DEPARTMENT OF MATHEMATICS

College of the Sciences and Mathematics

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West Chester University
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Department of Mathematics (http://www.wcupa.edu/mathematics)
Dr. Glidden (pglidden@wcupa.edu), Chairperson
Dr. Kolpas (skolpas@wcupa.edu), Assistant Chairperson
Dr. Gallitano (ggallitano@wcupa.edu), Graduate Coordinator - Mathematics (including Mathematics Education Concentration)
Dr. Rieger (rieger@wcupa.edu), Graduate Coordinator - Applied Statistics
Dr. McKibben (mmckibben@wcupa.edu), Graduate Coordinator - Applied and Computational Mathematics
Dr. Glidden (pglidden@wcupa.edu), Graduate Coordinator - Mathematics
Sally Malarney (somalarney@wcupa.edu), Administrative Assistant

Programs of Study

The Department of Mathematics offers the master of arts degree with options in mathematics and mathematics education, the master of science degrees with options in applied and computational mathematics and applied statistics, and a certificate in applied statistics.

Master of Arts in Mathematics

The M.A. in Mathematics at West Chester University is a thirty-three credit master's program, eighteen credits of core courses and fifteen credits of electives, which offers great flexibility. Elective courses may be in mathematics education, statistics, computer science, pure mathematics, applied and computational mathematics, actuarial science, business, and others. By properly selecting their electives, our M.A. candidates may train for work in a large variety of fields, including, but not limited to, actuarial science, computer science, operations research, biomathematics, cryptography, teaching in a high school or a two-year college, research, economics, environmental mathematics, geophysical mathematics, air traffic control operations, photogrammetry, and many more. Upon completion of the M.A. in Mathematics, students are also well prepared to pursue a doctoral program in mathematics.

Master of Arts in Mathematics - Mathematics Education Concentration

The M.A. in Mathematics with the Mathematics Education Track is a thirty-three credit master's program which is designed to offer candidates flexibility through their elective course selection so they may select mathematics education electives. The core curriculum is eighteen solid mathematics courses which consist of abstract algebra, real analysis, mathematical statistics, and geometry. Students in this program have fifteen credits of electives, and they may select up to four mathematics education electives, which is twelve credits and then an additional three credit elective in any area of mathematics or related field. This will help prepare them for a wide variety of job opportunities in the field of teaching and/or mathematics education. The student’s capstone experience is either a thesis or an oral comprehensive exam. A thesis is recommended if a student would like to pursue a doctoral program in mathematics education or related field. For further information, please contact Dr. Gail Gallitano, Graduate Coordinator.

Master of Science in Applied and Computational Mathematics

The M.S. in Applied and Computational Mathematics program is designed to prepare students to join the workforce as a consulting mathematician or to pursue doctoral study in computational and industrial mathematics or other computationally-intensive field of study.

Master of Science in Applied Statistics

Applied Statistics is one of the most relevant and in-demand degrees in today's world, and this program provides a vibrant, supportive environment to learn. Vital to a wide variety of disciplines, graduates of this program have found employment in pharmaceutical research and development; government public policy; economic forecasting and analysis; market research; public health; and many other areas. The mission of the program in applied statistics is to train students to possess the applied skills necessary for immediate employment and/or provide a course of study that would make further (doctoral) study in statistics, biostatistics, data science, or other related fields feasible. The program provides strong training in statistical analysis, statistical programming, and design of scientific studies, emphasizing hands-on work with data and communication of statistical concepts. The program features an active internship program. Starting in Fall 2018, students can choose to pursue a degree with a concentration in biostatistics or business and marketing analytics.

Programs

Master's Programs in Mathematics

- M.A. in Mathematics (http://catalog.wcupa.edu/graduate/sciences-mathematics/mathematics/mathematics-ma)
- M.A. in Mathematics - Mathematics Education Concentration (http://catalog.wcupa.edu/graduate/sciences-mathematics/mathematics/mathematics-ma-mathematics-education-concentration)
- M.S. in Applied and Computational Mathematics (http://catalog.wcupa.edu/graduate/sciences-mathematics/mathematics/applied-computational-ms)
- M.S. in Applied Statistics (http://catalog.wcupa.edu/graduate/sciences-mathematics/mathematics/applied-statistics-ms)

Certificates in Mathematics

- Applied Statistics (http://catalog.wcupa.edu/graduate/sciences-mathematics/mathematics/applied-statistics-certificate)
- Important information about the educational debt, earnings, and completion rates of students who attended this program: Certificate in Applied Statistics (https://wcupa.edu/_services/fin_aid/gainfullEmployment/AppliedStatistics/gdt.html)

Accelerated Bachelor's to Master's

- B.A. to M.A. in Mathematics (http://catalog.wcupa.edu/undergraduate/sciences-mathematics/mathematics/mathematics-ba)
Admissions

All applicants to one of West Chester University’s graduate programs will be held to the graduate admissions requirements (http://catalog.wcupa.edu/general-information/admissions-enrollment/graduate-admissions). When applicable, additional requirements for admission into specific department program(s) may be listed below.

Admission Policy for the Master’s in Mathematics Programs

M.A. in Mathematics

In addition to meeting the basic admission requirements of the University, applicants must have a bachelor’s degree in mathematics or a related field. Applicants must schedule an interview with the graduate coordinator prior to enrollment. A full treatment of calculus along with an advanced undergraduate course in modern algebra, linear algebra, differential equations, and geometry is recommended. Deficiencies in these areas may be removed by successfully completing appropriate courses. Applicants must submit scores for the general section of the GRE.

M.A. in Mathematics - Mathematics Education Concentration

In addition to meeting the basic admission requirement of the University, applicants must have a bachelor’s degree with a mathematics major or related field. Applicants must schedule an interview with the graduate coordinator prior to enrollment. Deficiencies, as determined by the graduate coordinator, may be removed by successfully completing appropriate course(s). Applicants must submit scores for the general section of the Graduate Record Examination (GRE).

Admission Policy for the M.S. in Applied and Computational Mathematics

In addition to meeting the general requirements for admission to a graduate program at West Chester University, applicants must have successfully completed the undergraduate calculus sequence, as well as courses in differential equations and linear algebra. Applicants must submit two letters of reference addressing their academic ability, and complete an in-person interview with the Graduate Coordinator.

Admission Policy for the M.S. in Applied Statistics

In addition to meeting the basic admission requirements of the University, applicants must have knowledge of calculus and linear algebra. Deficiencies, as determined by the program director, may be removed by successfully completing appropriate course(s). Borderline candidates for admission may be required to present GRE scores at the discretion of the program director.

Admission Policy for the Certificate in Applied Statistics

In addition to meeting the basic admission requirements of the University, applicants must have at least one undergraduate level (or higher) course in statistics. Deficiencies, as determined by the program director, may be removed by successfully completing an appropriate course.

Admission Policy for the Post-Master’s Certificate for Advanced Study in Applied Statistics

Admission into the post-master’s certificate program requires completion of a master’s degree in statistics or closely related field, with coursework in mathematical statistics, linear models, and at least one course in statistical programming.

Coursework that counted toward a master’s degree will not be considered toward completion of the certificate.

Policies

All graduate students are held to the academic policies and procedures outlined in the graduate catalog. Students are encouraged to review departmental handbooks for program tips, suggested course sequences, and explanations of procedures. When applicable, additional policies for specific department programs may be listed below.

Requirements for the M.A. in Mathematics

In addition to completing the course requirements, candidates must either pass a comprehensive examination or submit a thesis.

Requirements for the M.S. in Applied and Computational Mathematics

The electronic portfolio is developed cumulatively as the student progresses through curriculum of the program and must be submitted prior to graduation for approval by a faculty committee.

Requirements for the M.S. in Applied Statistics

Students must achieve a grade of B- or better in the following foundational courses: STA 504* or STA 505, STA 511, and STA 512. Per University policy, students may only repeat at most two total courses and must maintain an overall GPA of 3.0 or higher to remain in good academic standing ("STA 504 is a 4 credit alternative and will increase the curriculum to 33 credits.

Faculty

Professors

- Gail M. Gallitano (ggallitano@wcupa.edu) (1992)
- Graduate Coordinator, Mathematics
- B.S., Monmouth College; M.S., Farleigh Dickinson University; M.A., M.Ed., Ed.D., Columbia University
- Robert J. Gallop (rgallop@wcupa.edu) (2001)
- B.S., Pennsylvania State University; M.S., Ph.D., Drexel University
- Peter L. Glidden (pglidden@wcupa.edu) (1995)
- Chairperson, Mathematics
- B.A., College of Wooster; M.A., Ph.D., Columbia University
- Lisa E. Marano (lmarano@wcupa.edu) (2002)
- Mathematics
- B.A., Rider University; M.S., Ph.D., Lehigh University
- James McLaughlin (jmclaughlin2@wcupa.edu) (2005)
- B.S., University of Ulster; M.S., Queen’s University Belfast; Ph.D., University of Illinois
- Viorel Nitica (vnitica@wcupa.edu) (2001)
- B.S., M.S., University of Bucharest; Ph.D., Pennsylvania State University
- Scott Parsell (sparsell@wcupa.edu) (2009)
- B.S., Massachusetts Institute of Technology; M.S., Ph.D., University of Michigan
- Randall H. Rieger (rrieger@wcupa.edu) (2000)
- B.A., Bowdoin College; M.S., Ph.D., University of North Carolina
Courses

MAT

MAT 500. Fundamentals of Applied Mathematics. 3 Credits.
This course is designed to provide an intense review of the core concepts essential to the study of applied mathematics. Topics include the main theorems of differential and integral calculus; techniques and theories of vector analysis; sequences and power series; complex arithmetic and elementary complex-valued functions; first-order, second-order, and systems of linear differential equations; matrix algebra and vector spaces. The computer algebra systems Matlab and Mathematica will be introduced as computational tools for these topics. Typically offered in Fall, Spring & Summer.

MAT 503. History Of Mathematics. 3 Credits.
Contact department for more information about this course.

MAT 513. Linear Algebra. 3 Credits.
Vectors, vector spaces, determinants, linear transformations, matrices, and bilinear and quadratic forms.
Pre / Co requisites: MAT 513 requires prerequisite of MAT 512.

MAT 514. Theory Of Numbers. 3 Credits.
Contact department for more information about this course.

MAT 515. Algebra I. 3 Credits.
Elements of abstract algebra, groups, commutative ring theory, modules, and associative algebras over commutative rings. Offered in fall of odd-numbered years.

MAT 516. Algebra II. 3 Credits.
A continuation of MAT 515. Vector spaces, representation theory, and Galois theory.
Pre / Co requisites: MAT 516 requires prerequisite of MAT 515.
Typically offered in Spring.

MAT 517. Topics In Algebra. 3 Credits.
Contact department for more information about this course.
Repeatable for Credit.

MAT 521. Discrete Mathematics & Graph Theory. 3 Credits.
Contact department for more information about this course.

MAT 532. Geometry I. 3 Credits.
A study of geometry using calculus as our main tool. The course covers the basics of differential geometry: parametrizations, tangent spaces, curvature, geodesics; leading to Stokes theorem and the Gauss-Bonnet theorem. Several examples will be studied in depth, including the sphere and the projective plane (which were introduced in the first course).

MAT 535. Topology. 3 Credits.
This course is a rigorous introduction to point-set topology. Topics covered include topological spaces and continuous functions, connectedness, compactness, separation axioms, metrization theorems, and function spaces. Typically offered in Summer.

MAT 536. Algebraic Topology. 3 Credits.
This course is an introduction to the fundamental techniques of algebraic topology. Topics covered include fundamental groups and covering spaces, basic homological algebra, simplicial homology, singular homology, and cohomology. Typically offered in Summer.

MAT 541. Advanced Calculus. 3 Credits.
For students with background deficiencies in analysis. Ordinary and uniform limits; sequences of functions; and the Riemann integral.
Typically offered in Summer.

MAT 543. Topics in Differential Equations. 3 Credits.
An advanced topics course. Existence and uniqueness theorems, stability theory, singular points, regular singular points, Sturm separation theorem, and the "method of Liapunov.

MAT 545. Real Analysis I. 3 Credits.
A rigorous study of real-valued functions of real variables. Typically offered in Fall.
MAT 546. Real Analysis II. 3 Credits.
Continuation of MAT 545.
Pre / Co requisites: MAT 546 requires prerequisite of MAT 545.
Typically offered in Spring.

MAT 548. Industrial Mathematics - Continuous Models. 3 Credits.
This course is designed to provide a survey of mathematical concepts, techniques, and numerical algorithms used to study real-world continuous mathematical models. Application areas include population dynamics, climatology, feedback and control systems, traffic flow, diffusion, fluids and transport, and epidemiology. Computer software packages such as Matlab, Mathematica, and Maple will be used in the analysis of the problems.
Pre / Co requisites: MAT 548 requires prerequisite of MAT 500.
Typically offered in Fall.

MAT 549. Industrial Mathematics - Discrete Models. 3 Credits.
This course is designed to provide a survey of mathematical concepts, techniques, and numerical algorithms used to study real-world discrete mathematical models. Application areas include forestation, particle dynamics, image processing, genetics, queues, efficient call and traffic routing, and optimal scheduling. Computer software packages such as Matlab, Mathematica, and Maple will be used in the analysis of the problems.
Pre / Co requisites: MAT 549 requires prerequisite of MAT 500.
Typically offered in Fall.

MAT 552. Operations Research. 3 Credits.
This course provides an overview of deterministic operations research methodology including linear, integer, nonlinear, and dynamic programming, and classical optimization problems. The computer algebra system MATLAB and other software will be used as an investigative tool in analyzing the problems that arise.
Pre / Co requisites: MAT 552 requires prerequisite of MAT 500.
Typically offered in Fall.

MAT 553. Stochastic Modeling. 3 Credits.
This course introduces topics in stochastic optimization and control (including Markov chains, queueing theory, reliability theory, inventory theory, and forecasting), discrete-event and Monte Carlo simulation, and stochastic differential equations. Applications are drawn from manufacturing, finance, logistics, and service systems. The computer algebra system MATLAB and other software will be used as an investigative tool in analyzing these models.
Pre / Co requisites: MAT 553 requires prerequisite of MAT 500.
Typically offered in Spring.

MAT 554. Scientific Computing. 3 Credits.
This case-study driven course will illustrate the use of computational tools in multiple science and engineering domains. The focus is on using MATLAB and appropriate numerical methods (including solutions of linear and nonlinear algebraic equations, solutions of ordinary and partial differential equations, finite elements, linear programming, optimization algorithms, and fast-Fourier transforms) to assist in investigating mathematical models of phenomena in the physical, ecological, and financial realms.
Pre / Co requisites: MAT 554 requires prerequisite of MAT 500.
Typically offered in Spring.

MAT 555. Industrial Practicum - Continuous Models. 3 Credits.
This is a case study, team problem-solving based course focused on solving real-world problems that can be modeled using continuous mathematics techniques and that emanate from industry. Ideally, the problems would be obtained from partnerships with local industry and they will ordinarily focus on topics arising in optimization, financial mathematics, and other stochastic models.
Pre / Co requisites: MAT 555 requires prerequisites of MAT 548, MAT 549, and one of MAT 552, MAT 553 or MAT 554.
Typically offered in Fall.

MAT 556. Industrial Practicum - Discrete Models. 3 Credits.
This is a case study, team problem-solving based course focused on solving real-world problems that can be modeled using discrete mathematics techniques and that emanate from industry. Ideally, the problems would be obtained from partnerships with local industry and they will ordinarily focus on topics arising in the biological, natural, and physical sciences.
Pre / Co requisites: MAT 556 requires prerequisite of MAT 548, MAT 549, and at least one of the following: MAT 552, MAT 553, or MAT 554.
Typically offered in Spring.

MAT 570. Math Models In Life, Phys & Soc Sciences. 3 Credits.
Contact department for more information about this course.

MAT 575. Complex Analysis I. 3 Credits.
Contact department for more information about this course.

MAT 583. Operations Research & Applied Mathematics. 3 Credits.
Contact department for more information about this course.

MAT 595. Topics in Mathematics. 1-3 Credits.
Topics announced at time of offering.
Consent: Permission of the Department required to add. Repeatable for Credit.

MAT 599. Independent Study. 1-3 Credits.
Contact department for more information about this course.

MAT 609. Thesis I. 3 Credits.
Conduct literature search, develop thesis proposal and begin research under the guidance of a mathematics department faculty member.

MAT 610. Thesis II. 3-6 Credits.
Contact department for more information about this course.

MTE

MTE 501. Fundamental Concepts of Mathematics I. 3 Credits.
Selected topics that reflect the spirit and the content of the modern elementary school mathematics programs. Logic, sets, functions, number systems, integers, number theory, rational numbers, and problem solving, including estimations and approximations, proportional thinking, and percentages.
Typically offered in Fall & Spring.

MTE 502. Fundamental Concepts of Mathematics II. 3 Credits.
A continuation of MTE 501. The real number system, probability, statistics, geometry, measurement (including the metric system), and problem solving.
Pre / Co requisites: MTE 502 requires prerequisite of MTE 501.
Typically offered in Fall & Spring.

MTE 507. Foundations of Secondary Mathematics Education. 3 Credits.
Research methods in mathematics education; forces which have shaped mathematics education; classroom implications of 20th-century learning theorists; assessment in the classroom; methods of organizing for instruction; cultural and gender considerations.
Typically offered in Summer.

MTE 508. Jr. High School Math - Curriculum, Instruction, and Assessment. 3 Credits.
This course will focus on the curricula, methods of instruction, and assessment techniques used to teach mathematics in a junior high school setting. Course topics will include elementary school mathematics from the perspective of a secondary school teacher, junior high school mathematics, algebra I, and general/consumer mathematics. Teachers also will explore strategies that can be used to integrate the calculator, computer, and new CD-ROM technologies into the mathematics classroom.
Pre / Co requisites: MTE 508 requires prerequisite of MTE 507.
Typically offered in Spring.

MTE 510. Algebra for the Elementary Teacher. 3 Credits.
Pre / Co requisites: MTE 510 requires prerequisite of MTE 501.
Typically offered in Fall.

MTE 512. Sr. High School Math - Curriculum, Instruction and Assessment. 3 Credits.
This course will focus on the curricula, methods of instruction, and assessment techniques used to teach mathematics in a senior high school setting. Course topics will include geometry, algebra II, trigonometry, precalculus, and discrete mathematics. Teachers also will explore strategies that can be used to integrate the scientific and graphing calculator, computer, and the new CD-ROM technologies into the mathematics classroom.
Pre / Co requisites: MTE 512 requires prerequisite of MTE 507.
Typically offered in Spring.

MTE 530. Geometry for the Elementary Teacher. 3 Credits.
Basic concepts in geometry. Euclidean geometry and postulate systems.
Pre / Co requisites: MTE 530 requires prerequisite of MTE 501.
Typically offered in Fall.
MTE 553. Teaching Children Mathematics I. 3 Credits.
In-depth treatment of strategies, methods, and materials for teaching the following concepts
in an elementary classroom: place value; addition, subtraction, multiplication, and division of
whole numbers; measurement; elementary number theory; geometry; fractions; and integers.
Pre / Co requisites: MTE 553 requires prerequisites of two mathematics courses.
Typically offered in Fall, Spring & Summer.

MTE 555. Teaching Children Mathematics II. 3 Credits.
A continuation of the strategies and methods for teaching the topics covered in MTE 553
extended to real numbers, deeper concepts of geometry in the plane and space, percents,
proportional thinking and algebra.
Pre / Co requisites: MTE 555 requires prerequisite MTE 553; field clearances.
Typically offered in Fall, Spring & Summer.

MTE 560. Teaching Algebra In The Secondary School. 3 Credits.
Contact department for more information about this course.
Typically offered in Fall & Spring.

MTE 561. Calculus For Teachers. 3 Credits.
Contact department for more information about this course.
Typically offered in Fall & Spring.

MTE 567. Teaching Geometry In Secondary School. 3 Credits.
Contact department for more information about this course.
Typically offered in Fall & Spring.

MTE 568. Seminar For Second School Math Tchns. 3 Credits.
Selected topics of current interest in secondary school mathematics for the in-service teacher.
Repeatable for Credit.

MTE 595. Topics in Mathematics Education. 1-3 Credits.
Topics announced at time of offering.
Consent: Permission of the Department required to add.

MTE 599. Independent Study. 1-3 Credits.
Contact department for more information about this course.

MTE 604. Research Seminar. 3 Credits.
This course will focus on the study of research in mathematics education. Contemporary topics
of research will be discussed and perused. Students will be expected to report on a topic of
research of their choosing. In addition, empirical study and design will be discussed along with
data analysis and the reporting of results.

MTE 610. Thesis. 3-6 Credits.
Contact department for more information about this course.

STA

STA 501. Methodologies in Applied Statistics. 3 Credits.
This course will teach the commonly used statistical techniques that are most likely to be
encountered in graduate research. Topics will include t-tests, multiple linear regression,
ANOVA, chi-squared tests and power/sample size calculations.

STA 504. Mathematical Statistics I with Calculus Review. 4 Credits.
A rigorous treatment of probability spaces and an introduction to the estimation of
parameters. This course will also review relevant calculus topics.
Typically offered in Fall.

STA 505. Mathematical Statistics I. 3 Credits.
A rigorous treatment of probability spaces and an introduction to the estimation of
parameters.
Typically offered in Fall.

STA 506. Mathematical Statistics II. 3 Credits.
Continuation of STA 505. Correlation, sampling, tests of significance, analysis of variance,
and other topics.
Pre / Co requisites: STA 506 requires a prerequisite of STA 505 or STA 504.
Typically offered in Fall.

STA 507. Introduction to Categorical Data Analysis. 3 Credits.
Data-driven introduction to statistical techniques for analysis of data arising from medical and
public health studies. Contingency tables, logistic regression survival models, non parametric
methods and other topics.
Pre / Co requisites: STA 507 requires prerequisites of STA 511 and STA 512 or permission of
instructor.

STA 510. Statistical Methods for Research. 3 Credits.
This course will provide the tools and methods for designing a research project, conducting the
research, managing and manipulating a dataset, and finally analyzing data. This course is for
students not enrolled in the Applied Statistics Graduate Degree Program. It requires no prior
course in statistics or computer science. Topics covered will include: 1. Research Design 2. Basic
(including t-tests, linear regression, ANOVA, and chi-squared tests) 5. Writing a final report,
including graphics, summarizing the results.

STA 511. Intro Stat Computing & Data Management. 3 Credits.
Course will give students the ability to effectively manage and manipulate data, conduct
statistical analysis and generate reports and graphics, primarily using the SAS Statistical
Software package.
Typically offered in Fall.

STA 512. Principles of Experimental Analysis. 4 Credits.
Course provides technology-driven introduction to regression and other common statistical
multivariable modeling techniques. Emphasis on interdisciplinary actions.
Pre / Co requisites: STA 512 requires prerequisite: STA 511 or permission of instructor.
Typically offered in Spring.

STA 513. Intermediate Linear Models. 4 Credits.
Rigorous mathematical and computational treatment of linear models.
Pre / Co requisites: STA 513 requires prerequisites of STA 505 or STA 504, STA 506, STA 511,
and STA 512 or permission of instructor.

STA 514. Modern Experimental Design. 3 Credits.
Focusing on recent journal articles, this course will investigate issues associated with design of
various studies and experiments. Pharmaceutical clinical trials, case-controlled studies, cohort
studies, survey design, bias, causality and other topics.
Pre / Co requisites: STA 514 requires prerequisites of STA 511 and STA 512 or consent of
instructor.

STA 521. Statistics I. 3 Credits.
For nonmathematics majors. Emphasis on applications to education, psychology, and the
sciences. Distributions, measures of central tendency and variability, correlation, regression
and hypothesis testing, and other topics.

STA 531. Topics In Applied Statistics. 3 Credits.
Contact department for more information about this course.
Repeatable for Credit.

STA 532. Survival Analysis. 3 Credits.
This course will provide students with the knowledge and tools to conduct a complete
statistical analysis of time to event data. Students will get experience using common methods
for survival analysis, including Kaplan–Meier Methods, Life Table Analysis, parametric
regression methods, and Cox proportional Hazard Regression. Additional topics include
discrete time data, competing risks, and sensitivity analysis.

STA 533. Longitudinal Data Analysis. 3 Credits.
Introduction to the application and theory of models for clustered and longitudinal data.
Course will address the analysis for both continuous and categorical response data. Course will
be held in the statistics lab and use the statistical software package SAS. Other software such
as R, HLM, SPSS, MIXOR/MIXREG may be introduced.
Pre / Co requisites: STA 533 requires prerequisites: STA 511, STA 512, STA 507 and STA 513 or
permission of Director of M.S. Applied Statistics.

STA 534. Time Series. 3 Credits.
Time series analysis deals with the statistical study of random events ordered through
time. This class will focus on the characteristics inherent in such processes such as repetitive
cycles and deteriorating dependence. Course topics will include seasonal decomposition,
exponential smoothing, and ARIMA models. Emphasis will be placed on real life data analysis
and statistical communication. Data analysis will be done with a variety of programs such as
SAS, R, and Excel.
Pre / Co requisites: STA 534 requires prerequisite of STA 511 and STA 512.

STA 535. Multivariate Data Analysis. 3 Credits.
Multivariate data typically consist of many records, each with readings on two or more
variables, with or without an “outcome” variable of interest. Procedures covered in this course
include multivariate analysis of variance (MANOVA), principal component analysis, factor
analysis, and classification techniques.
Pre / Co requisites: STA 535 requires prerequisite: STA 505, STA 506, STA 511, STA 512.
STA 536. Data Mining. 3 Credits.
LEC (0), LAB (0)
The purpose of this course is to give you an introduction to many of the modern techniques that are used to analyze a wide array of data sets. We will be applying these methods using the statistical programming language R.

STA 537. Advanced Statistical Programming Using SAS. 3 Credits.
This course will focus on skills and techniques considered essential to advanced SAS programming. The primary topics covered will be SAS SQL and SAS Macro Programming. Other advanced topics such as indices, efficient programming techniques, memory usage, graphics, and using best programming practices will also be covered.
Pre / Co requisites: STA 537 requires a prerequisite of STA 511.

STA 538. Statistical Programming Using R. 3 Credits.
The statistical programming language R is one of the most popular tools for data analysis. It is freely available to most common operating systems and also an extremely powerful and customizable programming language. This course will focus on performing many rigorous statistical analyses and simulating data in R. Some of the topics include: verifying concepts of statistical inference using simulations, fitting linear models, performing various statistical tests, along with advanced graphics and visualization.
Typically offered in Fall, Spring & Summer.

STA 539. Applied Bayesian Methods. 3 Credits.
Review of conditional probability and Bayes’ Theorem, conditional distributions and conditional expectations, and likelihood functions; prior and posterior distributions; conjugate priors; credible intervals; Bayes’ factors; Bayesian estimation in linear models; predictive analysis; Markov Chain Monte Carlo methods. Use of appropriate technology.
Pre / Co requisites: STA 539 requires prerequisites of STA 506 and STA 511.
Typically offered in Fall, Spring & Summer.

STA 540. Statistical Consulting. 3 Credits.
This course will discuss the skills needed to be successful in different consulting environments. It will provide detailed instruction on use of communication skills and consulting strategies. Several interactive case studies will be presented. Then, students will be required to work as part of a team on a real consulting project. Students will be involved in a consulting session with clients, research and carry out the data analysis, and present the final results in another consulting meeting. Statistical methods from previous courses may be applied to the data for the projects. In addition, new statistical techniques may be taught as part of the class if the projects require statistical methodologies not introduced in previous classes.
Pre / Co requisites: STA 540 requires prerequisites of STA 511 and STA 512.
Typically offered in Fall, Spring & Summer.

STA 541. Categorical Data Analysis II. 3 Credits.
This course will extend the information presented in the STA 507 course. We will cover statistical methods for producing Receiver Operating Characteristic Curves and the Optimal operating point from logistic regression. Goodness-of-link and complex modeling issues for count data such as overdispersion and underdispersion will be presented. Students will be exposed to discussion of techniques for both cross-sectional and longitudinal count data. Techniques to assess goodness of fit for count data will be introduced. Students will be exposed to various programming techniques to fit such data within the SAS software using procedures such as PROC GENMOD, PROC COUNTRG, PROC FMM, PROC GLIMMIX, and PROC NLMIXED. Upon completion of this second part of Categorical Data Analysis, students will be comfortable with the analytical techniques for a variety of count outcomes in the real world setting. Proper communication and interpretation of these models is an essential component of the course.
Pre / Co requisites: STA 541 requires a prerequisite of STA 507.
Typically offered in Fall, Spring & Summer.

STA 542. Statistical Methods for Observational Studies. 3 Credits.
In the assessment of the association between a predictor and a response confounding by another factor might yield wrong answers. One standard technique to protect against confounding is randomization, which is the standard for conducting randomized clinical trials (RCT). In the setting where randomization cannot be applied, such as cohort or case-control studies, the potential for confounding exists; therefore, analytical techniques must be developed to address this potential confounding. These studies where the respective predictor is observed (i.e. gender, case versus control, etc...) rather than randomized (i.e. drug versus placebo, Treatment 1 versus Treatment 2, etc...) are referred to as observational studies. This course will cover statistical methods for the design and analysis of observational studies. Students will be exposed to discussion of differences between experimental, observational, and quasi-experimental studies. Techniques to assess statistical effects while addressing confounding (both measured and unmeasured) and selection bias will be introduced. Various techniques introduced are: propensity scores, inverse probability weighting, instrumental variables, Marginal Structural Models, Structural Nested Mean Models. Students additionally will be introduced to the Rubin Causal Model framework in the assessment of Causal effects.
Pre / Co requisites: STA 542 requires prerequisites of STA 511 and STA 512.
Typically offered in Fall, Spring & Summer.

STA 543. Statistical Methods in Business and Finance. 3 Credits.
This course will cover the application of statistics to modeling, estimation, inference and forecasting in the business and financial world through real world problems with an emphasis on critical evaluation. It will cover selected topics from econometrics, decision theory, and financial modeling, as well as business optimization and simulation.
Pre / Co requisites: STA 543 requires prerequisites of STA 505 or STA 504; STA 511; STA 512.
Typically offered in Fall, Spring & Summer.

STA 544. Applied Marketing Analytics. 3 Credits.
In this course we will learn how to provide in-depth insights about core big data assets commonly used in business analytics, as well as research in pharmaceutical, package goods, and financial industries. Additional topics will include national and customer level data assets, projection methodologies, business analytics techniques, and specific applications of statistical and analytic techniques to the marketing industry.
Typically offered in Fall, Spring & Summer.

STA 549. Independent Study. 1-3 Credits.
Individual exploration of a topic in statistics.
Typically offered in Fall, Spring & Summer.
Repeatable for Credit.

STA 601. Internship In Applied Statistics. 1-6 Credits.
In cooperation with a regional industrial company student will perform an internship in applied statistics.
Typically offered in Fall, Spring & Summer.
Repeatable for Credit.

STA 609. Thesis I. 3-6 Credits.
Research project under the guidance of the mathematics faculty.
Typically offered in Fall, Spring & Summer.
Repeatable for Credit.

STA 610. Thesis II. 3-6 Credits.
Research project under the guidance of the mathematics faculty.
Pre / Co requisites: STA 610 requires prerequisite of STA 609.
Typically offered in Fall, Spring & Summer.
Repeatable for Credit.