meet formally with their peers and the instructor for the purpose of facilitating the practicum experience. In the first 1 credit semester of this course students will learn how to identify the proper statistical technique to apply to a problem, complete a set of modules that review basic statistical fundamentals and have the opportunity to gain a first experience at data analysis using small time series data sets. During the second 2 credit semester of the practicum, students will engage in a project that incorporates the following steps of the data analytics process: problem defining, question formulation, hypothesis development, preliminary analytics, analytical design, data acquisition, data preparation and pre-processing, and initial data analysis as well as develop some fundamental coding skills using a large, real world data set. In addition, they will acquire training in analytical and statistical techniques including introduction to social network analysis as well as an introduction to a number of other statistical methods designed to encourage the student to explore and learn more advanced techniques. May be repeated for credit. This course has Differential Tuition.

DA 6822. Data Analytics Practicum I. (2-0) 2 Credit Hours.
This course presents students with practical knowledge, skills, and experience needed to conduct real-world, high-quality data analytics in an application area of interest. Students will meet formally with their peers and the instructor for the purpose of facilitating the practicum experience. In the first 1 credit semester of this course students will learn how to identify the proper statistical technique to apply to a problem, complete a set of modules that review basic statistical fundamentals and have the opportunity to gain a first experience at data analysis using small time series data sets. During the second 2 credit semester of the practicum, students will engage in a project that incorporates the following steps of the data analytics process: problem defining, question formulation, hypothesis development, preliminary analytics, analytical design, data acquisition, data preparation and pre-processing, and initial data analysis as well as develop some fundamental coding skills using a large, real world data set. In addition, they will acquire training in analytical and statistical techniques including introduction to social network analysis as well as an introduction to a number of other statistical methods designed to encourage the student to explore and learn more advanced techniques. This course has Differential Tuition.

DA 6833. Data Analytics Practicum. (3-0) 3 Credit Hours.
Students will work on a major data analytics project, focusing on the analysis and presentation of results portion of the process. The next steps will be detailed data analysis, conclusion drawing, report preparation and refinement, presentation preparation and final presentation. The practicum will culminate in a formal, completed report to the supporting organization, as well as to data analytics peers and professors. Students who earn a grade of "B" (3.0) or better in this course will satisfy the comprehensive examination requirement. A student who receives a grade of "B-," "C+," or "C" may still satisfy this requirement by successfully passing a comprehensive examination as set out in this catalog. This course has Differential Tuition.

Data Science (DS) Courses

DS 5003. Introduction to Data Science. (3-0) 3 Credit Hours.
An in-depth investigation into the Data Science life cycle. Focus areas on data visualization, data curation, tools available for data analysis, and software packages will be covered.

DS 5013. Programming for Data Science. (3-0) 3 Credit Hours.
An introduction to data-driven programming emphasizing problem solving, critical thinking, and algorithmic thinking. Topics will focus on foundational computer programming concepts along with fundamentals of object-oriented programming and mathematics/statistics packages.

DS 5023. Data Organization and Visualization. (3-0) 3 Credit Hours.
Prerequisite: STA 6003, DS 5003, and DS 5013, or the equivalents. This course investigates the data organization process from data integration to analysis and visualization through program design and implementation. Topics may also include data collection and sources, file input/output, data preprocessing algorithms, and data visualization using data science software packages and APIs. Course fee: LRDS $37.50.

DS 5033. Data Mining and Machine Learning. (3-0) 3 Credit Hours.
Prerequisite: STA 6003 and completion of or concurrent enrollment in DS 5023. This course investigates fundamental data science concepts in in-depth analysis, data mining, machine learning, and artificial intelligence. Topics may include clustering, classification, evaluation metrics, supervised and unsupervised learning, search algorithms, intelligent agents, and advanced AI applications in select areas.

DS 5043. Generative Artificial Intelligence. (3-0) 3 Credit Hours.
Prerequisite: CS 6243, CS 5233, or DS 5033. This course covers the Transformer architecture and fundamental topics such as tokenization, context windows, embeddings, etc. Students will learn to use various APIs, host language models locally, and explore the trade-offs between various state-of-the-art open-source models. Coursework will touch upon fine-tuning, prompt engineering, mitigating hallucinations, and alignment. Course Fee: LRMS $37.50.

DS 5083. Independent Study. (0-0) 3 Credit Hours.
Prerequisite: Graduate standing and permission in writing (form available) of the instructor and the Graduate Advisor of Record. Independent reading, research, discussion, and/or writing under the direction of a faculty member. For students needing specialized work not normally or not often available as part of the regular course offerings. May be repeated for credit, but not more than 6 hours, regardless of discipline, will apply to the degree. Course Fee: LRMS $37.50.

DS 5093. Special Topics in Data Science. (3-0) 3 Credit Hours.
Prerequisite: Consent of instructor. An organized course offering the opportunity for specialized study not normally or not often available as part of the regular course offerings. Special Topics courses may be repeated for credit when topics vary, but no more than 6 hours, regardless of discipline, will apply to the degree. Course Fee: LRMS $37.50.

Statistics (STA) Courses

STA 5093. Introduction to Statistical Inference. (3-0) 3 Credit Hours.
Prerequisite: Admission to the Master's program or consent of instructor. This course covers introduction to sampling methods, random variables, and descriptive analysis methods, basic probability theory, common probability distributions, joint distributions, moment generating function, statistical estimation, interval estimation, hypothesis testing for a single parameter and comparing two parameters, and goodness-of-fit tests. Statistical software will be used for data analysis. This course has Differential Tuition.

STA 5103. Applied Statistics. (3-0) 3 Credit Hours.
Prerequisite: STA 5093 or equivalent, or consent of instructor. This course covers relations between categorical variables, one-way factor models, factorial experiments, multiple comparisons, simple linear regression, and multiple linear regression. Statistical software will be used for data analysis. Statistical software will be used for data analysis. This course has Differential Tuition.

STA 5313. Theory of Sample Surveys with Applications. (3-0) 3 Credit Hours.
Prerequisite: STA 5093 or STA 6003 or consent of instructor. Basic sampling techniques and their comparisons for finite populations. Topics include simple random sampling, stratified sampling, ratio and regression estimates, systematic sampling, cluster sampling, multistage and double sampling, and bootstrap and other sampling plans. This course has Differential Tuition.

STA 5503. Mathematical Statistics I. (3-0) 3 Credit Hours.
Prerequisite: Admission to the Statistics graduate program or consent of instructor. Axioms of probability, counting rules, univariate random variables, multivariate random variables, joint, marginal, and conditional probability distributions, mathematical expectation, variable transformation, moment generating function, commonly used probability distributions, sampling distributions, laws of large numbers and the central limit theorem. This course has Differential Tuition.

STA 5513. Mathematical Statistics II. (3-0) 3 Credit Hours.
Prerequisite: STA 5503 or consent of instructor. Data reduction, sufficient and complete statistics, unbiased estimation, maximum likelihood estimation, method of moments, best unbiased estimator, Fisher information, Cramer-Rao lower bound, hypothesis testing, likelihood ratio test, Neyman-Pearson lemma and uniformly most powerful test, and interval estimation. This course has Differential Tuition.

STA 5893. AI Practicum. (3-0) 3 Credit Hours.
Prerequisite: Graduate standing or consent of instructor. This AI practicum course includes weekly AI seminar which provides insights on the current state of the AI and ML technologies and covers a wide variety of AI topics, such as computer vision, natural language processing (NLP), theoretical ML, AI fairness and ethics, cognitive science, AI hardware, etc. The seminars will include speakers from industry and academia, who discuss the state of the practice with real use cases and methodologies to make AI projects a tangible success. The practicum also offers an experiential training opportunity to apply AI to problems in the real world. Standard AI programming tool suites and design flow concepts will be learned through the mini-project. Students will also be introduced to how AI is impacting society, the ethics of AI solutions, concerns surrounding AI, and deploying AI in complex scenarios. Python programming experience is needed. This course has Differential Tuition.

STA 5973. Directed Research. (0-0) 3 Credit Hours.
Prerequisite: Graduate standing and permission in writing (form available) from the instructor and the student's Graduate Advisor of Record. The directed research course may involve either a laboratory or a theoretical problem. May be repeated for credit, but not more than 6 hours, regardless of discipline, will apply to the Master's degree. This course has Differential Tuition.

STA 6003. Statistical Methods in Research and Practice I. (3-0) 3 Credit Hours.
Prerequisite: One semester of calculus and one statistics course, or consent of instructor. The course includes concepts and knowledge in basic probability, common distributions, point and interval statistical estimations, test of hypothesis, goodness-of-fit tests, simple linear regression, and analysis of variance for regression. Course emphasis will be placed on understanding the underlying assumptions and limitations of the different techniques. Statistical software will be used for data analysis. Cannot be applied to MS in Statistics and Data Science. This course has Differential Tuition.

STA 6013. Regression Analysis. (3-0) 3 Credit Hours.
Prerequisite: STA 6003 or equivalent, or consent of instructor. Multiple regression analysis, including model adequacy checks, transformations, weighted regression, diagnostics, outlier detection, polynomial regression, indicator variables, multicollinearity, remedial measures, variable selection, model validation, autocorrelation, and specialized regressions including robust regression, nonlinear regression, logistic regression, generalized linear models, and penalized regressions. Statistical software will be used for data analysis. This course has Differential Tuition.

STA 6033. SAS Programming and Data Management. (3-0) 3 Credit Hours.
This course introduces essential SAS programming concepts with a focus on data management and the preparation of data for statistical analysis. Topics include accessing data, exploring and validating data, manipulating data with functions, processing repetitive code, combining and restructuring data, analyzing and reporting data, exporting results, and SQL. This course employs efficient and innovative methods, including the use of PROCs and Macros, to accomplish the above. This course also prepares students for the SAS Certified Associate: Programming Fundamentals Using SAS certificate exam and the SAS Specialist: Base Programming Using SAS certificate exam. This course has Differential Tuition.

STA 6103. Statistical Methods in Research and Practice II. (3-0) 3 Credit Hours.
Prerequisite: STA 6003 or equivalent, or consent of instructor. The course is specifically designed for non-statistics major graduate students and is a continuation of STA 6003. The course includes topics in multiple linear regression, experimental design introductions, analysis of variance, analysis of covariance, generalized linear models, and optional topics such as introduction to causal inference and multi-stage least squares procedure. Statistical software will be used for data analysis. Cannot be applied to MS in Statistics and Data Science. This course has Differential Tuition.

STA 6113. Applied Bayesian Statistics. (3-0) 3 Credit Hours.
Prerequisite: STA 5103 or consent of instructor. Probability and uncertainty, conditional probability and Bayes' Rule, single parameter and multiple parameter Bayesian analysis, posterior analysis for commonly used distributions, prior distribution elicitation, comparison of Bayesian and frequentist methods, Bayesian methods in linear models, Bayesian computation methods including rejection sampling, and stochastic simulation (Markov chain Monte Carlo), Bayesian shrinkage and regularization, hierarchical Bayesian methods, and applications. This course has Differential Tuition.

STA 6133. Simulation and Statistical Computing. (3-0) 3 Credit Hours.
Prerequisite: STA 5513 or consent of instructor. Elements of computer number representation, deterministic methods for function optimization, the Newton-Raphson method and variants, numerical quadrature, Gaussian quadrature, Laplace approximation, simulation of probability distributions, the inverse transform, common transformation methods, accept-reject methods, examples in Statistics, simulation from multivariate distributions, Monte Carlo integration, importance sampling, methods for variance reduction, Bootstrap, and Jackknife applications. This course has Differential Tuition.

STA 6233. R Programming for Data Science. (3-0) 3 Credit Hours.
This course is designed to introduce students to the statistical program language R for data manipulation and analysis. Topics include importing and writing various types of data, exploring and summarizing data, reshaping and cleaning data, generating graphical representations of data, and conducting basic statistical analyses using R. Other topics include writing R functions for own research problems, simplifying code for readability and performance, and object-oriented programming. Techniques for efficient programming will be stressed. This course has Differential Tuition.

STA 6243. Exploratory Data Analysis with Python. (3-0) 3 Credit Hours.
This course delves into the exploration of Exploratory Data Analysis (EDA) principles and methodologies, emphasizing data cleaning, preparation, exploration, and visualization. Students will engage with real-world datasets, learning to source, manage, transform, and explore a variety of data types using Python as the primary software tool. The course emphasizes critical thinking in the interpretation of data analytics and the development of compelling data narratives. Students are expected to complete comprehensive projects that showcase their ability to innovate in data management, analysis, and visualization. It aims to equip students with the skills needed for data science roles alongside facilitating effective communication to convey insights. This course has Differential Tuition.

STA 6253. Time Series Analysis and Applications. (3-0) 3 Credit Hours.
Prerequisite: STA 5513 or consent of instructor. This course provides examples and goals of time series analysis, stochastic processes, mean and autocovariance and cross-covariance functions, stationarity, estimation of mean and autocovariance functions, linear filters, smoothing time series, autoregressive and moving average (ARMA) processes, estimation by method of moments, least squares and maximum likelihood, model diagnostics, order and model selection, forecasting/prediction of time series, best linear prediction, and autoregressive integrated moving average (ARIMA) models. This course has Differential Tuition.

STA 6413. Nonparametric Statistics. (3-0) 3 Credit Hours.
Prerequisite: STA 5093 or consent of instructor. This course is designed to cover two big topics: (i) statistical inference under a nonparametric setting and (ii) nonparametric regression modeling based on smoothing techniques. The statistical inference methods include one-sample location problems, two-sample location problems, two-sample dispersion problems, and regression problems. The nonparametric modeling methods include local regression and penalized regression with the optimal choice of the smoothing parameter, density estimation, wavelets, and other adaptive nonparametric regression methods. This course has Differential Tuition.

STA 6443. Statistical Modeling. (3-0) 3 Credit Hours.
Prerequisite: Basic statistics or equivalent. Introduction of basic statistical methods, with specific emphasis on inferential statistics and predictive modeling algorithms . Topics include (i) exploratory data analysis; data visualization, graphical methods, extracting important variables and detecting outliers, (ii) linear models; analysis of variance (ANOVA), linear regression models, and logistic regression models. Students will be provided the opportunity to gain an understanding of when to apply and how to select various predictive modeling algorithms for various types of problems, as well as data assumptions and requirements for algorithm use, proper parameter setting, and interpreting results. Cannot be applied to MS in Statistics and Data Science. This course has Differential Tuition.

STA 6543. Predictive Modeling. (3-0) 3 Credit Hours.
This course presents students with basic understanding of predictive modeling techniques and predictive analytics tools, with specific emphasis on problem-solving with real data using R programming. Topics include data preprocessing, over-fitting and model tuning, supervised learning methods, including linear regression and classification, nonlinear regression and classification models, resampling methods, model regularization, tree and rule-based methods, and support vector machines. Unsupervised learning methods include principal component analysis, clustering methods, and outlier detection. Students will learn how to select various predictive modeling algorithms for a wide variety of applications and how to code the programs in R, as well as assumptions and requirements of predictive modelling, optimal tuning parameter setting, and how to interpret and report the results. Cannot be applied to MS in Statistics and Data Science. This course has Differential Tuition.

STA 6713. Linear Models. (3-0) 3 Credit Hours.
Prerequisite: STA 5103 or equivalent, or consent of instructor. The main objective of this course is to understand the underlying theories of linear models for regression, analysis-of-variance (ANOVA), and linear mixed models. By starting with the review of topics in matrix algebra, including rank, inverse, determinants, and spectral decomposition, students learn multivariate Normal distribution and properties of their linear and quadratic transformations. Then, relevant theories are connected to linear regression problems to derive the statistical properties of parameter estimates and implement hypothesis testing. Students will also have the opportunity to learn the statistical properties of ANOVA models and their hypothesis-testing problems under linear model contexts. The formulation of linear mixed model and generalized linear model under matrix algebra theory is also covered. This course has Differential Tuition.

STA 6813. Multivariate Analysis. (3-0) 3 Credit Hours.
Prerequisite: STA 5103 or equivalent, or consent of instructor. This course includes an introduction to multivariate data, matrix algebra, random vectors, multivariate normal distribution, inference about mean vectors, comparison of several multivariate means, principal component analysis, factor analysis, and discrimination and classification. Statistical software will be used for data analysis. This course has Differential Tuition.

STA 6833. Design and Analysis of Experiments. (3-0) 3 Credit Hours.
Prerequisite: STA 5103 or equivalent, or consent of instructor. Introduction to experimental design and applied data analysis as used in business, technological, and scientific settings. Topics include one-factor and two-factor experiments, randomized block designs, two-level and three-level factorial and fractional factorial designs, nested and split-plot designs, and optimal designs. Statistical software will be used for data analysis. This course has Differential Tuition.

STA 6843. Computer Aided Optimal Design. (3-0) 3 Credit Hours.
Prerequisite: STA 6833 or equivalent, or consent of instructor. Introduction to obtaining experimental designs and statistical methods for fitting response surfaces, and how to computer-generate the designs and use them in applied settings. Topics discussed include generating designs for obtaining process improvements with steepest ascents and for fitting response surfaces of different shapes, and use of the resultant model diagnostics to find optimum operating conditions. Use is made of JMP and SAS for design generation. This course has Differential Tuition.

STA 6853. Categorical Data Analysis. (3-0) 3 Credit Hours.
Prerequisite: STA 5103 or equivalent, or consent of instructor. This course will cover an introduction to categorical data, analysis and asymptotic inferences on contingency tables, generalized linear model, logistic regression, logit models for binary data and multicategories, log-linear model, models for matched pairs, modeling correlated responses, and generalized linear mixed models. Statistical software will be used for data analysis. This course has Differential Tuition.

STA 6863. Spatial Statistics. (3-0) 3 Credit Hours.
Prerequisite: STA 5103 or equivalent, or consent of instructor. This course will cover types of spatial data, problems dealt by geostatistical methods, basic theory of random fields, Gaussian random fields, covariograms and variograms, exploratory spatial data analysis, description of some geostatistical software, covariogram/variogram estimation: method-of-moments, least squares, maximum likelihood and restricted maximum likelihood, model selection, spatial prediction (kriging): simple kriging, ordinary kriging, universal kriging, lognormal kriging, trans-Gaussian kriging, indicator kriging, Poisson kriging, block kriging, statistical properties of kriging predictors, cross-validation, and simulation of random fields. This course has Differential Tuition.

STA 6903. Survival Analysis. (3-0) 3 Credit Hours.
Prerequisite: STA 5093 or equivalent, or consent of instructor. This course introduces both parametric and nonparametric methods for analyzing time to event data. Topics include survivor and hazard functions, censoring, Kaplan-Meier estimation, log-rank and related tests, inference based on standard lifetime distributions, regression approach to survival analysis including the Cox proportional hazards model, and time dependent covariates. Emphasis will be given on application, interpretation and data analysis using statistical software. This course has Differential Tuition.

STA 6923. Introduction to Statistical Learning. (3-0) 3 Credit Hours.
Prerequisite: STA 5103 or equivalent, or consent of instructor. This course provides an introduction to statistical learning and data mining tools in analyzing the vast amounts of data found in business, informatics, cybersecurity, and other industries. The course mostly covers supervised learning. The topics include concepts in statistical and machine learning, data preprocessing, variance-bias tradeoff, linear regressions with model assessment and regularization, model averaging, resampling tools, tree-based models with bagging, boosting, and random forests, discriminant analysis, and nearest-neighbor classification. Statistical software will be used for data analysis. This course has Differential Tuition.

STA 6933. Advanced Topics in Statistical Learning. (3-0) 3 Credit Hours.
Prerequisite: STA 6923 or equivalent, or consent of instructor. This course provides a deeper understanding of selected statistical learning concepts and tools with mathematical justifications. The topics include principal component analysis, cluster analysis, linear and nonlinear methods in regression and classification with regularization, generalized additive models, support vector machines, neural networks, and an introduction to deep learning. Statistical software will be used for data analysis. This course has Differential Tuition.

STA 6943. Statistics Internship. (0-0) 3 Credit Hours.
Prerequisite: Graduate standing, 15 semester credit hours of graduate work, and consent of instructor. Internship must be approved in advance by the Internship Coordinator and the student's Graduate Advisor of Record. Supervised full- or part-time off-campus work experience and training in statistics. Individual conferences and written reports required. This course has Differential Tuition.

STA 6953. Independent Study. (0-0) 3 Credit Hours.
Prerequisite: Graduate standing and permission in writing (form available) from the instructor and the student's Graduate Advisor of Record. Independent reading, research, discussion, and/or writing under the direction of a faculty member. For students needing specialized work not normally or not often available as part of the regular course offerings. May be repeated for credit, but not more than 6 hours, regardless of discipline, will apply to the degree. This course has Differential Tuition.

STA 6961. Comprehensive Examination. (0-0) 1 Credit Hour.
Prerequisite: Approval of the appropriate Graduate Program Committee to take the Comprehensive Examination. Independent study course for the purpose of taking the Comprehensive Examination. May be repeated as many times as approved by the Graduate Program Committee. Enrollment is required each term in which the Comprehensive Examination is taken if no other courses are being taken that term. The grade report for the course is either "CR" (satisfactory performance on the Comprehensive Examination) or "NC" (unsatisfactory performance on the Comprehensive Examination). This course has Differential Tuition.

STA 6973. Special Problems. (3-0) 3 Credit Hours.
Prerequisite: Consent of instructor. An organized course offering the opportunity for specialized study not normally or not often available as part of the regular course offerings. Special Problems courses may be repeated for credit when topics vary, but not more than 6 hours, regardless of discipline, will apply to the degree. This course has Differential Tuition.

STA 6983. Master's Thesis. (0-0) 3 Credit Hours.
Prerequisite: Permission from the Graduate Advisor of Record and thesis director. Thesis research and preparation. May be repeated for credit, but not more than 6 hours will apply to the Master's degree. Credit will be awarded upon completion of the thesis. Enrollment is required each term in which the thesis is in progress. This course has Differential Tuition.

STA 7023. Applied Linear Statistical Models. (3-0) 3 Credit Hours.
Prerequisite: Consent of instructor. An in-depth study of regression and analysis of variance models. Topics include multiple regression and model building, multiple and partial correlation, analysis of residuals, analysis of variance, multivariate analysis of variance, analysis of variance as regression analysis, generalized linear model, and applications of statistical models to problems in business. Computer software packages such as SAS or SPSS will be used for data analysis. This course is designed for doctoral students in Business and cannot be applied to a Master of Science degree in Applied Statistics without consent of the instructor and prior approval from the Graduate Advisor of Record. This course has Differential Tuition.

STA 7211. Doctoral Research. (0-0) 1 Credit Hour.
May be repeated for credit, but not more than 15 hours may be applied toward the Doctoral degree. This course has Differential Tuition.

STA 7212. Doctoral Research. (0-0) 2 Credit Hours.
May be repeated for credit, but not more than 15 hours may be applied toward the Doctoral degree. This course has Differential Tuition.

STA 7213. Doctoral Research. (0-0) 3 Credit Hours.
May be repeated for credit, but not more than 15 hours may be applied toward the Doctoral degree. This course has Differential Tuition.

STA 7214. Doctoral Research. (0-0) 4 Credit Hours.
May be repeated for credit, but not more than 15 hours may be applied toward the Doctoral degree. This course has Differential Tuition.

STA 7216. Doctoral Research. (0-0) 6 Credit Hours.
May be repeated for credit, but not more than 15 hours may be applied toward the Doctoral degree. This course has Differential Tuition.

STA 7311. Doctoral Dissertation. (0-0) 1 Credit Hour.
Prerequisite: Admission to candidacy for Doctoral degree in Applied Statistics. May be repeated for credit, but not more than 15 hours may be applied toward the Doctoral degree. This course has Differential Tuition.

STA 7313. Doctoral Dissertation. (0-0) 3 Credit Hours.
Prerequisite: Admission to candidacy for Doctoral degree in Applied Statistics. May be repeated for credit, but not more than 15 hours may be applied toward the Doctoral degree. This course has Differential Tuition.

STA 7314. Doctoral Dissertation. (0-0) 4 Credit Hours.
Prerequisite: Admission to candidacy for Doctoral degree in Applied Statistics. May be repeated for credit, but not more than 15 hours may be applied toward the Doctoral degree. This course has Differential Tuition.

STA 7316. Doctoral Dissertation. (0-0) 6 Credit Hours.
Prerequisite: Admission to candidacy for Doctoral degree in Applied Statistics. May be repeated for credit, but not more than 15 hours may be applied toward the Doctoral degree. This course has Differential Tuition.

STA 7503. Advanced Inference I. (3-0) 3 Credit Hours.
Prerequisite: STA 5513 or equivalent and Doctoral standing. This course is a brief discussion of measure theory and Lebesgue integration, statistical models, location and scale families of distributions, exponential families of distributions, sufficiency, factorization theorem, completeness, ancillarity, Basu's theorem, Fisher information, Kullback-Leibler divergence, elements of statistical decision theory, basic concepts for point estimation, best-unbiased estimation, Rao-Blackwell theorem, Lehmann–Scheffé theorem, Cramér–Rao (information) inequality, maximum likelihood estimation (MLE), and profiled/concentrated likelihood. This course has Differential Tuition.

STA 7513. Advanced Inference II. (3-0) 3 Credit Hours.
Prerequisite: STA 7503. Elements of asymptotics, different forms of stochastic convergence, laws of large numbers, central limit theorems, univariate and multivariate delta methods, asymptotic properties of maximum likelihood estimators, limit distribution of estimators, asymptotic relative efficiency, asymptotic confidence regions, tests of hypotheses, Neyman-Pearson theory, uniformly most powerful tests, unbiased tests, applications to exponential families, monotone likelihood ratio families, likelihood ratio tests, Wald tests, Rao/Score tests, asymptotic properties of tests, and duality between confidence regions and tests of hypotheses. This course has Differential Tuition.