Graduate Certificate in Mathematical Foundation of Data Analytics

Program Description

Recent advances in technology, such as e-commerce, smart phones, and social networking, are generating new types of data on a scale never seen before. This phenomenon is know as “big data”. This problem has opened a new avenue of consumer interaction, through new marketing strategies like recommender systems, to defining demographic, geographic, and political community clusters. Industry is attempting to take hold of this information to better position themselves in the local and global marketplaces. The graduate certificate in the mathematical foundations of data analytics will allow students to develop knowledge, skills, and abilities that relate to this growing need to understand and use “big data”.

Application

Enrollment in the Graduate Certificate of Mathematical Foundations of Data Analytics will require that students use the same application as if they are enrolling in graduate school. Students select Non-Degree Admission: Category A (code: G42B). Students must apply to the graduate school before applying for the graduate certificate. Students must declare for the certificate before being allowed to enroll in the capstone course. International students may enroll the certificate program but have to make sure it complies with their visa requirements.

Degree Requirements

Students will complete two required courses, one of which is a capstone course, and at least 9 credits of electives.

	Course Name & Number	**Credit Hours**
Required Courses		
MATH 746	Introduction to Data Analytics	3
MATH 802	Data Analytics Capstone	3
Electives – Choose 3		
MATH 553*	Mathematical Models	3
PHYS 730*	Principles of Computer Modeling	2
MATH 751	Numerical Linear Algebra	3
STAT 763	Applied Regression Analysis	3
STAT 764	Analysis of Variance	3
STAT 776	Applied Statistical Methods II	3

PHYS 816	Methods in Experimental Physics	2
*only one of these may be taken for credit toward completion of the certificate program.		

Program Courses

Required Courses

MATH 746 Introduction to Data Analytics (3)
Covers basic mathematical techniques for analyzing data sets. Uses object-oriented programming, like Python or R, to show how to organize, visualize and analyze large data. For students to be successful in this course, basic programming knowledge is needed prior to enrolling. Prerequisite(s): MATH 511, 571, or instructor's consent.

MATH 802 Data Analytics Capstone (3)
Individual directed study in an area of data analytics appropriate for each student's career objectives. Project must be approved and guided by a member of the graduate faculty. If an internship is used in substitution for this course, it needs to be approved prior to the start date of the internship, and the project(s) must be reported to a graduate faculty member. Prerequisite(s): successful completion of at least 12 credit hours of courses approved for the certificate program with a GPA of 3.000 or better, declaration of intent for certificate prior to enrolling.

Elective Courses

MATH 553 Mathematical Models (3)
Covers case studies from the fields of engineering technology and the natural and social sciences. Emphasizes the mathematics involved. Each student completes a term project which is the solution of a particular problem approved by the instructor. Prerequisite(s): Math 344 with a grade point of 2.000 or better, or departmental consent.

PHYS 730 Principles of Computer Modeling (2). 1 Classroom hour; 2 Lab hours. Essential elements, principles and strategies of forward and inverse numerical computer modeling. Formulation of a qualitative problem (parametrization), model design, implementation, and interpretation of model results. Working knowledge of computational techniques with examples in physics, geology, chemistry and environmental sciences. Prerequisites: PHYS 616 or EEPS 701, plus knowledge of a programming language or numerical or symbolic mathematics package, or instructor’s consent.

MATH 751 Numerical Linear Algebra (3)
Includes analysis of direct and iterative methods for the solution of linear systems, linear least squares problems, Eigenvalue problems, error analysis, and reduction by

orthogonal transformations. Prerequisite(s): MATH 511, 547, 551 with a grade point of 2.000 or better in each, or departmental consent.

STAT 763 Applied Regression Analysis (3)
Studies linear, polynomial and multiple regression. Includes applications to business and economics, behavioral and biological sciences, and engineering. Uses computer packages for doing problems. Prerequisite(s): STAT 571, MATH 344 and 511 with a grade point of 2.000 or better in each, or departmental consent.

STAT 764 Analysis of Variance (3)
An introduction to experimental design and analysis of data under linear statistical models. Studies single-factor designs, factorial experiments with more than one factor, analysis of covariance, randomized block designs, nested designs, and Latin square designs. Uses computer packages for doing problems. Prerequisite(s): STAT 571, MATH 344 and 511 with a grade point of 2.000 or better in each, or departmental consent.

STAT 776 Applied Statistical Methods II (3)
Covers selected topics from multivariate analysis including statistical theory associated with the multivariate normal, Wishart and other related distributions, partial and multiple correlation, principal component analysis, factor analysis, classification and discriminant analysis, cluster analysis, James-Stein estimates, multivariate probability inequalities, majorization and Schur functions. Prerequisite(s): STAT 764 with a grade point of 2.000 or better, or departmental consent.

PHYS 816. Methods in Experimental Physics (2). Experiments in modern physics and experimental methods are covered stressing the development of experimental techniques and how to analyze data statistically and mathematically from these experiments. Prerequisites: PHYS 516, 517, or their equivalents.