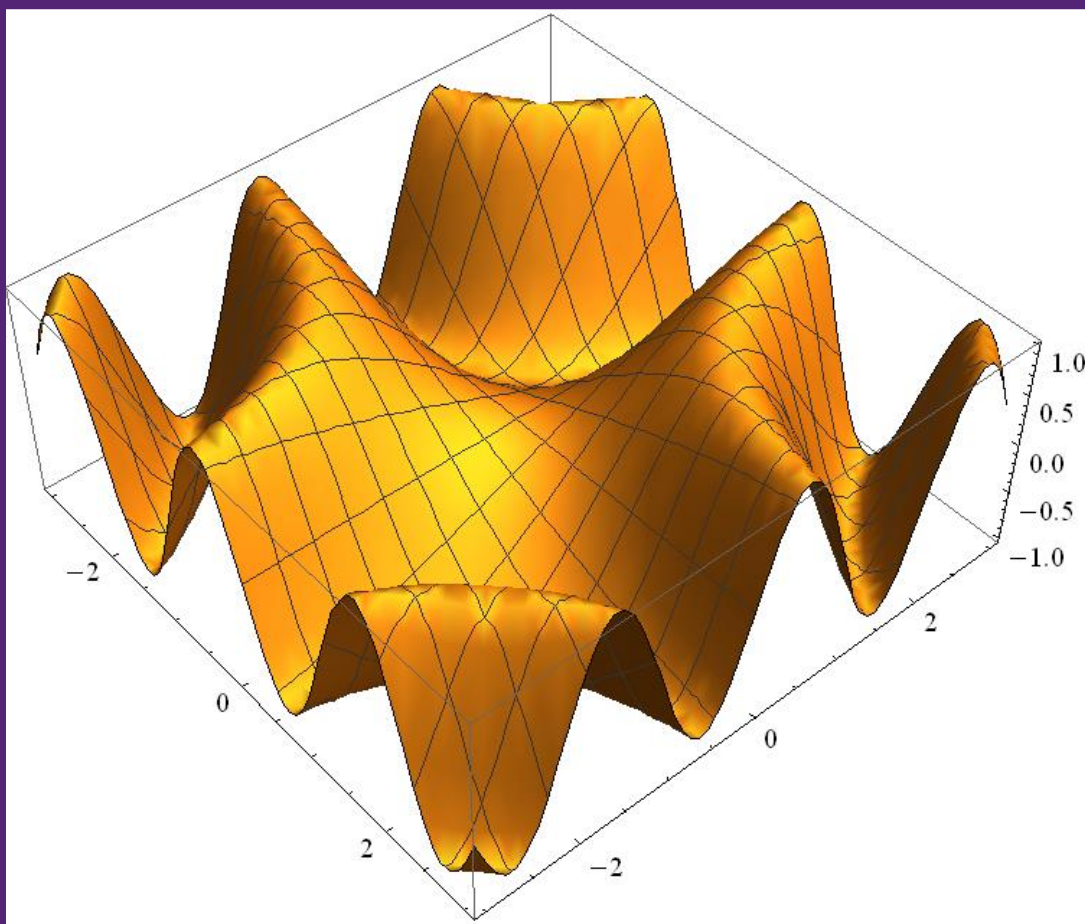


DEPARTMENT OF
MATHEMATICS
WEST CHESTER UNIVERSITY

UNDERGRADUATE
HANDBOOK



2016 – 2017

If you have any questions about any item in the *Handbook*, or if you wish to learn more about the Department of Mathematics at West Chester University, please do not hesitate to contact me:

Dr. Peter L. Glidden
Professor and Chair
Department of Mathematics
25 University Avenue - Room 101
West Chester University

E-mail: pglidden@wcupa.edu

Phone: 610-436-2440
Fax: 610-738-0578

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West Chester University

Cover art courtesy of Professor Joseph Moser, who retired in 2016 after fifty years of distinguished service to the Department and University.

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Introduction

Mathematics is one of the oldest of all disciplines and it is fundamental for serious scholarship in all of the sciences. Mathematicians use the basic tools of mathematics, including: theory, computational techniques, algorithms, and advanced technology, to solve a wide variety of real world problems. Mathematics is basic to the understanding of many disciplines, including physics, chemistry, computer science, and astronomy.

Mathematics is playing an important role in understanding recent important developments in the biological sciences and many other fields. Mathematical models are frequently used in the social sciences, especially in economics and psychology, and are found throughout actuarial science and statistics. Mathematicians are broadly classified as either pure (theoretical) or applied. The distinction between the two is often somewhat “fuzzy” as the work of both often overlaps.

Theoretical mathematicians advance mathematical knowledge by making new discoveries. They generally seek to increase mathematical knowledge without necessarily having an eye on its practical use. Such abstract theoretical knowledge has often proved to be of practical value as evidenced by the applications of group theory to quantum mechanics and Riemannian geometry to Einstein’s work in understanding the nature of the universe.

Applied mathematicians, in contrast, use the theories and tools of mathematics to define and solve practical problems in business; government; engineering; and the physical, biological, and social sciences. For example, they study the most efficient way to schedule postal deliveries between cities; the effectiveness and risks of new drugs, the aerodynamics of a proposed airplane design; or analyze and decipher secret coding used to transmit military, political, or financial information.

Information about careers in mathematics and programs to prepare for students for these careers are described later in the *Handbook*.

Mathematics at West Chester University

Our programs provide close interaction between students and faculty, access to an excellent library, and extensive computer support services. These are all instrumental in providing our students with a solid, undergraduate background in mathematics.

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; for a career as a middle or secondary school mathematics teacher; or for a career as an actuary, an applied mathematician, a statistician, or an industrial mathematician.

Faculty

Our faculty hold advanced degrees from major universities. Many have gained both national and international recognition in research and teaching. A list of Department faculty members that includes their contact information is given later in the *Handbook*. Additional information may be found on the Department's web site

http://www.wcupa.edu/ACADEMICS/SCH_CAS.MAT/

Quality Teaching

Students pursuing a major or minor in mathematics receive individual attention from our faculty members. The upper division classes for majors are small, ranging in size from five to about 25. We like to think of ourselves as being a friendly, warm, and student-centered department. Students are encouraged to visit their professors during office hours for extra help, if needed.

Auxiliary Teaching Support

The department maintains a Student/Tutorial Center (Room 105) staffed by advanced students. Those that qualify to staff the Tutorial Center acquire pre-professional teaching experience, help their peers, and develop communication skills.

Technical and Related Support

Students have access to several microcomputer labs with full internet access and mathematical, statistical, and programming software, including: Mathematica, Maple, MATLAB, MiniTab, and SAS. These computer labs are located in rooms 103 and 109 next to the Student Tutorial Center. Desktop computers also are available in the Student Tutorial Center (Room 105). The Department has a Seminar Room (Room 104) that includes a small mathematics library. The popular Wednesday afternoon "teas" for both students and faculty are held in room 105.

Careers in Mathematics and Statistics

A graduate who holds a bachelor's degree in mathematics can pursue entry-level positions leading to highly paid positions in both the private and public sectors. Some of these are described below.

Actuary

Actuaries determine future risk, make price decisions, and develop investment strategies. Many also design insurance, financial, and pension plans and help ensure their viability. Most actuaries specialize in life and health or property and casualty insurance; others work in finance or employee benefit programs.

In general, actuaries assemble and analyze data to estimate probabilities of an event taking place, such as death, sickness, injury, disability, or property loss. Most are employed in the insurance industry, where they estimate the amount a company will pay in claims. They assure that the price charged for insurance coverage will enable their company to be profitable.

Applicants for beginning actuarial jobs usually have a bachelor's degree in mathematics, actuarial science, statistics, or a business-related discipline such as economics, finance or accounting. Most companies prefer that applicants have passed a few of the actuarial examinations required for professional designation. See www.beanactuary.org for more information.

Commercial Banker

Commercial banks hire more people than any other industry in the financial sector. A graduate may begin in an entry-level position at a branch office, but with the quantitative skills that a degree in mathematical finance offers, a graduate can easily advance into management and specialist positions that use her or his skills to manage the bank's investments. Moreover, this degree prepares graduates for careers in economic forecasting and analysis.

Cryptanalyst

Cryptanalysts develop techniques for the secure transmission of information and they develop techniques for reading information secured by others.

Financial Planner

Financial planners build investment plans for their clients. They gather information from individuals and families regarding their retirement plans and investment goals and decide the best way to reach these goals given their assets. There are a series of exams to take to become a Certified Financial Planner. With many Americans reaching retirement age, there is a growing demand for those with this certification. For more information, see <http://www.cfp.net/>.

Operations Research Analyst

Operations research and management science are often used to describe the discipline of applying quantitative techniques to make decisions or solve problems. Many of the tools of an operations researcher were developed during World War II in addressing problems related to the deployment of radar, submarine searches, deployment of supplies and weapons, and the breaking of enemy codes. Following the war, numerous peacetime applications emerged placing these specialists in demand.

The emergence of operations research in today's economy reflects the growing complexity of managing large organizations that require efficient use of human, material, and financial resources. In general operations research analysts address questions related to strategy, forecasting, resource allocation, facilities layout, inventory control, personnel allocation, and delivery or distribution systems.

Statistician

Statisticians apply their mathematical knowledge to the design of surveys and experiments. They collect, process, and analyze the data, and interpret the results. Statisticians apply their knowledge to a variety of fields including biology, economics, engineering, medicine, public health, psychology, marketing, and education.

Statisticians often have different professional designations depending on their area of specialization. For example, a statistician working primarily with economic data may be known as an econometrician, while those in public health or medicine may hold titles of biostatistician, biometrician, or epidemiologist.

Teacher

A student who completes the BSEd degree may qualify for an Instructional I Certificate, which is issued by the Pennsylvania Department of Education. This certificate is valid for six years of teaching in Pennsylvania. Recommendation for the Certificate is made by the certifying officer of the University. The BSEd program includes an intensive, year-long field experience and a student teaching experience.

University teaching and research have always been favorite career pursuits for mathematicians. In most four-year colleges and universities, a Ph.D. is necessary for entry into a tenure-track position. Many mathematicians with a master's degree find permanent employment in two-year colleges. Those with either a bachelor's or a master's degree teach at the K-12 level.

Planning Your Program of Study

Starting At West Chester

If you are a first year student, the Department Chair will construct your Fall schedule and assign a Department faculty member as your advisor. If you are a transfer student, you will meet with the Chair, Assistant Chair, or your advisor to plan your first semester schedule.

Scheduling

Students should familiarize themselves with *myWCU*, which allows you to register for classes and monitor progress towards your degree. *myWCU* has a feature called “Degree Progress Report” or “DPR.” The DPR allows students to see exactly what requirements have and have not been met. If you are considering changing majors, *myWCU* also has a feature called “What If Degree Progress Report,” which allows you to see what requirements have and have not been met for the program you are considering.

Students are strongly encouraged to prepare, print, and review their DPR before meeting with their advisor to schedule courses. Doing so will make your advising meetings more efficient and rewarding because you will know in advance which requirements remain unmet. This allows more time for explaining required and elective mathematics courses; exploring potential minors; discussing your post-graduation plans; and, most importantly, having your advisor serve as a mentor to whom you can turn for help and advice.

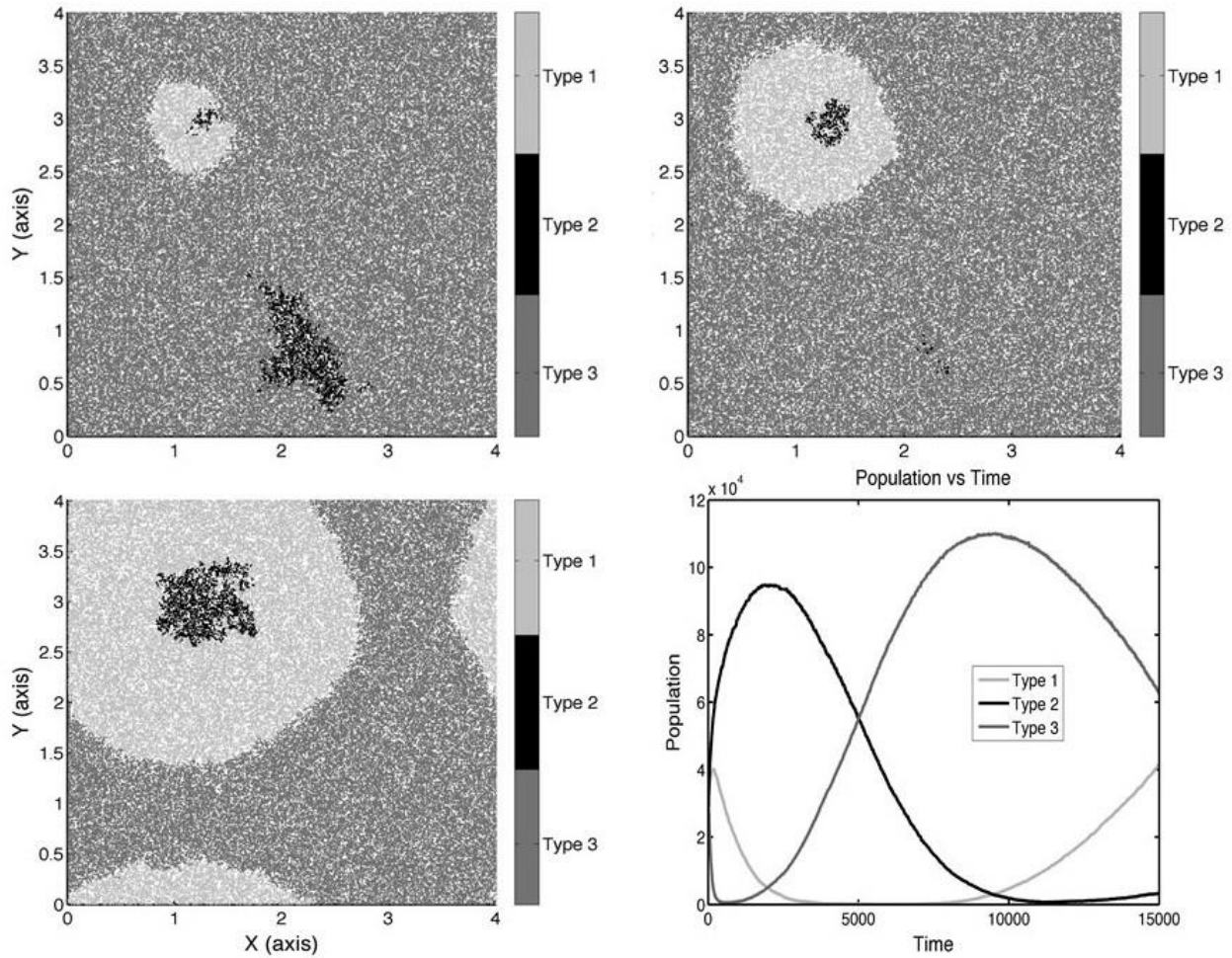
The scheduling of classes for a given semester typically takes place during the middle of the preceding semester. Students schedule classes online at *my.wcupa.edu*, using computers located in convenient locations throughout the campus. The *Handbook* contains sample four-year schedules for each program.

General Education Requirements

As part of their baccalaureate degrees, all West Chester University students must meet the University’s General Education requirements, which include course work in: academic foundations (English composition, mathematics, and public speaking), the natural sciences, behavioral and social sciences, the arts, the humanities, diverse communities (denoted “J”), and interdisciplinary courses (denoted “I”). Additionally, students must complete nine credits in courses designated as “Writing Emphasis” (denoted “W”).

Planning Toward Graduation

In spring of your sophomore year, when you are scheduling your junior year, you should take the time to plan your last four semesters at West Chester. Some upper division courses are offered only during Spring or Fall and others are offered only one semester every other year. Thus, if you miss out on a course, it may not be offered for another two years. While you are responsible to see that all graduation requirements are met, your advisor can be a valuable resource.



Evolutionary game simulation of Durrett and Levin's three species *E. coli* interacting particle system with diffusion of colicin. The system is modeled using a hybrid discrete continuous framework. Reference: *Andreas C. Aristotelous, Richard Durrett, Chemical evolutionary games, Theoretical Population Biology, Volume 93, May 2014.*

Baccalaureate Programs

The Department of Mathematics offers three undergraduate degrees:

- **BA Mathematics.** This program prepares students for graduate work in mathematics, applied mathematics, or statistics. The program has a foreign language requirement (French, German, or Russian), so it is ideal for students who want to pursue graduate work at graduate schools that require mastery of a foreign language.
- **BS Mathematics.** This program, which has no foreign language requirement, offers concentrations in actuarial science, computational mathematics, industrial mathematics, mathematical finance, mathematics, and statistics. The mathematics option prepares students for graduate work in pure mathematics and the other five concentrations prepare students for careers in applied mathematics.
- **BSEd Mathematics.** This program prepares students for teacher certification in grades 7-12. (This degree does not have a foreign language requirement.)

All three degrees require the same five, lower division courses:

MAT 161 Calculus I (4 credits)
MAT 162 Calculus II (4 credits)
MAT 261 Calculus III (4 credits)
MAT 200 The Nature of Mathematics (3 credits)
MAT 311 Linear Algebra (3 credits)

The Calculus sequence (MAT 161, MAT 162, and MAT 261) provides the foundation for nearly every upper division mathematics course. The Nature of Mathematics (MAT 200) includes mathematical notation and argument, structure of proofs, basic facts about logic, mathematical proofs, problem-solving techniques, and introductions to mathematical software packages. MAT 200 is designed to help students successfully transition from the Calculus sequence to upper division mathematics. Linear Algebra (MAT 311) includes matrices, systems of linear equations, vector spaces, linear transformation, determinants, eigenvalues, spectral theorem, and triangulation. Together, these five courses provide a solid foundation for success in upper division mathematics courses.

BA Mathematics

In the first two years, mathematics majors are given a solid foundation through courses that capture their interest and encourage them to continue in the mathematics program. As upper division students, mathematics majors are given a well-rounded introduction to higher mathematics. The curriculum requires two courses at an advanced level in each of the fundamental areas of algebra, analysis, and applied mathematics. Students in the BA

program are also required to complete a minor in a related field in order to enhance their appreciation and preparation for applications of mathematics. By careful selection of courses in the major and in the minor, students in the BA program will be prepared for critical analysis and problem solving positions in many areas of industry, government, or education.

Lower Division, Required Core Courses

MAT 161 Calculus I (4)
MAT 162 Calculus II (4)
MAT 200 The Nature of Mathematics (3)
MAT 261 Calculus III (4)
MAT 311 Linear Algebra (3)

Upper Division Required Courses

MAT 411 Algebra I (3)
MAT 421 Mathematical Statistics I (3)
MAT 441 Advanced Calculus I (3)

Upper Division Elective Courses¹

Upper division electives in mathematics are to be taken as follows:
One course in algebra,
One course in analysis,
One course in applied mathematics, and
An additional 12 credits in upper division mathematics courses.

Cognate Requirements

PHY 170 Physics I (4)
CSC 141 Computer Science I (3)

Foreign Language Requirement

The requirements for the BA degree include a foreign language. The equivalent of completing the second half of the intermediate year of an approved foreign language: Russian, French, or German (without the culture cluster option) is strongly recommended.

Requirement of a Minor

Students completing the BA degree are required to complete either a minor or, with the prior approval of the student's advisor and the Chair, an additional nine (9) credit hours of upper division mathematics. The discipline chosen for the minor should reflect the career goals of the student.

¹ The table that lists courses by area (e.g., algebra, analysis, applied mathematics) is given on page 36.

2165/ 2171 B.A. MATHEMATICS – 120 CREDITS

Name:	Date Major Declared:				
	CREDITS	COURSE	SEMESTER	GRADE	REP/W**
GENERAL EDUCATION REQUIREMENTS (48 LESS 9 ATTRIBUTED TO MAJOR REQUIREMENTS = 39 CREDITS)					
WRT 120	3				
WRT 200, 204, 205, 206, 208, or 220	3				
MATHEMATICS (MAT 311 below)	3				
SPK 208 OR 230	3				
DIVERSE COMMUNITIES "J" COURSE	3				
INTERDISCIPLINARY "I" COURSE	3				
SCIENCE (3 CREDITS OF PHY 170 BELOW)	3				
SCIENCE (CSC 141)	3				
BEHAVIOR & SOCIAL SCI (ANT, SOC, ECO, GEO, OR PSC)	3				
BEHAVIOR & SOCIAL SCI (ANT, SOC, ECO, GEO, OR PSC)	3				
HUMANITIES (PHI, HIS, LIT, OR CLS)	3				
HUMANITIES (PHI, HIS, LIT, OR CLS)	3				
ARTS (ART CINEMATOGRAPHY MUSIC PHOTOGRAPHY THEATRE)	3				
GENERAL EDUCATION ELECTIVE	3				
GENERAL EDUCATION ELECTIVE	3				
GENERAL EDUCATION ELECTIVE	3				
WRITING INTENSIVE COURSES:					
NOTE TO STUDENTS AND ADVISORS: I COURSES MAY NOT COUNT AS DISTRIBUTIVE REQUIREMENTS.					
MATHEMATICS REQUIREMENTS (42 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				
MAT 411 ABSTRACT ALGEBRA	3				
MAT 421 MATHEMATICAL STATISTICS I	3				
MAT 441 ADVANCED CALCULUS I	3				
ANALYSIS ELECTIVE: MAT 343, 432, 442, 444, 445	3				
APPLIED MATH ELECTIVE: MAT 319, 325, 343, 345, 403, 406, 409, 422, 425, 427, 493	3				
ALGEBRA ELECTIVE: MAT 412, 413, 414	3				
MATHEMATICS ELECTIVE (300 LEVEL AND HIGHER)	3				
MATHEMATICS ELECTIVE (300 LEVEL AND HIGHER)	3				
MINOR REQUIREMENTS AND FREE ELECTIVES (20 CREDITS)					
MINOR ELECTIVE	3				
MINOR ELECTIVE	3				
MINOR ELECTIVE	3				
MINOR ELECTIVE	3				
MINOR ELECTIVE	3				
MINOR ELECTIVE	3				
MINOR ELECTIVE	3				
FREE ELECTIVE	2				
FOREIGN LANGUAGE REQUIREMENT (12 CREDITS)					
LANGUAGE 101	3				
LANGUAGE 102	3				
LANGUAGE 201	3				
LANGUAGE 202	3				
RELATED REQUIREMENTS (7 CREDITS)					
CSC 141 COMPUTER SCIENCE I	3				
PHY 170 PHYSICS I	4				

B.A. Mathematics Sample Schedule

Year	Fall	Spring
1	MAT 161 CSC 141 Language 101 Gen Ed Humanities Gen Ed Arts	MAT 162 MAT 200 WRT 120 Language 102 PHY 170
2	MAT 261 MAT 311 WRT 200 Language 201 Minor Elective	SPK 208 or SPK 230 Applied Math Elective Language 202 Minor Elective Gen Ed Behavioral/Social Science
3	MAT 411 MAT 421 IW Course Minor Elective Gen Ed Elective	MAT 441 Algebra Elective Minor Elective Math Elective JW Course
4	Analysis Elective Math Elective Minor Elective Gen Ed Humanities Gen Ed Elective	Math Elective Minor Elective Gen Ed Behavioral/Social Science Gen Ed Elective Free Elective

General Notes:

- Three writing-emphasis (W) courses are required. At least one of them must be at the three hundred level or above. Transfer students entering with 40-70 credits must take two writing emphasis courses and those entering with more than 70 credits must take one.
- Students are encouraged to take courses that meet multiple requirements, for example, courses that are both “W” and “J” courses.

BS in Mathematics

The BS degree prepares students for careers in applied mathematics (actuarial science, computational mathematics, financial mathematics, industrial mathematics, or statistics) or pure mathematics. The main difference between the BA Mathematics Program and the BS Mathematics Program is that the BA has a foreign language requirement, while the BS does not.

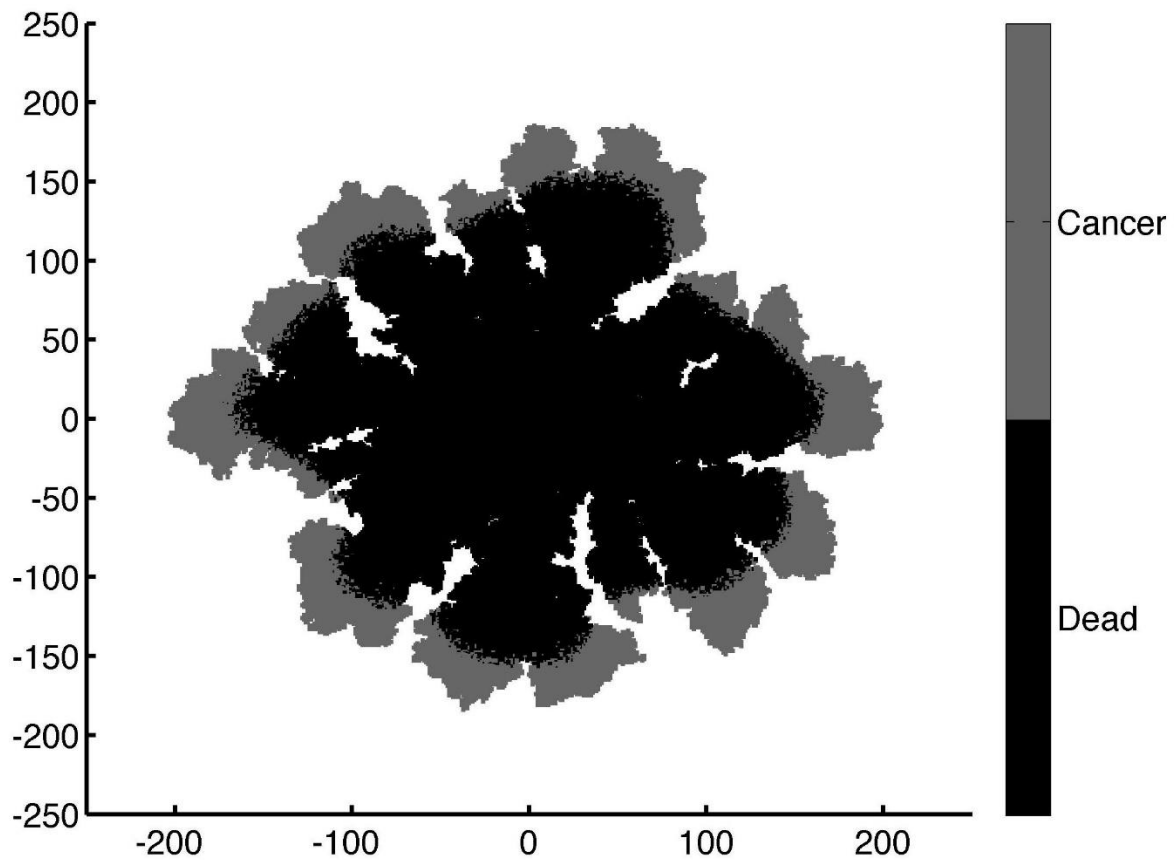
Lower Division, Required Core Courses

- MAT 161 Calculus I (4)
- MAT 162 Calculus II (4)
- MAT 200 The Nature of Mathematics (3)
- MAT 261 Calculus III (4)
- MAT 311 Linear Algebra (3)

Upper Division, Required Courses by Program

Actuarial	Computational	Financial
MAT 319	MAT 319	MAT 319
MAT 343	MAT 325	MAT 343
MAT 371	MAT 343	MAT 371
MAT 421	MAT 413	MAT 421
MAT 422	MAT 425	MAT 479
MAT 423	MAT 443	MAT 422 or MAT 423
MAT 478	MAT 427 or MAT 493	
STA 311		
Industrial	Mathematics	Statistics
MAT 319	MAT 343	MAT 121
MAT 325	MAT 411	MAT 319
MAT 343	MAT 421	MAT 343
MAT 413	MAT 441	MAT 421
MAT 425	MAT 445	MAT 422
MAT 443	Analysis Elective	MAT 423
MAT 445	Applied Elective	STA 311
MAT 427 or MAT 493	Algebra Elective	STA 320
	MAT Elective*	STA 321
	MAT Elective*	STA 490
	MAT Elective*	

*Mathematics MAT electives to be chosen above 311 but not MAT 350, MAT 354, MAT 360, or MAT 364.



Lattice based stochastic simulation of tumor growth in two dimensions exhibiting finger formation and necrosis, interacting with oxygen. The system is modeled by reaction diffusion partial differential equations coupled with interacting particle systems.
Reference: *Andreas C. Aristotelous, Richard Durrett, Fingering in Stochastic Growth Models, Experimental Mathematics, Vol. 23, Iss. 4, 2014.*

2165/ 2171 B.S. MATHEMATICS: ACTUARIAL SCIENCE – 120 CREDITS

Name:	Date Major Declared:				
	CREDITS	COURSE	SEMESTER	GRADE	REP/W**
GENERAL EDUCATION REQUIREMENTS (48 LESS 9 ATTRIBUTED TO MAJOR REQUIREMENTS = 39 CREDITS)					
WRT 120	3				
WRT 200, 204, 205, 206, 208, or 220	3				
MATHEMATICS (MAT 311 below)	3				
SPK 230 (below)	3				
DIVERSE COMMUNITIES "J" COURSE	3				
INTERDISCIPLINARY "I" COURSE	3				
SCIENCE (BIO, CHE, PHY, CSC, OR ESS)	3				
SCIENCE (BIO, CHE, PHY, CSC, OR ESS)	3				
BEHAVIOR & SOCIAL SCI (ECO 111 below)	3				
BEHAVIOR & SOCIAL SCI (ANT, SOC, ECO, GEO, PSY, OR PSC)	3				
HUMANITIES (PHI, HIS, LIT, OR CLS)	3				
HUMANITIES (PHI, HIS, LIT, OR CLS)	3				
ARTS (ART CINEMATOGRAPHY MUSIC PHOTOGRAPHY THEATRE)	3				
GENERAL EDUCATION ELECTIVE	3				
GENERAL EDUCATION ELECTIVE	3				
GENERAL EDUCATION ELECTIVE	3				
WRITING INTENSIVE COURSES: ENG 368, 371, OR 375; AND 2 OTHERS					
NOTE TO STUDENTS AND ADVISORS: I COURSES MAY NOT COUNT AS DISTRIBUTIVE REQUIREMENTS.					
BS MATHEMATICS REQUIREMENTS (21 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				
MAT 343 DIFFERENTIAL EQUATIONS	3				
CONCENTRATION COURSES (21 CREDITS)					
MAT 319 APPLIED STATISTICS	3				
MAT 371 MATHEMATICAL FINANCE - FORMERLY MAT 406	3				
MAT 478 FUNDAMENTALS OF ACTUARIAL SCIENCE – FORMERLY MAT 403	3				
MAT 421 MATHEMATICAL STATISTICS I*	3				
MAT 422 MATHEMATICAL STATISTICS II	3				
MAT 423 APPLIED PROBABILITY	3				
STA 311 STATISTICAL COMPUTING	3				
COGNATE REQUIREMENTS (24 CREDITS)					
ACC 201 ACCOUNTING 1	3				
ECO 111 PRINCIPLES OF MACROECONOMICS	3				
ECO 112 PRINCIPLES OF MICROECONOMICS	3				
ECO 340 INTERMEDIATE ECONOMICS	3				
FIN 325 CORPORATE FINANCE	3				
FIN 330 PRINCIPLES OF INSURANCE	3				
SPK 230 BUSINESS/PROFESSIONAL SPEECH	3				
ENG 368, ENG 371, ENG 375 TECHNICAL /BUSINESS WRITING	3				
INTERNSHIP OR ELECTIVES (15 CREDITS)					
MAT 491 INTERNSHIP IN APPLIED MATHEMATICS** (OPTIONAL)	3				
FREE ELECTIVE***	3				
FREE ELECTIVE***	3				
FREE ELECTIVE***	3				
FREE ELECTIVE***	3				

B.S. Mathematics: Actuarial Science Sample Schedule

Year	Fall	Spring
1	MAT 161 WRT 120 Gen Ed Arts Gen Ed Humanities Gen Ed Science	MAT 162 MAT 200 WRT 200 SPK 230 ECO 111
2	MAT 261 MAT 311 MAT 371 – formerly MAT 406 ECO 112 ACC 201	MAT 421* MAT 319 FIN 325 Gen Ed Behavioral/Social Science Gen Ed Science
3	MAT 423 FIN 330 IW Course Free Elective*** Gen Ed Elective	MAT 422 MAT 343 ECO 340 JW Course Free Elective***
4	STA 311 ENG 368 W Gen Ed Humanities Gen Ed Elective Free Elective***	MAT 478 – formerly MAT 403 MAT 491 Internship** Gen Ed Elective Free Elective***

General Notes:

- Three writing-emphasis (W) courses are required. At least one of them must be at the three hundred level or above. Transfer students entering with 40-70 credits must take two writing emphasis courses and those entering with more than 70 credits must take one.
- Students are encouraged to take courses that meet multiple requirements, for example, courses that are both “W” and “J” courses.

Program Specific Notes:

- * MAT 421 should be taken immediately after MAT 261
- ** May be taken for variable credit and repeated for credit.
- *** Must be approved by advisor.

2165/ 2171 B.S. MATHEMATICS: COMPUTATIONAL MATHEMATICS – 120 CREDITS

Name:	Date Major Declared:				
	CREDITS	COURSE	SEMESTER	GRADE	REP/W**
GENERAL EDUCATION REQUIREMENTS (48 LESS 9 ATTRIBUTED TO MAJOR REQUIREMENTS = 39 CREDITS)					
WRT 120	3				
WRT 200, 204, 205, 206, 208, or 220	3				
MATHEMATICS (MAT 311 below)	3				
SPK 230 (below)	3				
DIVERSE COMMUNITIES "J" COURSE	3				
INTERDISCIPLINARY "I" COURSE	3				
SCIENCE (CSC 141 BELOW)	3				
SCIENCE (BIO, CHE, PHY, CSC, OR ESS)	3				
BEHAVIOR & SOCIAL SCI (ANT, SOC, ECO, GEO, OR PSC)	3				
BEHAVIOR & SOCIAL SCI (ANT, SOC, ECO, GEO, OR PSC)	3				
HUMANITIES (PHI, HIS, LIT, OR CLS)	3				
HUMANITIES (PHI, HIS, LIT, OR CLS)	3				
ARTS (ART CINEMATOGRAPHY MUSIC PHOTOGRAPHY THEATRE)	3				
GENERAL EDUCATION ELECTIVE	3				
GENERAL EDUCATION ELECTIVE	3				
GENERAL EDUCATION ELECTIVE	3				
WRITING INTENSIVE COURSES: ENG 368, 371, OR 375; AND 2 OTHERS					
NOTE TO STUDENTS AND ADVISORS: I COURSES MAY NOT COUNT AS DISTRIBUTIVE REQUIREMENTS.					
BS MATHEMATICS REQUIREMENTS (21 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				
MAT 343 DIFFERENTIAL EQUATIONS	3				
CONCENTRATION COURSES (21 CREDITS)					
MAT 151 DISCRETE MATHEMATICS	3				
MAT 319 APPLIED STATISTICS	3				
MAT 325 COMPUTATIONAL MATHEMATICS	3				
MAT 413 COMPUTER ALGEBRA	3				
MAT 425 NUMERICAL ANALYSIS	3				
MAT 443 APPLIED ANALYSIS I	3				
ANY ONE: MAT 427 INTRODUCTION TO OPTIMIZATION TECHNIQUES OR MAT 493 MATHEMATICAL MODELING	3				
COGNATE REQUIREMENTS (21 CREDITS)					
CSC 141 COMPUTER SCIENCE I	3				
CSC 142 COMPUTER SCIENCE II	3				
CSC 240 COMPUTER SCIENCE III	3				
CSC 241 DATA STRUCTURES AND ALGORITHMS	3				
ANY ONE: CSC 242 COMPUTER ORGANIZATION OR MAT 405 CRYPTOGRAPHY	3				
SPK 230 BUSINESS/PROFESSIONAL SPEECH	3				
ENG 368, ENG 371, ENG 371 TECHNICAL /BUSINESS WRITING	3				
INTERNSHIP OR ELECTIVES (18 CREDITS)					
FREE ELECTIVE**	3				
FREE ELECTIVE**	3				
FREE ELECTIVE**	3				
FREE ELECTIVE**	3				
FREE ELECTIVE**	3				
FREE ELECTIVE**	3				

B.S. Mathematics: Computational Mathematics Sample Schedule

Year	Fall (even)	Spring (odd)
1	MAT 161 (4) MAT 151 (3) CSC 141 (3) Gen Ed Arts (3) Gen Ed Humanities (3)	MAT 162 (4) MAT 200 (3) CSC 142 (3) WRT 120 (3) SPK 230 (3)
2	Fall (odd)	Spring (even)
	MAT 261 (4) MAT 311 (3) CSC 240 (3) WRT 200 (3) Gen Ed Elective (3)	MAT 343 (3) MAT 325 (3) CSC 241 (3) Gen Ed Behavioral/Social Science (3) Free Elective** (3)
3	Fall (even)	Spring (odd)
	MAT 413* (3) MAT 427* (3) IW Course (3) Gen Ed Elective (3) Free Elective** (3)	MAT 319 (3) MAT 415* (or CSC 242) (3) Gen Ed Behavioral/Social Science (3) JW Course (3) Free Elective** (3)
4	Fall (odd)	Spring (even)
	MAT 425* (3) ENG 368 W (3) Gen Ed Humanities (3) Gen Ed Elective (3) Free Elective** (3)	MAT 443* (3) Gen Ed Science (3) Free Elective** (3) Free Elective** (3)

General Notes:

- Three writing-emphasis (W) courses are required. At least one of them must be at the three hundred level or above. Transfer students entering with 40-70 credits must take two writing emphasis courses and those entering with more than 70 credits must take one.
- Students are encouraged to take courses that meet multiple requirements, for example, courses that are both “W” and “J” courses.

Program Specific Notes:

- * If a student starts the program Fall of an odd year, then MAT 413 and MAT 427 must be taken Fall of Year 4; MAT 425, Fall of Year 3; MAT 443, Spring of Year 3; and MAT 415 Spring of Year 4. If CSC 242 is elected, check with Computer Science Department for course offering schedule.
- ** Free Elective or MAT 491 (Internship in Applied Math) must be approved by advisor. MAT 491 may be taken for variable credit and repeated for credit.

2165/2171B.S. MATHEMATICS: INDUSTRIAL MATHEMATICS- 120 CREDITS

Name:	Date Major Declared:				
	CREDITS	COURSE	SEMESTER	GRADE	REP/W**
GENERAL EDUCATION REQUIREMENTS (48 LESS 12 ATTRIBUTED TO MAJOR REQUIREMENTS = 36 CREDITS)					
WRT 120	3				
WRT 200, 204, 205, 206, 208, or 220	3				
MATHEMATICS (MAT 311 below)	3				
SPK 230 (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 SCI (ANT, SOC, ECO, GEO, OR PSC)	3				
BEHAVIOR & SOCIAL SCI (ANT, SOC, ECO, GEO, OR PSC)	3				
HUMANITIES (PHI, HIS, LIT, OR CLS)	3				
HUMANITIES (PHI, HIS, LIT, OR CLS)	3				
ARTS (ART CINEMATOGRAPHY MUSIC PHOTOGRAPHY THEATRE)	3				
GENERAL EDUCATION ELECTIVE	3				
GENERAL EDUCATION ELECTIVE	3				
GENERAL EDUCATION ELECTIVE	3				
WRITING INTENSIVE COURSES: ENG 368, 371, OR 375 , AND 2 OTHERS					
NOTE TO STUDENTS AND ADVISORS: I COURSES MAY NOT COUNT AS DISTRIBUTIVE REQUIREMENTS.					
BS MATHEMATICS REQUIREMENTS (21 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				
MAT 343 DIFFERENTIAL EQUATIONS	3				
CONCENTRATION COURSES (21 CREDITS)					
MAT 319 APPLIED STATISTICS	3				
MAT 325 COMPUTATIONAL MATHEMATICS	3				
MAT 413 COMPUTER ALGEBRA	3				
MAT 425 NUMERICAL ANALYSIS	3				
MAT 443 APPLIED ANALYSIS I	3				
MAT 445 COMPLEX VARIABLES	3				
ANY ONE: MAT 427 INTRODUCTION TO OPTIMIZATION TECHNIQUES OR MAT 493 MATHEMATICAL MODELING	3				
COGNATE REQUIREMENTS (26 CREDITS)					
CSC 141 COMPUTER SCIENCE I	3				
PHY 170 PHYSICS I	4				
PHY 180 PHYSICS II	4				
PHY 240 INTRODUCTION TO MODERN PHYSICS	3				
PHY 300 MECHANICS	3				
PHY 350 HEAT AND THERMODYNAMICS	3				
SPK 230 BUSINESS/PROFESSIONAL SPEECH	3				
ENG 368, ENG 371, ENG 371 TECHNICAL /BUSINESS WRITING	3				
INTERNSHIP OR ELECTIVES (16 CREDITS)					
FREE ELECTIVE**	4				
FREE ELECTIVE**	3				
FREE ELECTIVE**	3				
FREE ELECTIVE**	3				
FREE ELECTIVE**	3				

B.S. Mathematics: Industrial Mathematics Sample Schedule

Year	Fall (even)	Spring (odd)
1	MAT 161 (4) CSC 141 (3) Gen Ed Arts (3) Gen Ed Humanities (3) Gen Ed Behavioral/Social Science (3)	MAT 162 (4) MAT 200 (3) PHY 170 (4) WRT 120 (3) SPK 230 (3)
2	Fall (odd)	Spring (even)
	MAT 261 (4) MAT 311 (3) PHY 180 (4) WRT 200 (3) JW Course (3)	MAT 343 (3) MAT 325 (3) PHY 240 (3) Gen Ed Behavioral/Social Science (3) Free Elective** (3)
3	Fall (even)	Spring (odd)
	MAT 413* (3) MAT 445* (3) PHY 300 (3) Gen Ed Humanities (3) Gen Ed Elective (3)	MAT 319 (3) IW Course (3) ENG 368 W (3) Gen Ed Elective (3) Free Elective** (3)
4	Fall (odd)	Spring (even)
	MAT 425* (3) MAT 493* (3) PHY 350 (3) Gen Ed Elective (3)	MAT 443* (3) Free Elective** (3) Free Elective** (3) Free Elective** (4)

General Notes:

- Three writing-emphasis (W) courses are required. At least one of them must be at the three hundred level or above. Transfer students entering with 40-70 credits must take two writing emphasis courses and those entering with more than 70 credits must take one.
- Students are encouraged to take courses that meet multiple requirements, for example, courses that are both “W” and “J” courses.

Program Specific Notes:

- * If a student starts the program Fall of an odd year, then MAT 413 and MAT 445 must be taken Fall of Year 4; MAT 425 and MAT 493, Fall of Year 3; and MAT 443 Spring of Year 3.
- ** Free Elective or MAT 491 (Internship in Applied Math) must be approved by advisor. MAT 491 may be taken for variable credit and repeated for credit.

2165/ 2171 B.S. MATHEMATICS: MATHEMATICAL FINANCE – 120 CREDITS

Name:	Date Major Declared:				
	CREDITS	COURSE	SEMESTER	GRADE	REP/W**
GENERAL EDUCATION REQUIREMENTS (48 LESS 15 ATTRIBUTED TO MAJOR REQUIREMENTS = 33 CREDITS)					
WRT 120	3				
WRT 200, 204, 205, 206, 208, or 220	3				
MATHEMATICS (MAT 311 below)	3				
SPK 230 (below)	3				
DIVERSE COMMUNITIES "J" COURSE	3				
INTERDISCIPLINARY "I" COURSE	3				
SCIENCE (3 CREDITS OF PHY 170 BELOW)	3				
SCIENCE (CSC 141 BELOW)	3				
BEHAVIOR & SOCIAL SCI (ECO 111 BELOW)	3				
BEHAVIOR & SOCIAL SCI (ANT, SOC, GEO, PSC, OR PSY)	3				
HUMANITIES (PHI, HIS, LIT, OR CLS)	3				
HUMANITIES (PHI, HIS, LIT, OR CLS)	3				
ARTS (ART CINEMATOGRAPHY MUSIC PHOTOGRAPHY THEATRE)	3				
GENERAL EDUCATION ELECTIVE	3				
GENERAL EDUCATION ELECTIVE	3				
GENERAL EDUCATION ELECTIVE	3				
WRITING INTENSIVE COURSES: ENG 368, 371, OR 375 , AND 2 OTHERS					
NOTE TO STUDENTS AND ADVISORS: I COURSES MAY NOT COUNT AS DISTRIBUTIVE REQUIREMENTS.					
BS MATHEMATICS REQUIREMENTS (21 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				
MAT 343 DIFFERENTIAL EQUATIONS	3				
CONCENTRATION COURSES (18 CREDITS)					
MAT 319 APPLIED STATISTICS	3				
MAT 371 MATHEMATICS OF FINANCE – FORMERLY MAT 406	3				
MAT 479 FINANCIAL CALCULUS – FORMERLY MAT 409	3				
MAT 421 MATHEMATICAL STATISTICS I	3				
MAT 443 APPLIED ANALYSIS	3				
ANY ONE: MAT 423 APPLIED STATISTICS OR MAT 422 MATHEMATICAL STATISTICS II	3				
COGNATE REQUIREMENTS (28 CREDITS)					
ACC 201 ACCOUNTING I	3				
CSC 141 COMPUTER SCIENCE I	3				
PHY 170 PHYSICS I	4				
ECO 111 PRINCIPLES OF MACROECONOMICS	3				
ECO 112 PRINCIPLES OF MICROECONOMICS	3				
FIN 325 CORPORATE FINANCE	3				
ANY ONE: FIN 337 FINANCIAL MARKETS AND INSTITUTIONS OR FIN 344 INVESTMENTS	3				
SPK 230 BUSINESS/PROFESSIONAL SPEECH	3				
ENG 368, ENG 371, ENG 371 TECHNICAL /BUSINESS WRITING	3				
INTERNSHIP OR ELECTIVES (20 CREDITS)					
MAT 491 INTERNSHIP IN APPLIED MATHEMATICS* (OPTIONAL)	2				
FREE ELECTIVE**	3				
FREE ELECTIVE**	3				
FREE ELECTIVE**	3				
FREE ELECTIVE**	3				
FREE ELECTIVE**	3				
FREE ELECTIVE**	3				

B.S. Mathematics: Mathematical Finance Sample Schedule

Year	Fall	Spring
1	MAT 161 WRT 120 CSC 141 Gen Ed Humanities Gen Ed Behavioral/Social Science	MAT 162 MAT 200 PHY 170 SPK 230 WRT 200
2	MAT 261 MAT 311 ACC 201 ECO 111 Free Elective	MAT 319 MAT 343 ECO 112 Gen Ed Elective Free Elective
3	MAT 421 MAT 371 – formerly MAT 406 FIN 325 Gen Ed Elective Free Elective	MAT 422* (or IW Course) FIN 344 MAT 443** (or JW Course) Gen Ed Humanities Free Elective
4	MAT 491 Internship IW Course (or MAT 423*) ENG 368 W Gen Ed Elective Free Elective	MAT 379 – formerly MAT 409 JW Course (or MAT 443***) Free Elective Gen Ed Arts

General Notes:

- Three writing-emphasis (W) courses are required. At least one of them must be at the three hundred level or above. Transfer students entering with 40-70 credits must take two writing emphasis courses and those entering with more than 70 credits must take one.
- Students are encouraged to take courses that meet multiple requirements, for example, courses that are both “W” and “J” courses.

Program Specific Notes:

- * Student must take either MAT 422 (a Spring **only** course) or MAT 423 (a Fall **only** course); MAT 421 is a prerequisite for both courses.
- ** If student starts Year 1 in an odd year, take MAT 443 in Year 3 since MAT 443 **only** offered in Spring of even years.
- *** If student starts Year 1 in an even year, take MAT 443 in Year 4 since MAT 443 **only** offered in Spring of even years.

2165/ 2171 B.S. MATHEMATICS: MATHEMATICS- 120 CREDITS

Name:	Date Major Declared:				
	CREDITS	COURSE	SEMESTER	GRADE	REF/W**
GENERAL EDUCATION REQUIREMENTS (48 LESS 12 ATTRIBUTED TO MAJOR REQUIREMENTS = 36 CREDITS)					
WRT 120	3				
WRT 200, 204, 205, 206, 208, or 220	3				
MATHEMATICS (MAT 311 below)	3				
SPK 230 (below)	3				
DIVERSE COMMUNITIES "J" COURSE	3				
INTERDISCIPLINARY "I" COURSE (MAT 301 RECOMMENDED)	3				
SCIENCE (CSC 141 BELOW)	3				
SCIENCE (3 CREDITS OF PHY 170 BELOW)	3				
BEHAVIOR & SOCIAL Sci (ANT, SOC, ECO, GEO, OR PSC)	3				
BEHAVIOR & SOCIAL Sci (ANT, SOC, ECO, GEO, OR PSC)	3				
HUMANITIES (PHI, HIS, LIT, OR CLS)	3				
HUMANITIES (PHI, HIS, LIT, OR CLS)	3				
ARTS (ART CINEMATOGRAPHY MUSIC PHOTOGRAPHY THEATRE)	3				
GENERAL EDUCATION ELECTIVE (MAT 121 RECOMMENDED)	3				
GENERAL EDUCATION ELECTIVE (FOREIGN LANGUAGE 201 RECOMMENDED)	3				
GENERAL EDUCATION ELECTIVE (FOREIGN LANGUAGE 202 RECOMMENDED)	3				
WRITING INTENSIVE COURSES: ENG 371 AND 2 OTHERS (MAT 401 RECOMMENDED)					
NOTE TO STUDENTS AND ADVISORS: I COURSES MAY NOT COUNT AS DISTRIBUTIVE REQUIREMENTS.					
BS MATHEMATICS REQUIREMENTS (21 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				
MAT 343 DIFFERENTIAL EQUATIONS	3				
CONCENTRATION COURSES (30 CREDITS)					
MAT 411 ALGEBRA I	3				
MAT 421 MATHEMATICAL STATISTICS I	3				
MAT 441 ADVANCED CALCULUS	3				
MAT 445 COMPLEX VARIABLES	3				
ANALYSIS ELECTIVE: MAT 432, 442, 443, 444	3				
APPLIED MATH ELECTIVE: MAT 319, 325, 345, 403, 406, 409, 422, 425, 427, 493	3				
ALGEBRA ELECTIVE: MAT 412, 413, 414	3				
MATHEMATICS ELECTIVE*	3				
MATHEMATICS ELECTIVE*	3				
MATHEMATICS ELECTIVE*	3				
COGNATE REQUIREMENTS (17 CREDITS)					
SPK 230 BUSINESS SPEAKING	3				
CSC 141 COMPUTER SCIENCE I	3				
PHY 170 PHYSICS I	4				
PHY 180 PHYSICS II	4				
ENG 371 TECHNICAL WRITING (W COURSE)	3				
INDEPENDENT STUDY, W COURSES, OR ELECTIVES (16 CREDITS)					
FREE ELECTIVE*** - MAT 499 INDEPENDENT STUDY** RECOMMENDED	1				
W COURSE - MAT 401 RECOMMENDED	3				
W COURSE - MAT 301 RECOMMENDED	3				
FREE ELECTIVE***	3				
FREE ELECTIVE***	3				
FREE ELECTIVE***	3				

B.S. Mathematics – Mathematics Sample Schedule

Year	Fall	Spring
1	MAT 161 MAT 121 (recommended) CSC 141 Gen Ed Humanities Gen Ed Arts	MAT 162 MAT 200 PHY 170 WRT 120 SPK 230
2	MAT 261 MAT 311 PHY 180 WRT 200 Gen Ed Behavioral/Social Science	MAT 343 Math Elective* W course MAT 401 (recommended) Free Elective*** Gen Ed Elective (MAT 121 recommended)
3	MAT 411 MAT 421 Math Elective* I Course W course	MAT 441 Algebra Elective Math Elective* J Course Free Elective
4	MAT 445 Analysis Elective ENG 371 W course Gen Ed Humanities Gen Ed Elective (Foreign Language 201 recommended)	Free Elective*** (MAT 499 recommended**) Applied Elective Free Elective*** Gen Ed Behavioral/Social Science Gen Ed Elective (Foreign Language 202 recommended)

General Notes:

- Three writing-emphasis (W) courses are required. At least one of them must be at the three hundred level or above. Transfer students entering with 40-70 credits must take two writing emphasis courses and those entering with more than 70 credits must take one.
- Students are encouraged to take courses that meet multiple requirements, for example, courses that are both “W” and “J” courses.

Program Specific Notes:

- * Any courses in mathematics with course numbers above 311, with the exception of those courses with a primary focus on teacher training or those courses restricted to students majoring in elementary Education.
- ** May be taken for variable credit and repeated for credit.
- *** Must be approved by advisor.

2165/ 2171 B.S. MATHEMATICS: STATISTICS – 120 CREDITS

Name:	Date Major Declared:				
	CREDITS	COURSE	SEMESTER	GRADE	REP/W**
GENERAL EDUCATION REQUIREMENTS (48 LESS 6 ATTRIBUTED TO MAJOR REQUIREMENTS = 42 CREDITS)					
WRT 120	3				
WRT 200, 204, 205, 206, 208, or 220	3				
MATHEMATICS (MAT 311 below)	3				
SPK 230 (below)	3				
DIVERSE COMMUNITIES "J" COURSE	3				
INTERDISCIPLINARY "I" COURSE	3				
SCIENCE (BIO, CHE, PHY, CSC, OR ESS)	3				
SCIENCE (BIO, CHE, PHY, CSC, OR ESS)	3				
BEHAVIOR & SOCIAL Sci (ANT, SOC, ECO, GEO, OR PSC)	3				
BEHAVIOR & SOCIAL Sci (ANT, SOC, ECO, GEO, OR PSC)	3				
HUMANITIES (PHI, HIS, LIT, OR CLS)	3				
HUMANITIES (PHI, HIS, LIT, OR CLS)	3				
ARTS (ART CINEMATOGRAPHY MUSIC PHOTOGRAPHY THEATRE)	3				
GENERAL EDUCATION ELECTIVE	3				
GENERAL EDUCATION ELECTIVE	3				
GENERAL EDUCATION ELECTIVE	3				
WRITING INTENSIVE COURSES: ENG 368, 371, OR 375; AND 2 OTHERS					
NOTE TO STUDENTS AND ADVISORS: I COURSES MAY NOT COUNT AS DISTRIBUTIVE REQUIREMENTS.					
BS MATHEMATICS REQUIREMENTS (21 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				
MAT 343 DIFFERENTIAL EQUATIONS	3				
CONCENTRATION COURSES (27 CREDITS)					
MAT 121 STATISTICS I	3				
STA 311 STATISTICAL COMPUTING	3				
MAT 319 APPLIED STATISTICS	3				
STA 320 EXPERIMENTAL DESIGN	3				
STA 321 TOPICS IN ADVANCED STATISTICS	3				
MAT 421 MATHEMATICAL STATISTICS I	3				
MAT 422 MATHEMATICAL STATISTICS II	3				
MAT 423 APPLIED PROBABILITY	3				
STA 490 CAPSTONE COURSE IN STATISTICS	3				
SUPPLEMENTAL REQUIREMENTS (24 CREDITS)					
SUPPLEMENTAL ELECTIVE I	3				
SUPPLEMENTAL ELECTIVE II	3				
SUPPLEMENTAL ELECTIVE III	3				
SUPPLEMENTAL ELECTIVE IV	3				
SUPPLEMENTAL ELECTIVE V	3				
SUPPLEMENTAL ELECTIVE VI	3				
SPK 230 BUSINESS/PROFESSIONAL SPEECH	3				
ENG 368, ENG 371, ENG 371 TECHNICAL /BUSINESS WRITING	3				
INTERNSHIP OR ELECTIVES (6 CREDITS)					
MAT 491 INTERNSHIP IN APPLIED MATHEMATICS* (OPTIONAL)	3				
FREE MATH/STAT ELECTIVE*	3				

B.S. Mathematics: Statistics Sample Schedule

Year	Fall	Spring
1	MAT 121 MAT 161 Gen Ed Arts Gen Ed Humanities Gen Ed Behavioral/Social Science	Gen Ed Elective (MAT 122 Recommended) MAT 162 MAT 200 WRT 120 SPK 230
2	MAT 261 MAT 311 WRT 200 Supplemental Elective I Gen Ed Elective	MAT 319 STA 311 MAT 343 Gen Ed Science Elective Supplemental Elective II
3	MAT 421 STA 320 IW Course Gen Ed Elective Supplemental Elective III	MAT 422 ENG 368 W STA 321 Supplemental Elective IV Gen Ed Behavioral/Social Science
4	MAT 423 JW Course STA 490 Supplemental Elective V Supplemental Elective VI	Gen Ed Humanities MAT 491 Internship Gen Ed Science Elective Elective in MAT/STA (300 level or higher)*

General Notes:

- Three writing-emphasis (W) courses are required. At least one of them must be at the three hundred level or above. Transfer students entering with 40-70 credits must take two writing emphasis courses and those entering with more than 70 credits must take one.
- Students are encouraged to take courses that meet multiple requirements, for example, courses that are both “W” and “J” courses.

Program Specific Notes:

- * Must be approved by advisor.

BSEd in Mathematics

Of all the baccalaureate degrees, the BSEd is the most subject to change because the Pennsylvania Department of Education can change the certification requirements at any time. Thus, it is essential that you regularly check with your advisor and the College of Education web site (<http://www.wcupa.edu/academics/coe/>) to learn of any changes.

During your first two years of study you will take the lower division, mathematics core courses and courses in professional education. No later than April of your first year you must begin the process of gaining the clearances required for the field work you will complete during your second year. These clearances must be renewed annually thereafter.

Clearances Required Prior to Participating in Early Field Experiences

Students are required to possess the original copy of the following:

- a) The Pennsylvania Child Abuse Clearance,
- b) The Pennsylvania State Police Criminal Record Check,
- c) FBI Background Fingerprint Check, and
- d) Verification of a negative reading on a TB test.

See the following web page for further information:

<http://www.wcupa.edu/academics/coe/clearances.aspx>

During the middle of your second year, you must begin the process of seeking Formal Admission to Teacher Education (FATE). All students seeking a B.S.Ed. must formally apply for admission to teacher education. Only those students formally admitted to teacher education will be eligible to enroll in MAT 350, MAT 360, MAT 354, and MAT 364.

Formal Admission to Teacher Education (FATE)

The requirements for Formal Admission to Teacher Education include:

- a) Earned a minimum of 48 credits at the college level (100 level or above)
- b) Earned a minimum cumulative GPA of 2.8
- c) Earned 3 credits in college-level English composition
- d) Earned 3 credits in literature taught in English
- e) Earned 6 credits in college-level mathematics
- f) Achieved passing scores as established by the PA Department of Education on the SAT, ACT Plus Writing, or Core Academic Skills for Educators or Pre-service Academic Performance Assessment (PAPA) test modules.
- g) Approval of the Department of Mathematics and College of Education.

Because these requirements are subject to change, be sure to check

<http://www.wcupa.edu/academics/coe/fate.aspx> for the current requirements.

2165/ 2171 B.S.Ed. MATHEMATICS – 124 CREDITS

Name:		Date Major Declared:				
For details of the program requirements below, refer the College of Education website.						
<ul style="list-style-type: none"> • Basic Skills Requirements (Sophomore Year, Required for Formal Admission): 						
<ul style="list-style-type: none"> • Date of Formal Admission to Teacher Education Program: 						
<ul style="list-style-type: none"> • Praxis 5161-Mathematics Content Knowledge Test (Must take prior to student teaching): 						
	CREDITS	COURSE	SEMESTER	GRADE	REP/W**	
GENERAL EDUCATION REQUIREMENTS (48 LESS 18 ATTRIBUTED TO MAJOR REQUIREMENTS = 30 CREDITS)						
WRT 120	3					
WRT 200, 204, 205, 206, 208, or 220	3					
MATHEMATICS (3 CREDITS OF MAT 161 below)	3					
SPK 208 or 230	3					
DIVERSE COMMUNITIES "J" COURSE (LAN/ ENG 382 below)	3					
INTERDISCIPLINARY "I" COURSE	3					
SCIENCE (3 CREDITS OF PHY 170 below)	3					
SCIENCE (CSC 141 below)	3					
BEHAVIOR & SOCIAL SCI PSY 100	3					
BEHAVIOR & SOCIAL SCI (ANT, SOC, ECO, GEO, OR PSC)	3					
HUMANITIES (HIS 444 below)	3					
HUMANITIES (LIT OR CLS -- REQUIRED FOR FATE)	3					
ARTS (ART, CINEMATOGRAPHY, MUSIC, PHOTOGRAPHY, THEATRE)	3					
GENERAL EDUCATION ELECTIVE (LAN/ ENG 382 below)	3					
GENERAL EDUCATION ELECTIVE (MAT 121 RECOMMENDED)	3					
GENERAL EDUCATION ELECTIVE	3					
WRITING INTENSIVE COURSES: MAT 350, MAT 354, MAT 401						
NOTE TO STUDENTS AND ADVISORS: I COURSES MAY NOT COUNT AS DISTRIBUTIVE REQUIREMENTS.						
EDUCATION REQUIREMENTS (34 CREDITS)						
HIS 444 History of Education	3					
EDA 103 Foundations of Special Education	3					
EDA 304 Special Education Process & Procedures*	3					
EDR 347 Literacy Development and Secondary Students with Disabilities in Inclusive Classrooms	3					
LAN/ ENG 382 Teaching English Language Learners (ELLs) PK-12 - "J"	3					
EDP 250 Educational Psychology*	3					
MAT 350 Middle School Mathematics Methods "W"	3					
MAT 360 Middle School Mathematics Field Experiences*	1					
EDS 411 Student Teaching*	6					
EDS 412 Student Teaching*	6					
COGNATE REQUIREMENTS (11 CREDITS)						
PHY 170 Physics I	4					
PHY 180 Physics II	4					
CSC 141 Intro Computer Science	3					

2165/ 2171 B.S.Ed. SECONDARY MATHEMATICS- 124 CREDITS (CONT'D)

	CREDITS	COURSE	SEMESTER	GRADE	REP/W**
Mathematics Requirements (49 credit)					
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				
MAT 331 Geometry	3				
MAT 354 Secondary Mathematics Methods "W"	3				
MAT 364 Secondary Mathematics Field Experiences*	1				
MAT 401 History of Mathematics "W"	3				
MAT 411 Algebra I	3				
MAT 414 Number Theory	3				
MAT 421 Mathematical Statistics I	3				
MAT 441 Advanced Calculus	3				
Applied Mathematics Elective**	3				
Analysis Elective**	3				
Mathematics Elective	3				

B.S.Ed. Mathematics Sample Schedule

Year	Fall	Spring
1	CSC 141 MAT 161 WRT 120 MAT 121 (Recommended) SPK 208 or 230	MAT 162 MAT 200 WRT 200, 204, 205, 206, 208 or 220 PSY 100 EDA 103
2	MAT 261 MAT 311 PHY 170 EDP 250* Gen Ed Humanities LIT or CLS	MAT 441 MAT Elective – Analysis** (MAT 343 Recommended) PHY 180 EDA 304* Gen Ed Behavioral/ Social Science
3	MAT 411 MAT 421 MAT 350 “W” (Required) MAT 360* (Required) HIS 444 Gen Ed Elective	MAT 331 MAT 414 MAT 354 “W” (Required) MAT 364* (Required) LAN/ ENG 382 “J” EDR 347
4	EDS 411* & 412*	MAT Elective – Applied** MAT Elective “I” Course Gen Ed Arts MAT 401 “W”

General Notes:

- Three writing-emphasis (W) courses are required. At least one of them must be at the three hundred level or above. Transfer students entering with 40-70 credits must take two writing emphasis courses and those entering with more than 70 credits must take one.
- Students are encouraged to take courses that meet multiple requirements, for example, courses that are both “I” and “J” courses.

Program Specific Notes:

- * Clearances required.
- ** The table that lists courses by area (e.g., algebra, analysis, applied mathematics) is given on page 36.

Minor Programs

Minor in Mathematics

Required Courses (15 credits)

MAT 161 Calculus I (4)
MAT 162 Calculus II (4)
MAT 261 Calculus III (4)
MAT 311 Linear Algebra (3)

Approved Electives (6 credits)

Any two 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.

In this minor, a student must earn a minimum grade of C- in each course and have an average of at least 2.0 over all the courses taken in the minor.

Minor in Mathematics: Grades PreK-8

Required Courses

MAT 101 Mathematics for Teachers of Children I (3)
MAT 102 Mathematics for Teachers of Children II (3)
MAT 121 Statistics (3)
MAT 312 Algebra for Teachers in Grades 4-8 (3)
MAT 313 Geometry for Teachers in Grades 4-8 (3)
MAT 351 Methods for Teaching Children Mathematics (3)
MAT 353 Methods for Teaching Middle School Mathematics (3)
MAT 390 Seminar in Mathematics Education (3)

In this minor, a student must earn a minimum grade of C- in each course and have an average of at least 2.0 over all the courses taken in the minor.

Minor in Applied Statistics

Required Courses

Complete one of the following calculus courses: (3 or 4)

MAT 108 Brief Calculus (3)

MAT 109 Calculus for the Life Sciences (3)

MAT 161 Calculus I (4)

Complete one of the following courses:

MAT 121 Introduction to Statistics I

ECO 251 Quantitative Business Analysis I

Complete the following course:

MAT 122 Introduction to Statistics II

Complete at least one of the following:

STA 311 Intro Statistical Computing and Data Management (3)

STA 320 Experimental Design (3)

MAT 319 Applied Statistics (3)

MAT 421 Mathematical Statistics I (3)

Elective Courses

Select from the following courses as necessary to complete a total of 18 credits:

BIO 310 Biostatistical Applications

CSC 241 Data Structures & Algorithms

CSC 321 Data Base Management Systems

ECO 252 Quantitative Business Analysis II

ECO 401 Introduction to Econometrics

GEO 326 Geographical Analysis

HEA 419 Research Methods in Health

MAT 319 Applied Statistics

MAT 421 Mathematical Statistics I

MIS 300 Introduction to Management Information Systems

MKT 360 Marketing Research

PPD 481 Drug Design I

PSY 245 Statistics for the Behavioral Sciences

PSY 246 Research Methods in Psychology

STA 311 Intro Statistical Computing and Data Management

STA 320 Experimental Design

In this minor, a student must earn a minimum grade of C- in each course and have an average of at least 2.0 overall the courses taken in the minor

Calendar of Planned Course Offerings

Developmental, 100, and 200 Level Courses				
Course	Semester or Session Offered			
	Fall	Spring	Summer	Winter
MAT Q20	√	√	√	
MAT Q30	√	√	√	
MAT 101	√	√	√	
MAT 102	√	√	√	
MAT 103	√	√	√	√
MAT 104	√	√	√	
MAT 113	√	√	√	
MAT 115	√	√	√	
MAT 121	√	√	√	√
MAT 122	√	√		
MAT 131	√	√	√	
MAT 143	√	√	√	
MAT 145	√	√		
MAT 151	√	√	√	
MAT 161	√	√	√	
MAT 162	√	√	√	
MAT 200	√	√	√	
MAT 261	√	√	√	

300-400 Level Courses				
Course	Semester Offered*			
	Fall Even Numbered Years	Spring Odd Numbered Years	Fall Odd Numbered Years	Spring Even Numbered Years
MAT 311 [§]	√	√	√	√
MAT 312	√	√	√	√
MAT 313	√	√	√	√
MAT 319	√	√	√	√
MAT 321			√	
MAT 325		√		√
MAT 331		√		√
MAT 343	√	√	√	√

[§]Also offered in Summer.

300-400 Level Courses				
Course	Semester Offered*			
	Fall Even Numbered Years	Spring Odd Numbered Years	Fall Odd Numbered Years	Spring Even Numbered Years
MAT 350	√		√	
MAT 351	√	√	√	√
MAT 352†		√		√
MAT 353†	√	√	√	√
MAT 354		√		√
MAT 360	√		√	
MAT 364		√		√
MAT 371	√	√	√	√
MAT 401	√	√	√	√
MAT 411	√	√	√	√
MAT 412		√		√
MAT 413	√			
MAT 414		√		√
MAT 415		√		
MAT 421	√	√	√	√
MAT 422		√		√
MAT 423	√		√	
MAT 425			√	
MAT 427	√			
MAT 432		√		
MAT 441	√	√	√	√
MAT 442	√		√	
MAT 443				√
MAT 445	√			
MAT 478		√		√
MAT 479		√		√
MAT 493			√	
STA 311	√	√	√	√
STA 320	√		√	
STA 321		√		√
STA 490	√		√	

*If there is sufficient demand, 300-400 level courses will be offered during the summer.

†MAT 352 and MAT 353 are offered during a special session from mid-May to mid-June.

Placement of Electives in Groups

Algebra	Analysis	Applied Mathematics
MAT 412 Algebra II MAT 413 Computer Algebra MAT 414 Number Theory <i>MAT 415 Introduction to Cryptography§§</i>	MAT 343 <i>Differential Equations**</i> MAT 362 Calculus IV MAT 432 Topology MAT 442 Real Analysis II MAT 443 Applied Analysis I MAT 444 Applied Analysis II MAT 445 Complex Variables	MAT 319 Applied Statistics MAT 325 Computational Mathematics <i>MAT 343 Differential Equations**</i> MAT 371 Mathematics of Finance <i>MAT 415 Introduction to Cryptography§§</i> MAT 422 Mathematical Statistics II MAT 423 Applied Probability MAT 425 Numerical Analysis MAT 427 Optimization MAT 478 Fundamentals of Actuarial Science MAT 479 Financial Calculus MAT 493 Modeling

MAT 343 **cannot be credited to both areas.
 §§ MAT 415 **cannot** be credited to both areas.

Other Upper-Division Electives:

- MAT 321 Combinatorics
- MAT 332 Differential Geometry
- MAT 381 Discrete Mathematics
- MAT 401 History of Mathematics
- MAT 405 Special Topics in Mathematics
- MAT 432 Topology
- MAT 490 Seminar in Mathematics

Note: Mathematics courses designed for education majors or as general education courses may not count as mathematics electives, namely, MAT 301, MAT 302, MAT 309, MAT 312, MAT 313, MAT 330, MAT 350, MAT 351, MAT 352, MAT 353, MAT 354, MAT 357, MAT 360, MAT 364, and MAT 390.

Recommended Preparation for Graduate Study

Recommended Mathematics Courses

The following courses are recommended for students intending to enter a graduate program in pure or applied mathematics:

- MAT 343 Differential Equations
- MAT 412 Algebra II
- MAT 414 Theory of Numbers
- MAT 421 Mathematical Statistics I
- MAT 422 Mathematical Statistics II
- MAT 432 Topology
- MAT 442 Advanced Calculus II (or MAT 444 Applied Analysis II)
- MAT 445 Complex Variables

Recommended Computer Science Courses

Mathematics and statistics majors generally are encouraged to take courses in computer science. The following courses are recommended.

- CSC 141 Computer Science I
- CSC 142 Computer Science II
- CSC 240 Computer Science III
- CSC 241 Data Structures & Algorithms
- CSC 321 Database Management Systems

General Department Information

Advanced Placement Credit

The Department's policy for granting credit is as follows.

AP Test	Score on AP Test		
	3	4	5
Calculus AB	MAT 143	MAT 161	MAT 161
Calculus BC	MAT 161	MAT 162	MAT 162
Statistics	MAT 121	MAT 121	MAT 121

Computer Labs

The Mathematics Department has two computer labs, UNA 103 and UNA 109. These computers have all of the mathematics software needed for classes. Mathematics majors can obtain access to these labs Monday through Friday 8 a.m.-10 p.m.

Independent Study

Qualified students may take a course on an independent study basis. This alternative is appropriate when a student has a specialized and compelling interest that cannot be pursued within the framework of a regular course. A GPA of at least 2.00 both overall and within the student's major are required. Independent Study Forms may be obtained from the Registrar's Office web page.

Individualized Instruction

Individualized instruction is the teaching of a regular, listed catalog course to a single student. Individualized instruction is offered only when the University has cancelled or failed to offer a course according to schedule. The Individualized Instruction Form is available from the Registrar's Office web page.

Mathematics Colloquia

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

Pi Mu Epsilon

Pi Mu Epsilon is a national mathematics honor society. Induction is by invitation based on mathematics GPA.

Social Activities

There are frequent opportunities for faculty 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.

Tutoring

When you need help, you should first visit your professor during his/her office hours. These office hours are posted on the bulletin boards throughout 25 University Avenue and on the instructor's course syllabus.

Free tutoring, dependent on funding by the Dean's Office, also usually is available to mathematics students. The tutors often are junior and/or senior mathematics education majors. The tutoring hours are posted on the door of room 105 of 25 University Avenue and also on the bulletin boards throughout the mathematics building

University Avenue Mathematics Club (formally Anderson Math Club)

The University Avenue Mathematics Club is open for all Mathematics and Mathematics education majors to join. Meeting times are posted on bulletin boards of 25 University Avenue. The Club exists to help promote social and academic activities for our majors. Activities include: speakers on careers in mathematics; an open forum with current student teachers; visits to schools or to regional mathematics or mathematics education activities; the annual Thanksgiving Dinner, in which 25 UNA Mathematics Club students prepare a Potluck dinner for current and retired mathematics and mathematics education faculty.

The Department's Scholarship/Award Programs

A number of scholarships are supported by departmental alumni and former faculty members or their families:

The Class of 1943 Mathematics Scholarship. The scholarship is awarded to the most outstanding undergraduate mathematics education major. It is supported by two members of the class of '43 alumni: Mr. Oreste Leto and Ms. A. Jean Stevenson.

The Professor Mark Wiener Award. This is given in recognition of superior academic achievement for a student minoring in elementary school mathematics.

The Dr. Michael Montemuro Freshman Scholarship. The scholarship is awarded to the entering freshman with the highest potential for success as a mathematics or mathematics education major.

The Dr. & Mrs. Albert Filano Scholarship. The scholarship is awarded to an entering freshman and/or transfer student with the highest potential for success as a mathematics or mathematics education major.

The Benjamin Faber Scholarship The scholarship is awarded to an outstanding math student who demonstrates enthusiasm and curiosity for mathematics.

The Department of Mathematics Scholarship Program. These awards, several in number, are in recognition of academic achievement of undergraduates majoring in mathematics.

The Department of Mathematics Scholarship Program was founded in 1974 by Dr. James L'heureux and he has served as its treasurer since that time.

All the above scholarships and awards are given annually at an awards banquet held each fall. The banquet is attended by faculty, award recipients, and family members.

There are also numerous scholarships and awards sponsored by the University. They are described in the *Undergraduate Catalog*.

Catalog Descriptions of Mathematics Courses

MAT Q20. Fundamental Skills in Arithmetic. 3 Credits.

This course is designed to strengthen basic arithmetic skills and to introduce the elements of algebra. Mathematics placement required. Credits earned in Q00-level courses do not count toward the 120 hours of credit needed for graduation.

Pre / Co requisites: MAT Q20 requires a prerequisite of an appropriate score on the Mathematics Placement Examination.

Typically offered in Fall, Spring & Summer.

MAT Q30. Fundamentals of Algebra. 3 Credits.

This course is designed to strengthen basic algebraic skills. Credits earned in Q00-level courses do not count toward the 120 hours of credit needed for graduation.

Pre / Co requisites: MAT Q30 requires a grade of C- or better in MAT Q20 or an appropriate score on the Mathematics Placement Examination.

Typically offered in Fall, Spring & Summer.

MAT 101. Mathematics for Teachers of Children I. 3 Credits.

Sets; functions; logic; development of whole numbers, integers, and rationals (including ratios, proportions, and percents); number theory; problem solving. For students seeking Certification in Grades PK-4 or 4-8 only.

Pre / Co requisites: MAT 101 requires a grade of C- or better in MAT Q30 or an appropriate score on the Mathematics Placement Examination.

Typically offered in Fall, Spring & Summer.

MAT 102. Mathematics for Teachers of Children II. 3 Credits.

Development of real numbers; geometry; measurement; probability and statistics; problem solving. For students seeking Certification in Grades PK-4 or 4-8 only.

Pre / Co requisites: MAT 102 requires prerequisite of MAT 101.

Typically offered in Fall, Spring & Summer.

MAT 103. Introduction to Mathematics. 3 Credits.

This course is a liberal arts introduction to the nature of mathematics. Topics are chosen from among logic, graph theory, number theory, symmetry (group theory), probability, statistics, infinite sets, geometry, game theory, and linear programming. These topics are independent of each other and have as prerequisite the ability to read, reason, and follow a logical argument.

Pre / Co requisites: MAT 103 requires prerequisites of a grade of C- or better in MAT Q30 or an appropriate score on the Mathematics Placement Examination.

Distance education offering may be available.

Typically offered in Fall, Spring & Summer.

MAT 104. Introduction to Applied Mathematics. 3 Credits.

The course is designed to help prepare students to understand almost any quantitative issues they will encounter in contemporary society. Topics are selected from the following: principles of reasoning, problem-solving tools, financial management, exponential growth and decay, probability, putting statistics to work, mathematics and the arts, discrete mathematics in business and society and the power of numbers.

Pre / Co requisites: MAT 104 requires prerequisites of a grade of C- or better in MAT Q30 or an appropriate score on the Mathematics Placement Examination.

Typically offered in Fall, Spring & Summer.

MAT 113. Algebra and Functions. 3 Credits.

A review of basic algebra, followed by a thorough treatment of polynomial, rational, exponential, and logarithmic functions. Successful completion of this course prepares students for MAT 143.

Pre / Co requisites: MAT 113 requires a prerequisite of a grade of C- or better in MAT Q30 or an appropriate score on the Mathematics Placement Examination.

Typically offered in Fall, Spring & Summer.

MAT 115. Algebra, Functions, and Trigonometry. 3 Credits.

Topics include polynomial, rational, exponential, logarithmic, and trigonometric functions. An emphasis is placed on using technology to understand topics of importance in the life and earth sciences. Successful completion of this course prepares students for MAT 143 or MAT 145.

Pre / Co requisites: MAT 115 requires a grade of C- or better in MAT Q30 or an appropriate score on the Mathematics Placement Examination.

Typically offered in Fall, Spring & Summer.

MAT 121. Introduction to Statistics I. 3 Credits.

Basic concepts of statistics. Frequency distributions, measures of central tendency and variability, probability and theoretical distribution, significance of differences, and hypothesis testing.

Pre / Co requisites: MAT 121 requires a prerequisite of a grade of C- or better in MAT Q30 or an appropriate score on the Mathematics Placement Examination.

Distance education offering may be available.

Typically offered in Fall, Spring & Summer.

MAT 122. Introduction to Statistics II. 3 Credits.

Continuation of MAT 121. Inference about the means, standard deviations and proportions, goodness of fit, analysis of variance, regression analysis, correlation, and nonparametric tests.

Pre / Co requisites: MAT 122 requires a prerequisite of a grade of C- or better in MAT 121 or ECO 251.

Typically offered in Fall & Spring.

MAT 131. Precalculus. 3 Credits.

Topics include polynomial, rational, exponential, logarithmic, and trigonometric functions. An emphasis is placed on understanding function properties and graphs without the use of technology. Successful completion of this course prepares students for MAT 161.

Pre / Co requisites: MAT 131 requires a prerequisite of a grade of C- or better in MAT Q30 or an appropriate score on the Mathematics Placement Examination.

Typically offered in Fall, Spring & Summer.

MAT 143. Brief Calculus. 3 Credits.

An intuitive approach to calculus with emphasis on conceptual understanding and applications to business. Topics include differentiation, curve-sketching, optimization, integration, and partial derivatives.

Pre / Co requisites: MAT 143 requires a prerequisite of a grade of C- or better in MAT 113, MAT 115, or MAT 131; or an appropriate score on the Mathematics Placement Examination.

Typically offered in Fall, Spring & Summer.

MAT 145. Calculus for the Life Sciences. 3 Credits.

An overview of differential and integral calculus, motivated through biological problems. Topics include mathematical modeling with functions, limits, continuity, differentiation, optimization, and integration. Graphing calculators are used as an aid in the application of calculus concepts and methods to realistic biological problems.

Pre / Co requisites: MAT 145 requires a prerequisite of a grade of C or better in MAT 115 or MAT 131; or an appropriate score on the Mathematics Placement Examination.

Typically offered in Fall, Spring & Summer.

MAT 151. Introduction to Discrete Mathematics. 3 Credits.

Set theory, Boolean logic, elementary combinatorics, proofs, simple graph theory, and simple probability.

Pre / Co requisites: MAT 151 requires a prerequisite of a grade of C- or better in MAT Q30 or an appropriate score on the Mathematics Placement Examination.

Typically offered in Fall, Spring & Summer.

MAT 161. Calculus I. 4 Credits.

Differential and integral calculus of real-valued functions of a single real variable with applications.

Pre / Co requisites: MAT 161 requires prerequisites of a C or better in MAT 131 or an appropriate score on the Mathematics Placement Examination.

Typically offered in Fall, Spring & Summer.

MAT 162. Calculus II. 4 Credits.

Continuation of MAT 161 including the study of series, methods of integration, transcendental functions, and applications to the sciences.

Pre / Co requisites: MAT 162 requires prerequisite of C or better in MAT 161.

Typically offered in Fall, Spring & Summer.

MAT 190. Topics in Mathematics. 3 Credits.

Topics announced at time of offering.

Consent: Permission of the Department required to add.

MAT 200. The Nature of Mathematics. 3 Credits.

Topics include the role of mathematics in contemporary society, career opportunities, mathematical notation and argument, structure of proofs, basic facts about logic, mathematical proofs, problem-solving techniques, and introductions to mathematical software packages.

Pre / Co requisites: MAT 200 requires a prerequisite of C or better in MAT 161. Course should be taken by the end of sophomore year.

Typically offered in Fall, Spring & Summer.

MAT 201. Elementary Functions Essential Calculus I. 3 Credits.

Elementary functions from an advanced viewpoint with detailed discussion of formal manipulations. Special emphasis on applications and the use of technology. Open only to prospective Grade 4-8 certification students.

Pre / Co requisites: MAT 201 requires prerequisite MAT 102.

MAT 202. Elementary Functions and Essential Calculus II. 3 Credits.

Elementary functions from an advanced viewpoint with detailed discussions of formal manipulations. Special emphasis on applications and the use of technology. Open only to prospective Grade 4-8 certification students.

Pre / Co requisites: MAT 202 requires prerequisite MAT 201.

MAT 203. Elementary Functions and Essential Calculus II. 3 Credits.

Continued discussion of elementary functions. Introduction to the intuitive ideas of derivative and integral with applications.

Pre / Co requisites: MAT 203 requires prerequisite of MAT 202.

MAT 261. Calculus III. 4 Credits.

The calculus of several variables. Topics include polar coordinates, vectors and three-dimensional analytic geometry, differentiation of functions of several variables, multiple integrals, and line and surface integrals.

Pre / Co requisites: MAT 261 requires a prerequisite of MAT 162 with a C or better.

Typically offered in Fall, Spring & Summer.

MAT 301. The Scientific Revolution. 3 Credits.

This course addresses how modern science began in the 17th century by examining its origins and including introductions to the heroes of science - Copernicus, Kepler, Galileo, and Newton. This course counts toward the writing emphasis requirement.

Gen Ed Attribute: Interdisciplinary Requirement, Writing Emphasis.

Typically offered in Fall & Spring.

MAT 302. Mathematics and Social Justice. 3 Credits.

In this course we will explore several social issues and we will discuss methods which can quantitatively illustrate that are taking place. By doing so, the hope is that each student will learn mathematical skills and techniques. This tool kit of basic mathematical skills is often referred to as Quantitative Literacy (QL). Moreover as attainment of QL is itself a social justice issue, we will explore ways to carry these skills to historically marginalized groups through service learning projects.

MAT 309. Topics in Math for Elementary Teachers. 3 Credits.

Introduction to programming in BASIC; computer uses for the classroom teacher; descriptive statistics with applications for teaching; and measurements of length, area, volume, and temperature that focus on the SI metric system with practice in the classroom. Additional topics in applied mathematics will be considered.
Pre / Co requisites: MAT 209 requires prerequisite of MAT 102.
Repeatable for Credit.

MAT 311. Linear Algebra. 3 Credits.

An introduction to linear algebra. Topics covered include matrices, systems of linear equations, vector spaces, linear transformation, determinants, eigenvalues, spectral theorem, and triangulation.
Pre / Co requisites: MAT 311 requires Concurrent or Prerequisite of MAT 162.
Typically offered in Fall, Spring & Summer.

MAT 312. Algebra for Teachers in Grades 4-8. 3 Credits.

Formal structure of groups, rings, and fields with examples from the elementary curriculum. Topics from linear algebra including matrices, determinants, and linear programming.
Pre / Co requisites: MAT 312 requires prerequisite of MAT 102.
Typically offered in Fall & Spring.

MAT 313. Geometry for Teachers in Grades 4-8. 3 Credits.

Modern informal approach to two- and three-dimensional geometric figures, measurement, similarity, congruence, coordinate geometry, and the postulational method.
Pre / Co requisites: MATT 313 requires prerequisite of MAT 102.
Typically offered in Fall & Spring.

MAT 319. Applied Statistics. 3 Credits.

This course will cover simple and multiple linear regression methods and linear time series analysis with an emphasis on fitting suitable models to data and testing and evaluating models against data.
Pre / Co requisites: MAT 319 requires a prerequisite of MAT 143 or MAT 145 or MAT 161.
Typically offered in Fall & Summer.

MAT 321. Combinations and Graph Theory. 3 Credits.

Introduction to set theory, graph theory, and combinatorial analysis. Includes relations, cardinality, elementary combinatorics, principles of inclusion and exclusion, recurrence relations, zero-one matrices, partitions, and Polya's Theorem.

Pre / Co requisites: MAT 321 requires prerequisites of C or better in MAT 162 and MAT 200.

MAT 325. Computational Mathematics. 3 Credits.

An introduction to the use of the computer as an investigative tool in the field of mathematics with emphasis on experimental techniques involving graphical and numerical displays.

Pre / Co requisites: MAT 325 requires a prerequisite of MAT 162 with a "C" or better. Typically offered in Spring.

MAT 330. Using Technology Teaching Elementary School Mathematics. 3 Credits.

Using computer software, calculators, and the Internet as aids in teaching elementary school mathematics.

Pre / Co requisites: MAT 330 requires prerequisites of MAT 101 and MAT 102.

MAT 331. Foundations of Geometry. 3 Credits.

Geometric foundations from an advanced viewpoint. Topics are chosen from Euclidean and non-Euclidean geometrics.

Pre / Co requisites: MAT 331 requires prerequisite of C or better in MAT 162. Typically offered in Spring.

MAT 332. Differential Geometry. 3 Credits.

Classical differential geometry from a modern viewpoint. Curves and surfaces and shape operators. Introduction to Riemann geometry.

Pre / Co requisites: MAT 332 requires prerequisites of C or better in MAT 200, MAT 261 and MAT 331.

MAT 343. Differential Equations. 3 Credits.

The general theory of n th order, and linear differential equations including existence and uniqueness criteria and linearity of the solution space. General solution techniques for variable coefficient equations, series solutions for variable coefficient equations, and study of systems of linear equations.

Pre / Co requisites: MAT 343 requires a prerequisite of C or better in MAT 162. Typically offered in Fall, Spring & Summer.

MAT 350. Techniques of Teaching Middle School Mathematics. 3 Credits.

Techniques of Middle School Mathematics (3) Learning theory-based techniques for teaching children mathematical concepts in the middle school including: pedagogical content knowledge; techniques used to present specific mathematical concept; associated materials, including methods for exceptional students; levels of questioning; and motivational devices. Topics covered include number, measurement, algebra, geometry, and probability, and statistics.

Pre / Co requisites: MAT 350 requires prerequisites of MAT 261, EDA 304, Field Clearances, and Formal Admission to Teacher Education. MAT 350 requires a co-requisite of MAT 360.

Gen Ed Attribute: Writing Emphasis.

Typically offered in Fall.

MAT 351. Methods for Teaching Children Math. 3 Credits.

Concepts, learning aids, syllabi, texts, and methods in elementary school mathematics.

Pre / Co requisites: MAT 351 requires prerequisites of MAT 101 and MAT 102.

Typically offered in Fall, Spring & Summer.

MAT 352. Methods for Teaching Children Mathematics II. 3 Credits.

Techniques for teaching children concepts such as geometry in two and three dimensions, number sentences, graphing, ratios and percentages, quantifiers, etc. Use of laboratory materials will be emphasized.

Pre / Co requisites: MAT 352 requires prerequisites of MAT 351, Field clearances and Formal Admission to Teacher Education.

Typically offered in Spring.

MAT 353. Methods for Teaching Middle School Mathematics. 3 Credits.

Techniques for teaching children mathematical concepts in the middle school standards.

Topics covered include number, algebra, geometry, and probability and statistics.

Pre / Co requisites: MAT 353 requires prerequisites of MAT 121, MAT 312, MAT 313, MAT 351, field clearances, and FATE.

Typically offered in Fall & Spring.

MAT 354. Techniques of Teaching Secondary School Mathematics. 3 Credits.

Techniques used in the presentation of specific mathematical concepts, associated materials, including methods for exceptional students; levels of questioning, and motivational devices. Scope and sequence of secondary mathematics topics. Criteria for text evaluation. Preview of student teaching.

Pre / Co requisites: MAT 354 requires prerequisites of MAT 350 and EDS 306 and formal admission into teacher education.

Gen Ed Attribute: Writing Emphasis.

Typically offered in Spring.

MAT 357. Teaching Mathematics to Diverse Learners. 3 Credits.

Methods and materials associated with the presentation of mathematics to the handicapped. Emphasis on individualization and involving thinking skills at the concrete level. Evaluative and interpretive techniques are included.

Pre / Co requisites: MAT 357 requires prerequisites of MAT 101 and MAT 102 and formal admission into teacher education.

MAT 360. Field Experiences in Middle School Mathematics. 1 Credit.

The objective of this course is to apply the skills, techniques, and dispositions required to be an effective middle and secondary mathematics teacher. This course will allow you to work in a classroom setting to examine how the curriculum is delivered in a middle and high school setting. You will work with students on an individual or group basis, work cooperatively with teachers, and participate in the lesson and assessment planning process. By the end of the course, you should teach at least one lesson in a classroom setting.

Pre / Co requisites: MAT 360 requires a prerequisite of Formal Admission to Teacher Education. MAT 360 requires a co-requisite of MAT 350.

Typically offered in Fall.

MAT 362. Calculus IV. 3 Credits.

The calculus of vector-valued functions of a vector variable. Derivatives and properties of the derivative including the chain rule, fields and conservative fields, integration, and Green's, Stokes', and Gauss' theorems.

Pre / Co requisites: MAT 362 requires prerequisite of C or better in MAT 261 and C or better in MAT 311.

MAT 364. Field Experiences in Secondary School Mathematics. 1 Credit.

The objective of this course is to apply the skills, techniques, and dispositions required to be an effective secondary mathematics teacher. This course will allow you to work in a classroom setting to examine how the curriculum is delivered in a middle and high school setting. You will work with students on an individual or group basis, work cooperatively with teachers, and participate in the lesson and assessment planning process. By the end of the course, you should teach at least one lesson in a classroom setting.

Pre / Co requisites: MAT 364 requires prerequisites of MAT 360 and Formal Admission to Teacher Education. MAT 364 requires a co-requisite of MAT 354.

Typically offered in Spring.

MAT 371. Mathematics of Finance. 3 Credits.

The purpose of this course is to introduce the mathematical theory behind the concepts of: measurement of interest, annuities, yield rates, amortization of loans, sinking funds, and yield rates. Understanding the fundamental concepts of financial mathematics, and how these concepts can be applied to calculate present and future values of various financial instruments, is the prevailing theme of the course.

Pre / Co requisites: MAT 371 requires prerequisite of MAT 162 with a "C" or better.

Typically offered in Fall.

MAT 381. Discrete Mathematics. 4 Credits.

This course is designed to provide a foundation for the mathematics used in the theory and application of computer science. Topics include mathematical reasoning, the notion of proof, logic, sets, relations and functions, counting techniques, algorithmic analysis, modelling, cardinality, recursions and induction, graphs, and algebra.

Pre / Co requisites: MAT 381 requires prerequisite of C or better in MAT 162.

MAT 390. Seminar in Mathematics Education. 3 Credits.

This course is the capstone course for grades 4-8 certification students completing the 30-credit mathematics certification option. Topics selected from mathematics, statistics, the history of mathematics, and mathematics education for their significance and interest. Field experience may be required.

Pre / Co requisites: MAT 390 requires prerequisite of Formal Admission to Teacher Education.

Repeatable for Credit.

MAT 400. History of Mathematics for Elementary Teachers. 3 Credits.

History and development of elementary mathematics from primitive times to the discovery of calculus. Problems of the period are considered.

Pre / Co requisites: MAT 400 requires prerequisites of MAT 212 and MAT 233.

MAT 401. History of Mathematics. 3 Credits.

Development of mathematics from the Babylonian era to the 18th Century. Some modern topics included.

Pre / Co requisites: MAT 401 requires prerequisite of C or better in MAT 261.

Gen Ed Attribute: Writing Emphasis.

Typically offered in Fall, Spring & Summer.

MAT 405. Special Topics in Mathematics. 3 Credits.

Topics announced at the time of offering.

Consent: Permission of the Department required to add.

Repeatable for Credit.

MAT 411. Algebra I. 3 Credits.

Abstract algebra. Algebraic systems, groups, rings, integral domains, and fields.

Pre / Co requisites: MAT 411 requires prerequisites of C or better MAT 200, MAT 261, and MAT 311.

Typically offered in Fall.

MAT 412. Algebra II. 3 Credits.

Abstract algebra. Algebraic systems, groups, rings, integral domains, and fields.

Pre / Co requisites: MAT 412 requires prerequisite of C or better in MAT 411.

Typically offered in Spring.

MAT 413. Computer Algebra. 3 Credits.

The focus of this course is to introduce students to computer algebra packages and review important topics in algebra, calculus and linear algebra.

Pre / Co requisites: MAT 413 requires prerequisites of MAT 162 and MAT 311 with a "C" or better.

Typically offered in Fall.

MAT 414. Theory of Numbers. 3 Credits.

Properties of integers; primes, factorization, congruences, and quadratic reciprocity.

Pre / Co requisites: MAT 414 requires prerequisites of C or better in MAT 200 and MAT 261.

Typically offered in Spring & Summer.

MAT 415. Introduction to Cryptography. 3 Credits.

An introduction to the Mathematics of Cryptography.

Pre / Co requisites: MAT 415 requires prerequisites of MAT 161 and MAT 151 OR MAT 161 and MAT 200.

Typically offered in Spring.

MAT 421. Mathematical Statistics I. 3 Credits.

Probability theory, discrete and continuous random variables, distributions, and moment generating functions. Statistical sampling theory, joint and interval estimation, test of hypothesis, regression, and correlation.

Pre / Co requisites: MAT 421 requires a prerequisite of C or better in MAT 261.

Typically offered in Fall.

MAT 422. Mathematical Statistics II. 3 Credits.

Probability theory, discrete and continuous random variables, distributions, and moment generating functions. Statistical sampling theory, joint and interval estimation, test of hypothesis, regression, and correlation.

Pre / Co requisites: MAT 422 requires prerequisite of C or better in MAT 421.

Typically offered in Spring.

MAT 423. Applied Probability. 3 Credits.

Standard Concepts and methods of stochastic modeling and applications of stochastic processes.

Pre / Co requisites: MAT 423 requires prerequisites of MAT 261, MAT 311, and MAT 421 with a "C" or better.

Typically offered in Spring.

MAT 425. Numerical Analysis. 3 Credits.

Numerical methods for the approximate solution of applied problems. Interpolation theory, curve fitting, approximate integration, and numerical solution of differential equations.

Pre / Co requisites: MAT 425 requires prerequisites of C or better in MAT 261, MAT 325, MAT 343 and CSC 141.

Typically offered in Fall.

MAT 427. Introduction to Optimization Techniques. 3 Credits.

Nature of optimization problems: deterministic and stochastic, and discrete and continuous. Computer methods of solution, systematic and random search, linear quadratic, dynamic programming, and others.

Pre / Co requisites: MAT 427 requires prerequisites of C or better in MAT 261 and C or better in MAT 311.

MAT 432. Topology. 3 Credits.

Elements of point set topology. Separation axioms. Connectedness, compactness, and metrizability.

Pre / Co requisites: MAT 432 requires prerequisites of C or better in MAT 200 and MAT 261.

MAT 441. Advanced Calculus I. 3 Credits.

A rigorous treatment of the calculus of a single real variable. Topics in several real variables and an introduction to Lebesgue integration.

Pre / Co requisites: MAT 441 requires prerequisites of C or better in MAT 200 and MAT 261.

Typically offered in Fall, Spring & Summer.

MAT 442. Real Analysis II. 3 Credits.

A rigorous treatment of the calculus of a single real variable. Topics in several real variables and an introduction to Lebesgue integration.

Pre / Co requisites: MAT 442 requires prerequisite of C or better in MAT 441.

MAT 443. Applied Analysis I. 3 Credits.

The techniques of analysis applied to problems in the physical sciences. Topics include partial differential equations, orthogonal functions, complex integration, and conformal mapping.

Pre / Co requisites: MAT 443 requires prerequisite of C or better MAT 261, MAT 311 and MAT 343.

Typically offered in Fall.

MAT 444. Applied Analysis II. 3 Credits.

The techniques of analysis applied to problems in the physical sciences. Topics include partial differential equations, orthogonal functions, complex integration, and conformal mapping.

Pre / Co requisites: MAT 444 requires prerequisite of C or better in MAT 443.

MAT 445. Complex Variables. 3 Credits.

Introduction to functions of a complex variable. Analytic functions, mappings, differentiation and integration, power series, and conformal mappings.

Pre / Co requisites: MAT 445 requires prerequisite of C or better in MAT 261.

Typically offered in Fall.

MAT 478. Fundamentals of Actuarial Science. 3 Credits.

Students completing this course will have a better understanding of actuarial models of life contingencies, more specifically, students will understand that life insurance payments, life annuity payments, pension payments, etc. are determined by financial random variables dependent on human life.

Pre / Co requisites: MAT 478 requires prerequisite of MAT 371 and MAT 421 with a "C" or better.

Typically offered in Spring.

MAT 479. Financial Calculus. 3 Credits.

This course aims to provide the undergraduate mathematics major with an introduction to the mathematics behind derivative pricing and portfolio management. Pricing theory is first developed through the typical binomial model and then is extended to continuous time via the Black-Scholes model. In addition, the student will be exposed to how arbitrage can be used to aid in the pricing more complicated derivatives, such as call options on dividend-paying securities and exotic options.

Pre / Co requisites: MAT 479 requires prerequisite of MAT 371 and MAT 421 with a "C" or better.

Typically offered in Spring.

MAT 491. Internship in Applied Mathematics. 2-4 Credits.

In cooperation with regional businesses and industrial companies, student will perform an internship in applied mathematics.

Repeatable for Credit.

MAT 493. Mathematical Modeling. 3 Credits.

The idea of a mathematical model of a real situation. Techniques and rationales of model building. Examples from the life, physical, and social sciences.

Pre / Co requisites: MAT 493 requires prerequisites of C or better in MAT 261 and C or better in MAT 343.

MAT 499. Independent Study in Mathematics. 1-3 Credits.

Independent investigation of an area of mathematics not covered in the department's course offerings.

Consent: Permission of the Department required to add.

Repeatable for Credit.

MTE 340. Using Technology Teaching Elementary Mathematics. 3 Credits.

Using computer software, calculators, and the Internet as aids in teaching elementary school mathematics.

Pre / Co requisites: MTE 340 requires prerequisites of MAT 101 and MAT 102.

STA 311. Intro Statistical Computing and Data Management. 3 Credits.

Course will give students the ability to manage and manipulate data effectively, conduct basic statistical analysis, and generate reports and graphics primarily using the SAS Statistical Software Program.

Typically offered in Spring.

STA 320. Experimental Design. 3 Credits.

The purpose of this course is to guide students in learning how to design, conduct and analyze the results of scientific studies so that valid and objective inferences about the population are obtained. It will cover ANOVAs, block, factorial, and split plot designs, as well as response surface analysis.

Typically offered in Spring.

STA 321. Topics in Advanced Statistics. 3 Credits.

Course will cover select topics in categorical analysis, nonparametrics and time series analysis. Emphasis will be placed on statistical programming, particularly simulations.

Pre / Co requisites: STA 321 requires prerequisites of STA 311, STA 320, and MAT 421.

Typically offered in Spring.

STA 490. Capstone Course in Statistics. 3 Credits.

Course will synthesize lessons learned throughout the students career with the goal of preparing students for work as professional statisticians. Topics will include report writing, presentations, statistical consulting, sampling design, and resume writing.

Typically offered in Spring.

Faculty and Staff
25 University Avenue (UNA)

Department Chair

Glidden, Peter, Ph.D., Columbia University
Mathematics Education

UNA 101A 610-436-2440
pglidden@wcupa.edu

Assistant Department Chair

Kolpas, Allison, Ph.D., University of California, Santa Barbara
Applied Mathematics

UNA 106 610-436-4964
akolpas@wcupa.edu

Department Secretary

Suzanne Loeffler

UNA 101 610-436-2440
sloeffler@wcupa.edu

**Tenured & Tenure-Track Faculty
2016-2017**

Andreas Aristotelous, Ph.D., University of Tennessee
Applied and Computational Mathematics

UNA 115 610-436-3495
aaristotelous@wcupa.edu

Bowen, Brian, Ph.D., University of Delaware
Mathematics Education

UNA 108 610-436-2351
bbowen@wcupa.edu

Crossett, Andrew, Ph.D., Carnegie Mellon University
Applied Statistics

UNA 111 610-436-2613
acrossett@wcupa.edu

Fisher, Michael, Ph.D., Lehigh University
Graph Theory & Combinatorics

UNA 123 610-430-4196
mfisher@wcupa.edu

Gallitano, Gail, Ed. D., Columbia University
Mathematics Education

UNA 114 610-436-2452
ggallitano@wcupa.edu

Gallop, Robert, Ph.D., Drexel University
Applied Statistics, Biostatistics

UNA 180 610-436-2419
rgallop@wcupa.edu

Gupta, Shiv, Ph.D., Case Western Reserve University
Algebra (Group Theory, Number Theory)

UNA 112 610-436-3459
sgupta@wcupa.edu

Ilaria, Daniel R., Ph.D., Rutgers University
Mathematics Education

UNA 108 610-436-3248
dilaria@wcupa.edu

Johnson, Kim, Ph.D., Penn State University
Mathematics Education

UNA 118 610-436-3249
kjohnson2@wcupa.edu

Johnston, Clifford, Ph.D., Temple University Partial Differential Equations, Stochastic Processes	UNA 173 610-738-0432 cjohnston@wcupa.edu
Junius, Premalatha, Ph.D., University of Northern Colorado Applied Mathematics	UNA 106 610-436-2199 pjunius@wcupa.edu
Kump, Joann, M.A.T., Mathematics Statistics	UNA 118 610-436-2632 jkump@wcupa.edu
Li, Chuan, Ph.D., University of Tennessee Applied Mathematics	UNA 115 610-436-1081 cli@wcupa.edu
Marano, Lisa, Ph.D., Lehigh University Stochastic Processes & Financial Mathematics	UNA 173A 610-436-0585 lmarano@wcupa.edu
McAneny, Kathleen (Taffy), Ph.D., University of Delaware Mathematics Education	UNA 107 610-436-1078 kmcaneny@wcupa.edu
McClintock, Scott, Ph.D., University of Kentucky Statistics	UNA 121 610-436-4963 smcclintock@wcupa.edu
McKibben, Mark, Ph.D., Ohio University Differential Equations, Stochastic Analysis	UNA 113 610-436-2148 mmckibben@wcupa.edu
McLaughlin, James, Ph.D., University of Illinois Number Theory, Special Functions	UNA 179 610-436-4417 jmclaughlin@wcupa.edu
Miller, Emily, Ph.D., University of Delaware Mathematics Education	UNA 107 610-436-2436 emiller@wcupa.edu
Nitica, Viorel, Ph.D., Penn State University Dynamical Systems, Operator Algebras, Discrete Mathematics	UNA 172 610-430-4411 vnitica@wcupa.edu
Parsell, Scott, Ph.D., University of Michigan Analytic Number Theory	UNA 175 610-436-3465 sparsell@wcupa.edu
Rieger, Randall, Ph.D., University of North Carolina Applied Statistics, Biostatistics	UNA 116 610-436-2893 rrieger@wcupa.edu
Short, Thomas, Ph.D., Carnegie-Mellon University Applied Statistics	UNA 111 610-436-2369 tshort@wcupa.edu
Sullivan, Rosemary, Ph.D., Lehigh University Geometric Probability Theory	UNA 128 610-430-4418 rsullivan@wcupa.edu

Szymanski, Wacław, Ph.D., D.Sc., Polish Academy of Sciences
Functional Analysis, Operator Theory

UNA 110 610-436-3451
wszymanski@wcupa.edu

Tan, Lin, Ph.D., University of California (Los Angeles)
Algebra (Algebraic Groups, Combinatorics)

UNA 117 610-436-3455
ltan@wcupa.edu

Zimmer, Peter, Ph.D., University of Kansas
Partial Differential Equations, Stochastic Processes

UNA 178 610-436-2696
pzimmer@wcupa.edu



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