DEPARTMENT OF MATHEMATICS
WEST CHESTER UNIVERSITY

GRADUATE HANDBOOK
2020-2021

If you have any questions about any item in the Handbook or if you wish to learn more about our graduate programs or the Department of Mathematics at West Chester University, please do not hesitate to contact us.

Peter L. Glidden, Ph.D., Columbia University — UNA 101
Professor and Chair — pglidden@wcupa.edu — 610-436-2440

Gail Gallitano, Ed. D., Columbia University — UNA 114
Professor and Coordinator of the MA Mathematics Program — ggallitano@wcupa.edu — 610-436-2452

Allison Kolpas, Ph.D., University of California, Santa Barbara — UNA 106
Associate Professor and Assistant Chair and Coordinator of the MS Applied and Computational Mathematics Program — akolpas@wcupa.edu — 610-436-2148

Randall Rieger, Ph.D., University of North Carolina — UNA 116
Professor and Coordinator of the MS Applied Statistics Program — rrieger@wcupa.edu — 610-436-2893

Department of Mathematics
25 University Avenue
West Chester University
Fax: 610.738.0578

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Mathematics at West Chester University

Mission

The Department's mission statement includes the following goals:

- To give students a firm grounding in the ideas and methods of mathematics.
- To develop an understanding and appreciation of the abstract and deductive nature of mathematics.
- To give students an appreciation of the contemporary as well as the historical importance of mathematics.
- To provide students with sufficient skills to enable them to apply their knowledge to related fields of study.
- To prepare students for continued study in graduate school, a career as a middle or secondary school teacher of mathematics, or for a career as an actuary, as an applied mathematician or such as a statistician, or an industrial mathematician.

Mathematics Colloquia

Almost every Wednesday afternoon, the Department of Mathematics hosts a talk on an important topic in mathematics, applied mathematics or mathematics education. The talks are presented by our faculty, visiting faculty members, well known lecturers, former students, and sometimes even current upper-class undergraduate or graduate students.

Quality Teaching

Graduate students receive individual attention from our faculty members. We like to think of ourselves as being a friendly, warm, and student-centered department.

Social Activities

There are frequent opportunities for faculty members and students to socialize. Both are invited to attend the Wednesday afternoon Teas, the Annual Thanksgiving Dinner, and the Annual Awards Banquet as well other events sponsored by individual faculty members and student organizations.

Technical and Related Support

Students have access to microcomputer networks at numerous locations. These have full internet access. A current collection of mathematical, statistical and programming software is available for student use including Mathematica, Maple, MATLAB, MiniTab, and SAS. Computational Mathematics Laboratories are located in rooms 103 & 109 next to the Student Tutorial Center. Desktop computers and a large and current software library are available in the Student Tutorial Center. The Department also has a Seminar Room (room 103) that includes a small mathematics library.

Degree Programs

The Department of Mathematics offers three graduate degrees:

- **MA Mathematics**. The MA in Mathematics Program is a thirty-three credit Master's Program designed to offer candidates flexibility through elective courses. The core curriculum is eighteen mathematics courses consisting of abstract algebra, real analysis, mathematical statistics, and geometry. Students in this program have fifteen credits of electives, which they may carefully select to prepare themselves for a wide variety of job opportunities. 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 degree in mathematics or a related field, or be employed as a research mathematician. A graduate degree in mathematics is a much sought-after degree by many employers because mathematics teaches discipline and great problem-solving skills. Through selection of elective courses students may prepare for a wide variety of jobs in many areas with possible employment in colleges, universities, and many state, federal and private agencies. The program is also well suited for high school mathematics teachers or educators who are interested in college teaching. Students may elect up to four mathematics education courses. *For further information, please contact Dr. Gail Gallitano, Program Coordinator.*

- **MA Mathematics – the Mathematics Education Track**. The MA 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 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, Program Coordinator.*

- **MS in Applied and Computational Mathematics**. The Master of Science in Applied and Computational Mathematics Program at WCU is designed to provide the training essential to launching a career as an industrial mathematician or pursue doctoral study in applied and computational mathematics and related fields. Our project-driven curriculum equips students with students with advanced knowledge in content areas that span the realm of applied mathematics, including differential equations, discrete mathematics, probabilistic modeling, optimization, and statistical analysis. The development, refinement, analysis, and validation of mathematical models of real-world phenomena from industrial settings is front and center in all courses, making every course directly applicable to professional settings. Classes are offered in the evenings and the program accommodates both

full-time and part-time students. We encourage students with backgrounds in related fields to apply and have designed an independent study bridge course to ease their transition. *For further information, please contact Dr. Allison Kolpas, Program Coordinator.*

- **MS in Applied Statistics.** The MS in Applied Statistics is a state-of-the art program that brings together statistical theory, computer programming, and scientific research. This degree prepares you for immediate employment in a variety of high-paying industry positions as well as for doctoral study in applied statistics or a related field. Students are able to get their Master's degree in Applied Statistics with a concentration in either Biostatistics and Bioinformatics or Business and Marketing Analytics. Starting in Fall of 2021, students may also declare a concentration in Data Science. Students will also still have the option to get the more general Master's in Applied Statistics without a concentration, which allows for taking courses in a variety of application areas. Our Master's degree in Applied Statistics with a concentration in Biostatistics and Bioinformatics will prepare students for careers in medical research, pharmaceutical and clinical statistics. Our Master's degree in Applied Statistics with a concentration in Business and Marketing Analytics will prepare students for careers in business, banking, risk management, and marketing analytics. Our Master's degree with a concentration in Data Science will provide students with the necessary knowledge and skills to build models, algorithms, and systems using massively disparate data sources to answer questions such as how to make real-time predictive fraud detection and credit risk assessments, and how to extract information from Electronic Medical Records (EMR) for patients' health risk stratification and healthcare resource allocation. Students may select a concentration at the time of application to the Program. They will have the option of changing concentrations (or moving to the general degree) at any time while enrolled in the Program. *For further information, please contact Dr. Randall Rieger, Program Coordinator.*

MA Mathematics

The MA in Mathematics at West Chester University is a thirty-three credit Master's Program which offers great flexibility. Students take eighteen credits of core curriculum courses and fifteen credits of electives which they choose in conjunction with their advisor. The core curriculum includes a broad selection of mathematics courses including abstract algebra, real analysis, mathematical statistics, and geometry. Students may select from a wide range of specialized electives. Elective courses may be in mathematics education, statistics, computer science, pure mathematics, applied and computational mathematics, actuarial science, and others. For their capstone experience, a student may choose between a thesis and an oral comprehensive exam.

By properly selecting their electives, our MA 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/four-year college, research, economics, environmental mathematics, geophysical mathematics, air traffic control operations, photogrammetry, and many more. Five excellent jobs namely, software engineer, actuary, computer systems analyst, computer programmer, and mathematician all require a strong background in mathematics. Upon completion of the MA in Mathematics students are also well prepared to pursue a doctoral degree in mathematics.

Mathematics opens the doors to many promising careers and teaches patience, discipline, and systematic problem-solving skills. In addition, most high-earning college degrees all have a common element namely mathematics. Not only do many professions and majors (engineering, doctors, physics, nurses, computer science, actuarial science, etc.) require courses in mathematics, but the analytical and problem-solving skills students learn in mathematics can apply to all disciplines. There are an unlimited number of job opportunities for our graduates with an MA in Mathematics.

Many public and private employers hire in the field of mathematics. These include schools, colleges, universities, and many state and federal agencies. Some specific employers include the Internal Revenue Service, U. S. Census Bureau, Ford Motor Co., Transamerica Insurance Co., Jet Propulsion Laboratory, IBM Corporation, Center for Communications Research, A. C. Nielsen Co., American Airlines, U. S. Department of Energy, Exxon Production Research Co., United Airlines, Bureau of Labor Statistics, Prudential Securities, International Computer Science Institute, National Security Agency, Silicon Graphics, and others.

WCU Master of Arts in Mathematics
Thesis Option
Graduate Advising Sheet. (33 credits)

Student Name: _____WCU ID # _____ Semester accepted _____

Core Curriculum (18 credit hours)	**Semester**	**Year**	**Grade**
MAT 515 (3) Algebra I	_____	____	_____
MAT 516 (3) Algebra II	_____	____	_____
MAT 545 (3) Real Analysis I	_____	____	_____
MAT 546 (3) Real Analysis II	_____	____	_____
MAT 532 (3) Geometry I	_____	____	_____
STA 505 (3) Mathematical Statistics I	_____	____	_____

Electives (9 credit hours)

Course	**Semester**	**Year**	**Grade**
1. _____	_____	____	_____
2. _____	_____	____	_____
3. _____	_____	____	_____

Electives may be chosen, in consultation with the student's advisor, from a variety of disciplines including Pure Mathematics, Mathematics Education, Applied Mathematics, Computer Science, Statistics, Actuarial Science, and others.

Thesis Option (6 credit hours)	**Semester**	**Year**	**Grade**
MAT 609 Thesis I	_____	____	_____
MAT 610 Thesis II	_____	____	_____

WCU Master of Arts in Mathematics
Non-Thesis Option
Graduate Advising Sheet. (33 credits)

Student Name: _____WCU ID # _____ Semester accepted _____

Core Curriculum (18 credit hours)	**Semester**	**Year**	**Grade**
MAT 515 (3) Algebra I	_____	____	_____
MAT 516 (3) Algebra II	_____	____	_____
MAT 545 (3) Real Analysis I	_____	____	_____
MAT 546 (3) Real Analysis II	_____	____	_____
MAT 532 (3) Geometry I	_____	____	_____
STA 505 (3) Mathematical Statistics I	_____	____	_____

Electives (15 credit hours)

Course	**Semester**	**Year**	**Grade**
1. _____	_____	____	_____
2. _____	_____	____	_____
3. _____	_____	____	_____
4. _____	_____	____	_____
5. _____	_____	____	_____

Electives may be chosen, in consultation with the student's advisor, from a variety of disciplines including Pure Mathematics, Mathematics Education, Applied Mathematics, Computer Science, Statistics, Actuarial Science, and others.

Oral Comprehensive Exam (3 subject areas)	**Semester**	**Year**	**Grade**
1. _____	_____	____	_____

WCU Master of Arts in Mathematics – Mathematics Education
Thesis Option
Graduate Advising Sheet. (33 credits)

Student Name: _____WCU ID # _____ Semester accepted _____

Core Curriculum (18 credit hours)	**Semester**	**Year**	**Grade**
MAT 515 (3) Algebra I	_____	____	_____
MAT 516 (3) Algebra II	_____	____	_____
MAT 545 (3) Real Analysis I	_____	____	_____
MAT 546 (3) Real Analysis II	_____	____	_____
MAT 532 (3) Geometry I	_____	____	_____
STA 505 (3) Mathematical Statistics I	_____	____	_____

Electives (9 credit hours)

Course	**Semester**	**Year**	**Grade**
1. MTE 512 (3) Teaching Math Senior High	_____	____	_____
2. MTE 604 (3) Research in Math Ed	_____	____	_____
3. MTE 508 (3) Middle School Math	_____	____	_____

Electives may be chosen, in consultation with the student's advisor, from a variety of disciplines including Pure Mathematics, Mathematics Education, Applied Mathematics, Computer Science, Statistics, Actuarial Science, and others.

Thesis Option (6 credit hours)	**Semester**	**Year**	**Grade**
MAT 609 Thesis I	_____	____	_____
MAT 610 Thesis II	_____	____	_____

WCU Master of Arts in Mathematics – Mathematics Education
Non-Thesis Option
Graduate Advising Sheet. (33 credits)

Student Name: _____WCU ID # _____ Semester accepted _____

Core Curriculum (18 credit hours)	**Semester**	**Year**	**Grade**
MAT 515 (3) Algebra I	_____	____	_____
MAT 516 (3) Algebra II	_____	____	_____
MAT 545 (3) Real Analysis I	_____	____	_____
MAT 546 (3) Real Analysis II	_____	____	_____
MAT 532 (3) Geometry I	_____	____	_____
STA 505 (3) Mathematical Statistics I	_____	____	_____

Electives (15 credit hours)

Course	**Semester**	**Year**	**Grade**
1. MTE 512 (3) Teaching Math Senior High	_____	____	_____
2. MTE 604 (3) Research in Math Ed	_____	____	_____
3. MTE 507 (3) Foundations of Math Ed	_____	____	_____
4. MTE 508 (3) Middle School Math	_____	____	_____
5. MAT 533 (3) Geometry II	_____	____	_____

Electives may be chosen, in consultation with the student's advisor, from a variety of disciplines including Pure Mathematics, Mathematics Education, Applied Mathematics, Computer Science, Statistics, Actuarial Science, and others.

Oral Comprehensive Exam (3 subject areas)	**Semester**	**Year**	**Grade**
1. Student Schedules the Date	_____	____	_____

(ACCELERATED) B.A. MATHEMATICS TO M.A. MATHEMATICS – 141 CREDITS

General Education Requirements (40 less 9 Attributed to Major Requirements = 31 credits)		
	Credits	Semester
First Year Experience (FYE)	3	
WRT 120/ WRT 123§	3	
WRT 200-Level Course	3	
Mathematics (MAT 311 below)	3	
Diverse Communities "J" course	3	
Interdisciplinary "I" course	3	
Science (CSC 141 below)	3	
Science (3 credits of PHY 170 below)	3	
Behavior & Social Sciences	3	
Behavior & Social Sciences	3	
Humanities	3	
Humanities	3	
Arts	3	
Additional General Education Requirements		
Writing Emphasis Courses: Three "W" courses		
Speaking Emphasis Courses: Three "S" courses		
Ethics Requirement: One "E" course		
Foreign Language Requirement (0-12 credits)		
Language 101	3	
Language 102	3	
Language 201	3	
Language 202	3	
Cognate Requirements (7 credits)		
CSC 141 Computer Science I	3	
PHY 170 Physics I	4	

General Education Notes:

§ WRT 123 is a 4-credit course, so the fourth credit counts as a free elective.

- Transfer Students Should Refer to the Catalog for General Education Requirements.
- Students are encouraged to take courses that meet multiple requirements, for example, courses that are both "W" and "J" courses.

Mathematics Core Requirements (18 credits)		
MAT 161 Calculus I	4	
MAT 162 Calculus II	4	
MAT 200 Nature of Mathematics	3	
MAT 261 Calculus III	4	
MAT 311 Linear Algebra	3	
BA Mathematics Requirements (24 credits)		
MAT 411 Abstract Algebra	3	
MAT 421 Mathematical Statistics I	3	
MAT 441 Real Analysis I	3	
Algebra Elective	3	
Analysis Elective	3	
Applied Mathematics Elective	3	
Mathematics Elective (300 level and higher)*	3	
Mathematics Elective (300 level and higher)*	3	
Minor Requirements and Free Electives (28 - 40 credits)§		
Minor Elective	3	
Minor Elective	3	
Minor Elective	3	
Minor Elective	3	
Minor Elective	3	
Minor Elective	3	
Free Elective	3	
Free Elective	3	
Free Elective	3	
Free Elective	3	

Program Specific Notes:

* Any courses in mathematics with course numbers above 311, with the exception of those courses with a primary focus on teacher education or those courses restricted to students majoring in elementary Education.

(ACCELERATED) B.A. MATHEMATICS TO M.A. MATHEMATICS – 141 CREDITS (CONTINUED)

GRADUATE COURSES (33 CREDITS)		
MAT 515 ALGEBRA I	3	
MAT 516 ALGEBRA II	3	
MAT 532 GEOMETRY I	3	
MAT 545 REAL ANALYSIS I	3	
MAT 546 REAL ANALYSIS II	3	
STA 505 MATHEMATICAL STATISTICS I	3	
MAT 514 OR MAT 575 (RECOMMENDED ELECTIVE)*	3	
GRADUATE MATHEMATICS ELECTIVE	3	
GRADUATE MATHEMATICS ELECTIVE	3	
GRADUATE MATHEMATICS ELECTIVE OR THESIS	3	
GRADUATE MATHEMATICS ELECTIVE OR THESIS	3	

***STUDENTS REACHING YEAR 4 IN FALL OF AN EVEN YEAR MAY USE MAT 545 TO REPLACE THE ANALYSIS ELECTIVE AND MAT 514 TO REPLACE THE ALGEBRA ELECTIVE.**
STUDENTS REACHING YEAR 4 IN FALL OF AN ODD YEAR MAY USE MAT 515 TO REPLACE THE ALGEBRA ELECTIVE AND MAT 575 TO REPLACE THE ANALYSIS

(Accelerated) B.A. Mathematics
to M.A. Mathematics

First Year	
Fall (odd)	Spring (even)
MAT 161 (4) CSC 141 (3) Language 101 (3) FYE (3) Gen Ed Arts (3)	MAT 162 (4) MAT 200 (3) PHY 170 (4) WRT 120 (3) Language 102 (3)
Second Year	
Fall (even)	Spring (odd)
MAT 261 (4) SPK 208 (3) Language 201 (3) WRT 200 (3) Minor Elective (3)	MAT 311 (3) W course (MAT 401 recommended) (3) Gen Ed Behavioral /Social Sciences (3) Language 202 (3) Minor Elective (3)
Third Year	
Fall (odd)	Spring (even)
MAT 411 (3) MAT 421 (3) Minor Elective (3) I Course (3) W Course (3)	MAT 441 (3) MAT 514 (Elective) (3)* W course (ENG 371 W recommended) (3) J Course (3) Minor Elective (3)
Fourth Year	
Fall (even)	Spring (odd)
MAT 545 (3)* STA 505 (3) Minor Elective (3) Gen Ed Humanities (3) Free Elective (3)	MAT 546 (3)* MAT 575 (Elective) (3)* Minor Elective (3) Gen Ed Behavioral/Social Science (3) Free Elective (2)
Fifth Year	
Fall (odd)	Spring (even)
MAT 515 (3)* MAT 532 (3) Grad Math Elective or Thesis (3)	MAT 516 (3)* Grad Math Elective (3) Grad Math Elective or Thesis (3)

***STUDENTS REACHING YEAR 4 IN FALL OF AN ODD YEAR MAY USE MAT 515 TO REPLACE THE ALGEBRA ELECTIVE AND MAT 575 TO REPLACE THE ANALYSIS ELECTIVE. MAT 515-516 MAY BE TAKEN PRIOR TO MAT 545-546.**

(Accelerated) B.S. Mathematics: Mathematics To M.A. Mathematics – 141 credits

General Education Requirements (40 less 9 Attributed to Major Requirements = 31 credits)		
	Credits	Semester
First Year Experience (FYE)	4	
WRT 120/ WRT 123§	3	
WRT 200-Level Course	3	
Mathematics (MAT 311 below)	3	
Diverse Communities "J" course	3	
Interdisciplinary "I" course	3	
Science (CSC 141 below)	3	
Science (3 credits of PHY 170 below)	3	
Behavior & Social Sciences	3	
Behavior & Social Sciences	3	
Humanities	3	
Humanities	3	
Arts	3	
Additional General Education Requirements		
Writing Emphasis Courses: Two "W" courses in addition to ENG 371		
Speaking Emphasis Courses: Two "S" courses in addition to SPK 230		
Ethics Requirement: One "E" course		
Independent Study; E, S, & W courses; and Free Electives (21 credits§)		
Free Elective** (W **course** - MAT 401 recommended)	3	
Free Elective** (W **course**)	3	
Free Elective** (MAT 499 Independent Study recommended*)	3	
Free Elective (MAT 125 Recommended)	3	
Free Elective**	3	
Free Elective**	3	
Free Elective**	3	

General Education Notes:

§ WRT 123 is a 4-credit course, so the fourth credit counts as a free elective.

- Transfer Students Should Refer to the Catalog for General Education Requirements.
- Students are encouraged to take courses that meet multiple requirements, for example, courses that are both "W" and "J" courses.

Mathematics Core Requirements (18 credits)		
MAT 161 Calculus I	4	
MAT 162 Calculus II	4	
MAT 200 Nature of Mathematics	3	
MAT 261 Calculus III	4	
MAT 311 Linear Algebra	3	
BS Mathematics Concentration Courses (33 credits)		
MAT 343 Differential Equations	3	
MAT 411 Algebra	3	
MAT 421 Mathematical Statistics I	3	
MAT 441 Real Analysis I	3	
MAT 445 Complex Variables	3	
Algebra Elective	3	
Analysis Elective	3	
Applied Mathematics Elective	3	
Mathematics Elective***	3	
Mathematics Elective***	3	
Mathematics Elective***	3	
Cognate Requirements (17 credits)		
CSC 141 Computer Science I	3	
PHY 170 Physics I	4	
PHY 180 Physics II	4	
ENG 371 Technical Writing (W)	3	
SPK 230 Business Speaking (S)	3	

Program Specific Notes:

* May be taken for variable credit and repeated for credit.

** Must be approved by advisor.

*** Any courses in mathematics with course numbers above 311, with the exception of those courses with a primary focus on teacher education or those courses restricted to students majoring in elementary Education.

(ACCELERATED) B.S. MATHEMATICS: MATHEMATICS TO M.A. MATHEMATICS – 141 CREDITS (CONTINUED)

GRADUATE COURSES (33 CREDITS)		
MAT 515 ALGEBRA I	3	
MAT 516 ALGEBRA II	3	
MAT 532 GEOMETRY I	3	
MAT 545 REAL ANALYSIS I	3	
MAT 546 REAL ANALYSIS II	3	
STA 505 MATHEMATICAL STATISTICS I	3	
MAT 575 (RECOMMENDED ELECTIVE)*	3	
GRADUATE MATHEMATICS ELECTIVE	3	
GRADUATE MATHEMATICS ELECTIVE	3	
GRADUATE MATHEMATICS ELECTIVE OR THESIS	3	
GRADUATE MATHEMATICS ELECTIVE OR THESIS	3	

***STUDENTS ELECTING MAT 445 MAY INSTEAD APPLY A GRADUATE COURSE TAKEN IN YEAR 3 OR YEAR 4 TO A REPLACE A THIRD MATHEMATICS ELECTIVE; MAT 575 IS NOT REQUIRED.**

(Accelerated) B.S. Mathematics: Mathematics to M.A. Mathematics

First Year	
Fall (odd)	Spring (even)
MAT 161 (4) MAT 125 (3) (recommended) CSC 141 (3) FY Gen Ed Arts (3)	MAT 162 (4) MAT 200 (3) PHY 170 (4) WRT 120 (3) SPK 230 (3)
Second Year	
Fall (even)	Spring (odd)
MAT 261 (4) MAT 311 (3) PHY 180 (4) WRT 200 (3) Gen Ed Behavioral/Social Science (3)	MAT 343 (3) W course (MAT 401 recommended) (3) Gen Ed Humanities (3) I Course (3) Free Elective (3)
Third Year	
Fall (odd)	Spring (even)
MAT 411 (3) MAT 421 (3) Gen Ed Behavioral/Social Science (3) J Course (3) W Course (3)	MAT 441 (3) MAT 532 (3) ENG 371 W (3) Algebra Elective (3)* Free Elective (3)
Fourth Year	
Fall (even)	Spring (odd)
MAT 545 (3)* STA 505 (3) Undergrad Math Elective (3) Foreign Language 201 (3) (recommended) Free Elective (3)	MAT 546 (3)* MAT 575 (elective) (3)* Free Elective (3) Foreign Language 202 (3) (recommended) MAT 499 (1) (recommended)
Fifth Year	
Fall (odd)	Spring (even)
MAT 515 (3)* Grad Math Elective (3) Grad Math Elective or Thesis (3)	MAT 516 (3)* Grad Math Elective (3) Grad Math Elective or Thesis (3)

***STUDENTS REACHING YEAR 4 IN FALL OF AN ODD YEAR WILL INSTEAD USE MAT 515 TO REPLACE THE ALGEBRA ELECTIVE AND TAKE AN ANALYSIS ELECTIVE IN YEAR 3. MAT 515-516 MAY BE TAKEN PRIOR TO MAT 545-546.**

MA in Mathematics - Tentative Course Schedule 2020/2021

	Fall 2020	Spring 2021	Sum I 2021	Sum II 2021	Fall 2021	Spring 2022	Sum I 2022	Sum II 2022
MAT503- History of Math			√					
MAT 513 – Linear Algebra				√				√
MAT 514 – Number Theory			√					
MAT 515 – Algebra I					√			
MAT 516 – Algebra II						√		
MAT 521 – Discrete Math & Graph Theory							√	
MAT 532 – Geometry I					√			
MAT 533 – Geometry II				√		√		
MAT 535 - Topology	√							
MAT 536 – Algebraic Topology		√						
MAT 543 – Topics in Differential Equations				√				
MAT 545 - Real Analysis I	√							
MAT 546 – Real Analysis II		√						
MAT 548 - Industrial Math I	√				√			
MAT 549 – Industrial Math II		√				√		
MAT 552 – Operations Research					√			
MAT 553 – Stochastic Modeling		√				√		
MAT 554 - Scientific Computing					√			
MAT 555 – Industrial Math Practicum I						√		
MAT 556 – Industrial Math Practicum II								
MAT 570 – Math Models in Life, Phys, Soc Sci								√
MAT 575 – Complex Analysis							√	
MAT 595 – Topics in Mathematics			√					√
MAT 597 - Topics								
STA 505 – Mathematics Statistics I	√				√			
STA 506 – Mathematics Statistics II		√				√		
STA 511 – Intro StatComputing/Data Mgt	√				√			
STA 512 – Principles of Experimental Analysis						√		
MTE 507 – Foundation of Math Education	√							
MTE 508 – Middle School Math, Curriculum		√						
MTE 512 – HS Math Curriculum,					√			
MTE 553 – Teaching Elementary Math I	√	√			√			
MTE 555 – Teaching Elementary Math II	√	√			√	√		
MTE 604 – Research in Math Ed		√				√		

MS Applied and Computational Mathematics

Mission:

The MS in Applied and Computational Mathematics program at West Chester University is a 36-credit Master's program with a project-driven curriculum. The program is designed to provide students the training essential to launching a career as an industrial mathematician or pursue doctoral study in applied and computational mathematics and related fields. Students must complete 12 graduate courses (8 core courses, 2 elective courses, and 2 practicums). The two practicum courses emulate an industrial microcosm in which students tackle real-world problems from inception; they gain valuable managerial experience by supervising the work of a team of students to bring the project to completion.

Distinctive features of the program include:

- Project-oriented approach in all courses
- Dual emphasis is placed on computational mathematics in the study of all real-world projects in each course of the curriculum
- Practicum course in which undergrads, grads, faculty, and industrial partners work together to solve real-world problems
- Seminar series

Students who complete the program will:

- Acquire advanced knowledge of a wide variety of topics that span the realm of applied mathematics, including differential equations, discrete mathematics, probabilistic modeling, optimization and statistical analysis.
- Become adept at employing all steps of the mathematical modeling process in the analysis of real-world phenomena.
- Acquire expertise in using various forms of technology and in using, modifying, and creating numerical algorithms used in the analysis of real-world phenomena.
- Develop the valuable intuition of using the right tool for the right job.

Bridge Course:

We have designed the transition course MAT 500 *Fundamentals of Applied Mathematics* for students who need to review calculus, linear algebra, and differential equations. MAT 500 is waived for students with knowledge of these subjects. Students who require MAT 500 are encouraged to complete the course the summer prior to their first semester in the program.

Electronic Portfolio:

Submission of an electronic portfolio for departmental approval is a graduation requirement of the program. The portfolio is an annotated compendium of all numerical methods and applied techniques accumulated throughout the coursework, along with all technical reports and formal presentations. See the program coordinator for more details.

Career Information:

Mathematicians and computational scientists analyze data and apply mathematical and statistical techniques to help solve real-world problems in business, engineering, healthcare, or other fields. Many different types of organizations hire mathematicians and computational scientists however positions rarely carry the simple title of "mathematician."

Career information, including job opportunities, internships, and fellowships can be found on the Society for Industrial and Applied Mathematics (SIAM) Career Resources Website: https://www.siam.org/Careers/Resources.

WCU Master of Science in Applied and Computational Mathematics
Graduate Advising Sheet. (36 credits)

Student Name: _____ WCU ID # _____Semester accepted _____

Core Curriculum (24 credit hours)	**Semester**	**Year**	**Grade**
MAT 500* Fundamentals of Applied Mathematics	_____	____	____
MAT 548 Industrial Mathematics I – Continuous Models	_____	____	____
MAT 549 Industrial Mathematics II – Discrete Models	_____	____	____
MAT 552 Operations Research	_____	____	____
MAT 553 Stochastic Modeling and Simulation	_____	____	____
MAT 554 Scientific Computing	_____	____	____
STA 505 Mathematical Statistics I	_____	____	____
STA 511 Introduction to Statistical Computing and Data Management	_____	____	____

Note: * = This course is waived for students who meet the prerequisites

Industrial Mathematics Practicum (6 credit hours)	**Semester**	**Year**	**Grade**
MAT 555* Industrial Math Practicum I - Continuous Models	_____	____	_____
MAT 556* Ind. Math Practicum II – Discrete Models	_____	____	_____

Note: * **=** An internship may replace one of the practicum courses

Pure Mathematics Course Elective (3 credit hours)

Course	**Semester**	**Year**	**Grade**
1. _____	_____	____	_____

Choose from:

MAT 514 Theory of Numbers
MAT 515 Algebra I
MAT 516 Algebra II
MAT 532 Geometry I
MAT 533 Geometry II
MAT 535 Topology
MAT 545 Real Analysis I
MAT 546 Real Analysis II
MAT 575 Complex Analysis

Additional Course Elective (3 credit hours)

Course	**Semester**	**Year**	**Grade**
1. _____	_____	____	_____

Choose from: any 500-level MAT or STA course not completed to fulfill other degree requirements.

Exit Electronic Portfolio

Submission Date_____ Date approved_____

FALL 2020/SPRING 2021 – (ACCELERATED) B.S. TO M.S. APPLIED AND COMPUTATIONAL MATHEMATICS – 138 CREDIT

GENERAL EDUCATION REQUIREMENTS (40 - LESS 9 ATTRIBUTED TO MAJOR REQUIREMENTS = 31 CREDITS)	CREDITS	SEMESTER
First Year Experience (FYE)	4	
WRT 120/ WRT 123§	3	
WRT 200-Level Course	3	
MATHEMATICS (MAT 311 BELOW)	3	
DIVERSE COMMUNITIES "J" COURSE	3	
INTERDISCIPLINARY "I" COURSE	3	
SCIENCE (CSC 141 below)	3	
SCIENCE (PHY 170, BIO 110, CHE 103, or ESS 101 below)	3	
BEHAVIOR & SOCIAL SCIENCES	3	
BEHAVIOR & SOCIAL SCIENCES	3	
HUMANITIES	3	
HUMANITIES	3	
ARTS	3	
ADDITIONAL GENERAL EDUCATION REQUIREMENTS		
WRITING EMPHASIS COURSES: TWO "W" COURSES IN ADDITION TO ENG 368, ENG 371, OR ENG 375		
SPEAKING EMPHASIS COURSES: THREE "S" COURSES		
ETHICS REQUIREMENT: ONE "E" COURSE		
COGNATE REQUIREMENTS (21-23 CREDITS)		
CSC 141 COMPUTER SCIENCE I	3	
ENG 368, ENG 371, OR ENG 375 TECHNICAL /BUSINESS WRITING (W)	3	
PHY 170, BIO 110, CHE 103, OR ESS 101	3-4	
COGNATE 1*	3-4	
COGNATE 2*	3	
COGNATE 3*	3	
COGNATE 4*	3	

GENERAL EDUCATION NOTES:

§ WRT 123 IS A 4-CREDIT COURSE, SO THE FOURTH CREDIT COUNTS AS A FREE ELECTIVE.

- TRANSFER STUDENTS SHOULD REFER TO THE CATALOG FOR GENERAL EDUCATION REQUIREMENTS.
- STUDENTS ARE ENCOURAGED TO TAKE COURSES THAT MEET MULTIPLE REQUIREMENTS, FOR EXAMPLE, COURSES THAT ARE BOTH "W" AND "J" COURSES.

MATHEMATICS CORE REQUIREMENTS (18 CREDITS)		
MAT 161 CALCULUS I	4	
MAT 162 CALCULUS II	4	
MAT 200 NATURE OF MATHEMATICS	3	
MAT 261 CALCULUS III	4	
MAT 311 LINEAR ALGEBRA	3	
BS APPLIED AND COMPUTATIONAL CONCENTRATION COURSES (27 CREDITS LESS 3 ATTRIBUTED TO GRADUATE REQUIREMENTS = 24 CREDITS)		
MAT 125 INTRODUCTION TO STATISTICS AND PROBABILITY	3	
STA 319 APPLIED STATISTICS	3	
MAT 325 NUMERICAL ANALYSIS I	3	
MAT 343 DIFFERENTIAL EQUATIONS	3	
MAT 413 COMPUTER ALGEBRA	3	
MAT 425 NUMERICAL ANALYSIS II	3	
MAT 443 APPLIED ANALYSIS I	3	
ANY ONE: MAT 445 COMPLEX VARIABLES OR MAT 441 REAL ANALYSIS I (MAT 575 OR MAT 545 BELOW)	3	
MAT 455 INDUSTRIAL MATHEMATICS PRACTICUM	3	
INTERNSHIP OR ELECTIVES (21 - 23 CREDITS LESS 9 ATTRIBUTED TO GRADUATE REQUIREMENTS = 12-14 CREDITS §)		
MAT 491 INTERNSHIP IN APPLIED MATHEMATICS**	2-4	
FREE ELECTIVES (MAT 548 BELOW)	3	
FREE ELECTIVES (MAT 549 BELOW)	3	
FREE ELECTIVES (MAT 554 BELOW)	3	
FREE ELECTIVES***	3	
FREE ELECTIVES***	3	
FREE ELECTIVES***	3	
FREE ELECTIVES***	1-3	

GRADUATE REQUIREMENTS (36 CREDITS LESS 6 CREDITS WAIVED = 30 CREDITS)		
MAT 500 FUNDAMENTALS OF APPLIED MATHEMATICS (A)	3	
MAT 548 INDUSTRIAL MATHEMATICS I-CONTINUOUS MODELS	3	
MAT 549 INDUSTRIAL MATHEMATICS II-DISCRETE MODELS	3	
MAT 552 OPERATIONS RESEARCH	3	
MAT 553 STOCHASTIC MODELING	3	
MAT 554 SCIENTIFIC COMPUTING	3	
MAT 555 INDUSTRIAL PRACTICUM I (A)	3	
MAT 556 INDUSTRIAL PRACTICUM II (A)	3	
STA 505 MATHEMATICAL STATISTICS I	3	
STA 511 INTRO STAT COMPUTING & DATA MANAGEMENT	3	
MAT 575 OR MAT 545 (MAT ELECTIVE)	3	
MAT/STA ELECTIVE (B)	3	

PROGRAM SPECIFIC NOTES

* SELECT 4 SCIENCE COGNATES (PHY, BIO, CHE, CS, ESS) UNDER GUIDANCE OF ADVISOR. AT LEAST TWO COGNATES MUST BE AT THE 200-LEVEL OR ABOVE. DISCUSS WITH YOUR ADVISOR ANY PREREQUISITES. FOR EXAMPLE, CSC 220 REQUIRES MAT 151.

** MAY BE TAKEN FOR VARIABLE CREDIT AND REPEATED FOR CREDIT.

*** MUST BE APPROVED BY ADVISOR. A MINOR MAY BE OBTAINED BY ELECTING APPROPRIATE ADDITIONAL CLASSES IN A SINGLE SCIENTIFIC DISCIPLINE. DISCUSS THIS OPTION WITH YOUR ADVISOR.

(A) MAT 500 AND ONE PRACTICUM COURSE (MAT 555 OR MAT 556) ARE WAIVED FOR ACCELERATED PROGRAM STUDENTS

(B) CHOOSE ANY 500-LEVEL MAT OR STA COURSE NOT COMPLETED TO FULFILL OTHER DEGREE REQUIREMENTS

(Accelerated) B.S. to M.S. Applied and Computational Mathematics
Sample Course Plan
Students Admitted Fall 2020/Spring 2021

Year	Fall	Spring
1	FYE MAT 125 MAT 161 CSC 141 WRT 120 / WRT 123	MAT 162 MAT 200 PHY 170, BIO 110, CHE 103, or ESS 101 Gen Ed Behavioral/Social Science Gen Ed Humanities
2	MAT 261 MAT 311 Cognate 1* WRT 200-level Gen Ed Humanities	MAT 343 MAT 325 Cognate 2* Gen Ed Behavioral/Social Science JW Course
3	MAT 413 MAT 425 Cognate 3* Gen Ed Arts Free Elective***	STA 319 MAT 443 ENG 368, ENG 371, or ENG 375 (W) Free Elective*** Free Elective***
4	MAT 548 MAT 552 (A) MAT 575 or MAT 545 Cognate 4* IW Course	MAT 491** MAT 455 MAT 549 Free Elective***
5	MAT 554 (B) STA 505 STA 511	MAT 553 MAT 555 or MAT 556 MAT/STA Elective (C)

General Education Notes:

- Transfer Students Should Refer to the Catalog for General Education Requirements.
- Students are encouraged to take courses that meet multiple requirements, for example, courses that are both "W" and "J" courses.
- Writing Emphasis Courses: Two "W" courses in addition to ENG 368, ENG 371, or ENG 375.
- Speaking Emphasis Courses: Three "S" courses.
- Ethics Requirement: One "E" course.

Program Specific Notes

* Select four Science Cognates (PHY, BIO, CHE, CSC, ESS) under guidance of advisor. At least two cognates must be at the 200-level or above. Discuss with your advisor any prerequisites, for example, CSC 220 requires MAT 151.

** May be taken for variable credit and repeated for credit.

*** Must be approved by advisor. A minor may be obtained by electing appropriate additional classes in a single scientific discipline. Discuss this option with your advisor.

(A) Offered Fall odd years only. Plan accordingly.

(B) Offered Fall even years only. Plan accordingly.

(C) Choose any 500-level MAT or STA course not completed to fulfill other degree requirements.

Tentative Course Offerings for the MS in Applied & Computational Mathematics Program

Fall 2019 – Spring 2023

	Fall 2019	Spring 2020	Fall 2020	Spring 2021	Fall 2021	Spring 2022	Fall 2022	Spring 2023
MAT 500	*Offered independently as needed*							
MAT 548 (MAT 493)	✓		✓		✓		✓	
MAT 549 (MAT 423)		✓		✓		✓		✓
MAT 552 (MAT 427)	✓				✓			
MAT 553 (MAT 479)		✓		✓		✓		✓
MAT 554			✓				✓	
MAT 555 (MAT 455)		✓				✓		
MAT 556 (MAT 455)				✓				✓

MS Applied Statistics

One of the most relevant degrees in today's world, the Master of Science in Applied Statistics prepares you to analyze and explain information, an ever-increasing need for employers in virtually every industry. From estimating population trends to analyzing data on new products to investigating the efficacy of new medical treatments, professionals with backgrounds in applied statistics are in demand in seemingly limitless disciplines.

Among the many benefits of a West Chester University education in applied statistics are:

- a flexible curriculum that allows you to explore various concentrations
- visiting lectures from prominent statisticians on topics of current interest in applied statistics
- pursuing intensive study on a topic of interest with a faculty member through the optional thesis track
- optional supervised, paid internships at local companies

Want to know more about this thriving field of study or WCU's intimate, energetic program of study in it? Contact the Office of Graduate Studies (gradstudy@wcupa.edu) or the program director, Dr. Randall Rieger (rrieger@wcupa.edu). Or visit us online at wcupa.edu/applied statistics.

Concentrations

To reflect the fast-changing technology and areas of application in the field and to meet the specific professional needs of students, our Master's degree program includes concentrations in Biostatistics and Bioinformatics, Business and Marketing Analytics, and Data Science. Students will also still have the option to get the more general Master's in Applied Statistics without a concentration.

Biostatistics and Bioinformatics: Our Master's degree in Applied Statistics with a concentration in Biostatistics and Bioinformatics will prepare students for careers in medical research, pharmaceutical statistics, and bioinformatics. This concentration will provide students with the tools to help answer pressing research questions in medicine, biology and public health, such as whether a new drug or vaccine is efficacious, and what risk factors are linked to cancer and other diseases. Students in this concentration will choose from a wide variety of elective courses in areas such as Survival Analysis, Longitudinal Data Analysis, Data Mining, Clinical Trials, and Applied Bayesian Methods.

Business and Marketing Analytics: Our Master's degree in Applied Statistics with a concentration in Business and Marketing Analytics will prepare students for careers in business, banking, risk management, and marketing analytics. This concentration will provide students with the necessary knowledge to answer questions such as whether or not an advertising campaign was successful, how one can better predict consumer behavior, how to determine which factors are most important in profitability, and how to best communicate

results to a nontechnical audience. Students in this concentration will choose from a wide variety of elective courses in areas such as Time Series, Marketing Analytics, Statistical Methods in Business and Finance, and Multivariate Data Analysis.

Data Science: Our Master's degree in Applied Statistics with a concentration in Data Science will prepare students for a wide range of careers across industries, government, and businesses. This concentration will provide students with the necessary knowledge and skills to build models, algorithms, and systems using disparate data sources to answer questions such as how to make real-time predictive fraud detection and credit risk assessments in financial services, how to identify new business opportunities, how to improve customer and employee retention in an organization, how to extract information from Electronic Medical/Health Record data for patients' health risk stratification and healthcare resource allocation. Students in this concentration will choose from a wide variety of elective courses such as Data Mining, Foundations of Data Science Machine Learning, Bayesian Statistics, and Data Visualization and Infographics.

General Degree: Many of our students choose to get the general degree in applied statistics which allows them to take elective classes in a variety of concentration areas, thus providing a very general and well-rounded background in areas of statistical application.

Students may select a concentration at the time of application to the Program. They will have the option of changing concentrations (or moving to the general degree) at any time while enrolled in the Program.

Certificate Program in Applied Statistics

Students can pursue studies on a part-time basis or just learn new skills through an exciting option: the Certificate Program in Applied Statistics. This 19-credit hour program features a hands-on curriculum where you can apply statistical and computational procedures to real-life problems. The certificate program offers a broad overview to the application of statistical concepts to various research settings.

Post Master's Certificate of Advanced Study in Applied Statistics

This Certificate is an official West Chester University degree designed for students who have already successfully completed a Master's degree in Statistics or a similar field. It is a degree for those who are looking for a way to competitively advance and differentiate themselves professionally, while also staying up-to-date with the rapidly evolving field of Statistics. To complete this Certificate, students are required to take 12 credits of elective courses above and beyond what was used to complete their Master's degree. New elective courses such as Bayesian Modeling, R Programming, Marketing Analytics, Data Visualization and Infographics, Statistical Issues in Clinical Trials, and Advanced Categorical Analysis are examples of courses that may comprise a Certificate.
(See Curriculum page for additional courses.)

Graduate Degree Requirements

At any time during the first year of the program, students will be allowed to select the thesis track for the MS in Applied Statistics or the Certificate option. The thesis option replaces two elective classes with a six-credit thesis, to be initiated after the completion of STA 506.

WCU Master of Science in Applied Statistics - Non-Thesis option
Graduate Advising Sheet. (33-34 credits)

Student Name: _____WCU ID # _____ Semester accepted _____

Core Curriculum (24 credit hours)		**Semester**	**Year**	**Grade**
STA 503 (1)	Introduction to R Programming	_____	____	_____
STA 505 (3)	Mathematical Statistics 1 or	_____	____	_____
STA 504 (4)	Mathematical Statistics w/Calculus Review	_____	____	_____
STA 506 (3)	Mathematical Statistics II	_____	____	_____
STA 507 (3)	Introduction to Categorical Data Analysis	_____	____	_____
STA 511 (3)	Introduction to Statistical Computing and Data Management	_____	____	_____
STA 512 (4)	Principles of Experimental Analysis	_____	____	_____
STA 513 (4)	Intermediate Linear Models	_____	____	_____
STA 514 (3)	Modern Experimental Design	_____	____	_____

Internship in Applied Statistics (Optional)		**Semester**	**Year**	**Grade**
STA 601	Internship	_____	____	_____

Applied Statistics Elective (6-9 credit hours)

	Course	**Semester**	**Year**	**Grade**
1.	Elective _____	_____	____	_____
2	Elective _____	_____	____	_____
3.	Elective if Internship not elected _____	_____	____	_____

Choose from:

STA 531 Topics in Applied Statistics
STA 532 Survival Analysis
STA 533 Longitudinal Data Analysis
STA 534 Time Series
STA 535 Multivariate Data Analysis
STA 536 Data Mining
STA 537 Advanced Statistical Programming Using SAS

STA 538 Statistical Programming Using R
STA 539 Applied Bayesian Methods
STA 540 Statistical Consulting
STA 541 Categorical Data Analysis II
STA 542 Observational Studies
STA 543 Statistical Methods in Business and Finance
STA 544 Marketing Analytics
STA 545 Statistical Issues in Clinical Trials
STA 551 Foundations of Data Science
STA 552 Applied Statistical Machine Learning
STA 553 Data Visualization and Infographics

WCU Master of Science in Applied Statistics - Thesis option
Graduate Advising Sheet. (33-34 credits)

Student Name: _____ WCU ID # _____Semester accepted _____

Core Curriculum (24 credit hours)		**Semester**	**Year**	**Grade**
STA 503 (1)	Introduction to R Programming	_____	_____	_____
STA 505 (3)	Mathematical Statistics 1 or	_____	_____	_____
STA 504 (4)	Mathematical Statistics w/Calculus Review	_____	_____	_____
STA 506 (3)	Mathematical Statistics II	_____	_____	_____
STA 507 (3)	Introduction to Categorical Data Analysis	_____	_____	_____
STA 511 (3)	Introduction to Statistical Computing and Data Management	_____	_____	_____
STA 512 (4)	Principles of Experimental Analysis	_____	_____	_____
STA 513 (4)	Intermediate Linear Models	_____	_____	_____
STA 514 (3)	Modern Experimental Design	_____	_____	_____

Thesis in Applied Statistics		**Semester**	**Year**	**Grade**
STA 609 (3-6)	Thesis I	_____	_____	_____
STA 610 (3-6)	Thesis II	_____	_____	_____

Internship in Applied Statistics (Optional)		**Semester**	**Year**	**Grade**
STA 601	Internship	_____	_____	_____

Applied Statistics Elective (3-6 credit hours)

	Course	**Semester**	**Year**	**Grade**
1.	Elective _____	_____	____	_____
2.	Elective if Internship not elected _____	_____	_____	_____

Choose from:

STA 531 Topics in Applied Statistics
STA 532 Survival Analysis
STA 533 Longitudinal Data Analysis
STA 534 Time Series
STA 535 Multivariate Data Analysis
STA 536 Data Mining
STA 537 Advanced Statistical Programming Using SAS
STA 538 Statistical Programming Using R
STA 539 Applied Bayesian Methods
STA 540 Statistical Consulting
STA 541 Categorical Data Analysis II
STA 542 Observational Studies
STA 543 Statistical Methods in Business and Finance
STA 544 Marketing Analytics
STA 545 Statistical Issues in Clinical Trials
STA 551 Foundations of Data Science

STA 552 Applied Statistical Machine Learning
STA 553 Data Visualization and Infographics

The concentration in Biostatistics and Bioinformatics differs from the general Applied Statistics degrees shown above in requiring specific elective courses relevant to Biostatistics and/or Bioinformatics. These electives include: STA 532, STA 533, STA 537, STA 539, STA 540, STA 541, STA 542, STA 601, or STA 609. Other STA electives may be substituted with permission of the Program Director. The concentration in Business and Marketing Analytics differs from the general Applied Statistics degrees shown above in requiring specific elective courses relevant to Business and Marketing Analytics. These electives include : STA 534, STA 535, STA 536, STA 537, STA 538, STA 543, STA 544, STA 601, or STA 609. Other STA electives may be substituted with permission of the Program Director. The concentration in Data Science differs from the general Applied Statistics degrees shown above in requiring STA 551 as one of the elective courses. In addition, the two other electives selected by a student in the Data Science concentration must be selected from the following list: STA 534, STA 536, STA 537, STA 543, STA 544, STA 552, STA552, STA601, or STA609. Other STA electives or CSC 545 mat be substituted with permission of the Program Director.

Post-Master's Certificate of Advanced Study in Applied Statistics

Students must take four classes from the following list [1]

STA 531 Topics In Applied Statistics
STA 532 Survival Analysis
STA 533 Longitudinal Data Analysis
STA 534 Time Series
STA 535 Multivariate Data Analysis
STA 536 Data Mining
STA 537 Advanced Statistical Programming Using SAS
STA 538 Statistical Programming Using R
STA 539 Applied Bayesian Methods
STA 540 Statistical Consulting
STA 541 Categorical Data Analysis II
STA 542 Statistical Methods for Observational Studies
STA 543 Statistical Methods in Business and Finance
STA 544 Applied Marketing Analytics
STA 545 Statistical Issues in Clinical Trials
STA 551 Foundations of Data Science
STA 552 Applied Statistical Machine Learning
STA 553 Data Visualization and Infographics

[1] Selected courses must be different than courses already taken as part of preexisting Master's degree. Additional courses may be selected, or exceptions made, at the discretion of the Program Director.

(Accelerated) B.S. Mathematics – Applied Statistics
Sample Schedule and Advising Sheet

	Fall	Spring
Yr 1	MAT 125 MAT 161 Gen Ed Arts Gen Ed Humanities Gen Ed Behavioral/Social Science	Gen Ed Elective (STA 200 Recommended) MAT 162 MAT 200 WRT 120 SPK 230
Yr 2	MAT 261 MAT 311 WRT 200 Related Elective I JW Course	STA 319 STA 311 Gen Ed Behavioral/Social Science Gen Ed Science Elective Related Elective II
Yr 3	MAT 421 STA 320 IW Course Gen Ed Elective Gen Ed Humanities	MAT 422 STA 321 ENG 368 W Gen Ed Science Elective Gen Ed Elective
Yr 4	MAT 343 STA 490 Related Elective III STA 503 STA 505 STA 511	Related Elective IV MAT 423 STA 506 STA 512
Summer	STA 531 (Session I) STA 531 (Session II)	
Yr 5	STA 507 STA 513	STA 514 STA 531

Note that the graduate classes in Year 4 replace:
2 Related Electives (Students are encouraged to use their year three general education electives to complete any minor of interest)
2 Upper division math/stat electives (One of which was encouraged to be an internship)

MS in Applied Statistics
Tentative Course Schedule

	Fall 2020	Winter 2020/21	Spring 2021	Sum 1 2021	Sum II 2021
STA 501 – Methodologies in Applied Statistics			√		
STA 503 – Introduction to R	√				
STA 504 – Mathematics Statistics I with Calculus Review	√				
STA 505 – Mathematical Statistics I	√				
STA 506 – Mathematical Statistics II			√		
STA 507 – Categorical Data Analysis	√				
STA 511 – Introduction to Statistical Programming	√				
STA 512 – Principles of Experimental Analysis			√		
STA 513 – Intermediate Linear Models	√				
STA 514 – Modern Experimental Design and Sampling Methods			√		
STA 531 –Topics in Applied Statistics – Advanced Topics					
STA 532 – Survival Analysis					
STA 533 – Longitudinal Data Analysis			√		
STA 534 – Time Series					√
STA 535 – Multivariate Data Analysis					
STA 536 – Data Mining					
STA 537 – Advanced SAS Programming					
STA 538 – Statistical Programming Using R		√			
STA 539 – Applied Bayesian Methods			√		
STA 540 – Statistical Consulting				√	
STA 541 – Categorical Data Analysis II					
STA 542 – Statistical Methods for Observational Studies					√
STA 543 – Statistical Methods in Business and Finance					
STA 544 – Applied Marketing Analytics	√				
STA 545 –Statistical issues in Clinical Trials					
STA 551 – Foundations of Data Science					
STA 552 – Applied Statistical Machine Learning					
STA 553– Data Visualization and Infographics	√				

Catalog Descriptions of Graduate Courses

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 theorems 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.
This course will cover selected topics from the History of Mathematics. Many great mathematicians will be studied including Hippocrates, Euclid, Archimedes, Heron, Cardano, Newton, the Bernoulli Brothers, Euler, Gauss, and others. Mathematics problems will be approached using the methods and knowledge of the era studied. A solid background in undergraduate mathematics is required.

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.
Algebraic Numbers and Algebraic Integers.
Quadratic Fields. Integers in Quadratic Fields. Euclidean Quadratic Fields.
Quadratic Fields with unique factorization property.
Euler's Proof of Fermat's Last Theorem for exponent three.

MAT 515. Algebra I. 3 Credits.
This course investigates elements of the theory of groups and rings.
Topics include a brief review of elementary group- and ring theory, the fundamental theorem of finite Abelian groups, group actions, normal subgroups and the isomorphism theorems, the Sylow theorem, ideals and factor rings, prime and maximal ideals, ring homomorphisms and the ring isomorphism theorems, principal ideal domains, unique factorization domains, Euclidean domains.

MAT 516. Algebra II. 3 Credits.
This course is a continuation of MAT 515, and covers elements of field theory and Galois Theory.
Topics include the field of fractions of an integral domain, extension fields, Kronecker's Theorem, algebraic extensions, algebraic closure, transcendental extensions, splitting fields, finite fields, field automorphisms, separable and normal extensions, the fundamental theorem of Galois theory
Pre requisites: MAT 516 requires prerequisite of MAT 515.

MAT 517. Topics In Algebra. 3 Credits.
Selected topics from abstract algebra, including finite fields, finite groups, Galois Theory and algebraic number theory.
Pre requisites: MAT 517 requires prerequisite of undergraduate abstract algebra, with MAT 515 strongly recommended, or consent of instructor.
Contact department for more information about this course.
Repeatable for Credit.

MAT 521. Discrete Mathematics & Graph Theory. 3 Credits.
Topics from Discrete Mathematics including the study of logic, sets, relations, and counting will be introduced. From Graphs and Graph Theory, topics including Eulerian and Hamiltonian Graphs, Digraphs, Trees, Algorithms, Paths, Planarity, and Chromatic Numbers will follow. Applications such as Social Network Analysis will be stressed.

MAT 532. Geometry I. 3 Credits.
This course is a rigorous introduction to geometry from a transformational point of view, emphasizing Euclidean, hyperbolic, and/or projective geometry. Other topics such as Spherical geometry, symplectic geometry, or Affine geometry may be included if time permits.
Pre requisites: MAT532 requires prerequisite of undergraduate Linear Algebra and Abstract Algebra.

MAT 533. Geometry II. 3 Credits.
A study of geometry using calculus as our main tool. The course covers the basics of differential geometry: parametrizations, tengent spaces, curvature, geodesics; leading to Stokes theorem and the Gauss-Bonnett theorem. Several examples will be studied in depth, including the sphere and the projective plane (which were introduced in the first course).
Pre requisites: MAT533 requires prerequisite of undergraduate Linear Algebra and Abstract Algebra, MAT532 strongly recommended.

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.
Pre requisites: MAT535 requires prerequisite of undergraduate Topology and/or Real Analysis.
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.
Pre requisites: MAT536 requires prerequisite of undergraduate Topology and/or Real Analysis, and MAT535 strongly recommended. 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 the real number system, sequences and series, basic point-set topology, limits and continuity, differentiation, and the Riemann integral.
Typically offered in Fall.

MAT 546. Real Analysis II. 3 Credits.
Continuation of MAT 545. Topics may include: sequences and series of functions, Taylor and Fourier series, functions of several variables, and the Lebesgue theory of measure and integration.
Pre / Co requisites: MAT 546 requires prerequisite of MAT 545.

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 MAT 500.
Typically offered in Spring.

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 Fall.

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 prerequisites of MAT 548, MAT 549, and at least one of the following: MAT 552, MAT 553, or MAT 554.
Typically offered in Spring.

MAT 575. Complex Analysis I. 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 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 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 geometries, 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 552. Teaching Children Mathematics II. 3 Credits.
A continuation of the pedagogical strategies and methods for teaching the topics covered in MAT 351/MTE 553 extended to topics such as real numbers, geometry, percent, proportional reasoning, measurement, and algebra.
Pre / Co requisites: MTE 552 requires a prerequisite of MTE 553 and field clearances.
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.

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 503. Introduction to R. 1 Credit.
This is an introductory course in R programming. The major topics include setting up Rstudio, R data objects, data input/output, built-in and user-defined R functions, control statement and looping, basic R plot functions, commonly used R libraries, and R markdown.
Distance education offering may be available.
Typically offered in Fall.

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 511. Intro Stat Computing & Data Management. 3 Credits.
This 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 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 continous 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, MIXORMIXREG 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.
Pre / Co requisites: STA 536 requires a prerequisite of a grade of C or higher in STA 512.
Typically offered in Spring & Summer.

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 COUNTREG, 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 545. Statistical Design and Analysis of Clinical Trials. 3 Credits.
This course in the statistical design and analysis of clinical trials will focus on the scientific questions each phase of clinical trials (Phase I, Phase II, and Phase III) addresses. For oncology trials, various Phase I designs will be explored, noting the strengths and weaknesses of each design. Group Sequential procedures that specify how interim analyses will be performed in Phase III trials will be explored, together with graphical methods associated with each procedure.
Pre / Co requisites: STA 545 requires a prerequisite of a grade of C or higher in STA 511 and STA 512.
Typically offered in Fall & Summer.

STA 546. Foundations of Bioinformatics. 3 Credits.
Bioinformatics is an interdisciplinary field involving molecular biology, computer science, mathematics, and statistics. Most data sets are very large and so require computationally intensive algorithms. This course intends to introduce students to many areas of biological data, along with algorithms and software to help model biological processes.
Pre / Co requisites: STA 546 requires a prerequisite of a C or higher in STA 512.
Typically offered in Fall, Spring & Summer.

STA 551. Foundations of Data Science. 3 Credits.
This is a data science survey course. The first part of this course will be dedicated to data science foundations. Topics include statistical models, machine learning algorithms, model performance metrics, and major resampling algorithms. The second part will focus on data science processes. Topics include data science project life cycle, model selection, validation, performance evaluation, and data science ethics. The last part of the course will discuss data science infrastructure and pipelines.
Pre / Co requisites: STA 551 requires a prerequisite of a C or higher in STA 503 and STA 506.
Typically offered in Fall, Spring & Summer.

STA 552. Applied Statistical Machine Learning. 3 Credits.
This course introduces commonly used models and algorithms in data science fields. Both supervised and unsupervised machine learning algorithms will be discussed. Specific topics will be selected from supervised learning (probabilistic and linear classification, neural networks, tree-based models), unsupervised learning (clustering and feature extraction), and semi-supervised learning algorithms. This course will introduce both theories and applications.
Pre / Co requisites: STA 552 requires a prerequisite of a C or higher in STA 503 and STA 506.
Typically offered in Fall, Spring & Summer.

STA 553. Data Visualization. 3 Credits.
This course focuses on the principles of data visualization and addresses questions about what, why, and how to visualize. Topics include visualization design elements such as colors, shapes, and movements, etc.; data exploratory visualization; statistical graphics and model visualization; process visualization; dashboard design; and the ethics of data visualization. The course will also introduce some commonly used visualization tools.
Pre / Co requisites: STA 553 requires a prerequisite of a C or higher in STA 503. STA511
Typically offered in Fall, Spring & Summer.

STA 599. 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.
Preliminary research under the guidance of a mathematics faculty member. Students must present oral preliminary findings before proceeding to STA 610.
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.

Faculty and Staff

25 University Avenue (UNA)

Department Chair

Glidden, Peter, Ph.D., Columbia University — UNA 101A 610-436-2440
Mathematics Education — pglidden@wcupa.edu

Assistant Department Chair

Kolpas, Allison, Ph.D., University of California, Santa Barbara — UNA 106 610-436-4964
Applied Mathematics — akolpas@wcupa.edu

Administrative Assistant

Sally Malarney — UNA 101 610-436-2440
smalarney@wcupa.edu

Tenured & Tenure-Track Faculty

Bowen, Brian, Ph.D., University of Delaware — UNA 108 610-436-2351
Mathematics Education — bbowen@wcupa.edu

Brazas, Jeremy, Ph.D., University of New Hampshire — UNA 108 610-436-2054
Algebraic & General Topology — jbrazas@wcupa.edu

Crossett, Andrew, Ph.D., Carnegie Mellon University — UNA 111 610-436-2613
Applied Statistics — acrossett@wcupa.edu

Fisher, Michael, Ph.D., Lehigh University — UNA 123 610-430-4196
Graph Theory & Combinatorics — mfisher@wcupa.edu

Gallitano, Gail, Ed. D., Columbia University — UNA 114 610-436-2452
Mathematics Education — ggallitano@wcupa.edu

Gallop, Robert, Ph.D., Drexel University — UNA 180 610-436-2419
Applied Statistics, Biostatistics — rgallop@wcupa.edu

Gupta, Shiv, Ph.D., Case Western Reserve University — UNA 112 610-436-3459
Algebra (Group Theory, Number Theory) — sgupta@wcupa.edu

Johnson, Kim, Ph.D., Penn State University — UNA115 610-436-3249
Mathematics Education — kjohnson2@wcupa.eduJ

Johnston, Clifford, Ph.D., Temple University — UNA 173 610-738-0432
Partial Differential Equations, Stochastic Processes — cjohnston@wcupa.edu

Junius, Premalatha, Ph.D., University of Northern Colorado — UNA 113 610-436-2199
Applied Mathematics — pjunius@wcupa.edu

Li, Chuan, Ph.D., University of Tennessee — UNA 118 610-436-1081
Applied Mathematics — cli@wcupa.edu

Marano, Lisa, Ph.D., Lehigh University — UNA 173A 610-436-0585
Stochastic Processes & Financial Mathematics — lmarano@wcupa.edu

McClintock, Scott, Ph.D., University of Kentucky — UNA 121 610-436-4963
Statistics — smcclintock@wcupa.edu

McKibben, Mark, Ph.D., Ohio University — UNA 113 610-436-2148
Differential Equations, Stochastic Analysis — mmckibben@wcupa.edu

McLaughlin, James, Ph.D., University of Illinois — UNA 179 610-436-4417
Number Theory, Special Functions — jmclaughlin@wcupa.edu

Miller, Emily, Ph.D., University of Delaware — UNA 107 610-436-2436
Mathematics Education — emiller@wcupa.edu

Nitica, Viorel, Ph.D., Penn State University — UNA 172 610-430-4411
Dynamical Systems, Operator Algebras, Discrete Mathematics — vnitica@wcupa.edu

Parsell, Scott, Ph.D., University of Michigan — UNA 175 610-436-3465
Analytic Number Theory — sparsell@wcupa.edu

Peng, Cheng, Ph.D., University of Toledo — UNA 111 610-436-2369
Statistics — cpeng@wcupa.edu

Perkoski, Andre, M.A., West Chester University — UNA 110 610-436-3495
Mathematics — aperkoski@wcupa.edu

Pyott, Laura Connell, M.S., University of Delaware — UNA 107 610-436-3451
Statistics — lpyott@wcupa.edu

Rieger, Randall, Ph.D., University of North Carolina — UNA 116 610-436-2893
Applied Statistics, Biostatistics — rrieger@wcupa.edu

Sullivan, Rosemary, Ph.D., Lehigh University
Geometric Probability Theory
UNA 128 610-430-4418
rsullivan@wcupa.edu

Swartz, Barbara, Ph.D., University of Virginia
Mathematics Education
UNA115 610-436-XXXX
bswartz@wcupa.edu

Tan, Lin, Ph.D., University of California (Los Angeles)
Algebra (Algebraic Groups, Combinatorics)
UNA 117 610-436-3455
ltan@wcupa.edu

Xu, Justin, Ph.D., University of Connecticut
Actuarial Science
UNA110 610-436-1078
jxu@wcupa.edu

Zimmer, Peter, Ph.D., University of Kansas
Partial Differential Equations, Stochastic Processes
UNA 178 610-436-2696
pzimmer@wcupa.edu

WCU
WEST CHESTER
UNIVERSITY

Department of Mathematics
25 University Avenue, Room 101
West Chester, Pennsylvania 19383