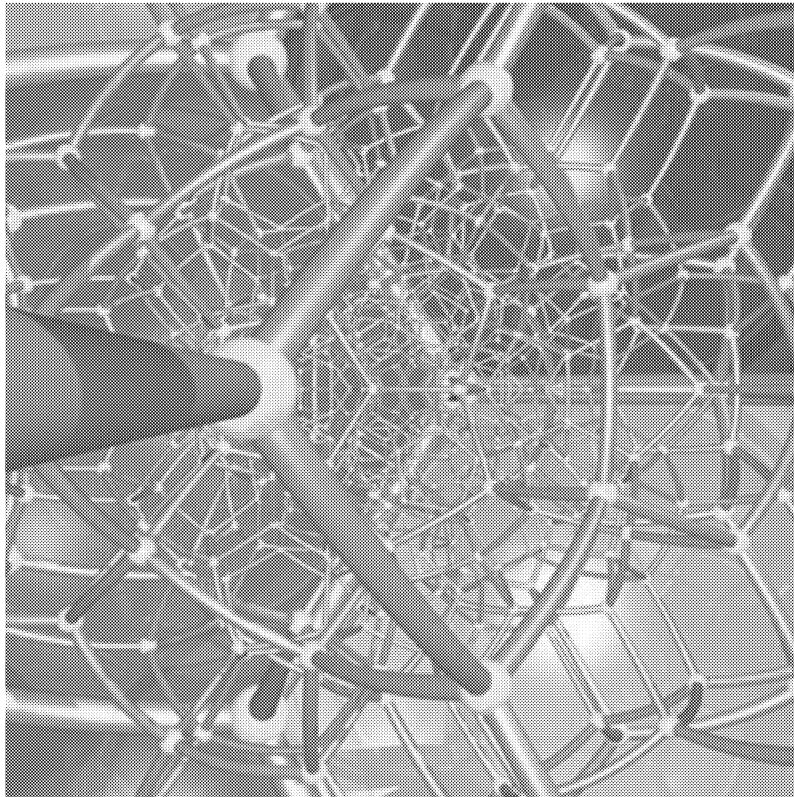# DEPARTMENT OF MATHEMATICS
WEST CHESTER UNIVERSITY

HANDBOOK
FOR
MATHEMATICS MAJORS

2011-2012

On the cover:

The hecatonicosachoron above, also called the "120-cell", is the four-dimensional analogue of the three-dimensional dodecahedron, which has 12 pentagonal faces, 20 vertices and 30 edges. Each of the hecatonicosachoron's 120 "faces" is itself a three-dimensional dodecahedron. Created by Etienne Ghys und Jos Leys, it has 600 vertices and 1200 edges. The images in the exposition show the hecatonicosachoron drawn through stereographic projection from a sphere in four dimensions onto three-dimensional space.

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

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Introduction

Mathematics is one of the oldest of all disciplines and the most fundamental of 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 applications. 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 the fringes of 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 students for them are described later in this *Handbook.*

Mathematics at West Chester University

Our program provides close interaction with 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.

We offer career-oriented programs geared to education, research and academia. The BA program provides the flexibility of a minor program of study in cognate disciplines such as biology, computer science, economics, geology, physics, and psychology. Our program in applied is geared for

students to concentrate in specific career oriented areas such as actuarial science, computer science, statistics, or industrial mathematics. **The BSED degree** (mathematics education) enables a student to pursue a teaching career in the middle and secondary schools. **The BA & BS** programs provide opportunities to obtain a strong theoretical basis in pure mathematics and in the applied areas for those students aiming for graduate school.

Our graduates have realized successful careers in a wide-range of fields such as actuarial science, biostatistics, information technology, university teaching, and as applied mathematicians in business and industry. They have obtained graduate assistantships and fellowships at major universities including the University of California at both Los Angeles and Berkley, the University of Chicago, the University of Pennsylvania, Lehigh University, and the University of North Carolina. Many have obtained the Ph.D. degree.

Quality Teaching

Students pursuing a major or minor in mathematics receive individual attention from our faculty and advanced students. The classes for majors are small, ranging in size from five, sometimes less, to no more than twenty-five. We like to think of ourselves as comprising a friendly, warm, and student-centered department. Students in both upper and lower-division courses receive individual attention and are encouraged to visit their professors outside of class for extra help if needed.

Auxiliary Teaching Support

The department maintains a Student/Tutorial Center (UNA 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 microcomputer networks at numerous locations. These computers can access the on-line catalog of the library and the Internet. A current collection of mathematical, statistical and programming software is available for student use including Mathematica, Maple, MathLab, MiniTab, and SAS. Computational Mathematics Laboratoriesare located in UNA 103 & 109 next to the Student Tutorial Center. Desk-top computers and a large and current software library are available in the Student Tutorial Center.

The department also houses a Seminar Room within the faculty office complex. It provides access to a small library related to the courses students are taking, and is used for faculty/student socials. The popular Wednesday afternoon "teas" for both students and faculty are held in UNA 105.

The Faculty and the Department's Mission

Faculty

Our faculty hold advanced degrees from major universities. Many have gained both national and international recognition in research and teaching. The faculty and how to contact them are listed later in this handbook. Other pertinent information may be found in the Department's Web site math.wcupa.edu.

Mission

The Department's mission statement includes the following goals:

To give students a firm grounding in the ideas and methods of mathematics.

To develop an understanding and appreciation of the abstract and deductive nature of mathematics.

To give students an appreciation of the contemporary as well as the historical importance of mathematics

To provide students with sufficient skills to enable them to apply their knowledge to related fields of study

To prepare students for continued study in graduate school, a career as a middle or secondary school teacher of mathematics, for a career as an actuary, statistician, or an industrial mathematician

Careers in the Mathematical Sciences

A graduate who holds a bachelor's degree in mathematics can pursue entry-level positions leading to highly paid positions in business, industry, government, and teaching.

Companies in the computer and telecommunications industries employ students with a strong background in mathematics, as do energy producing companies, financial organizations, insurance companies, and consulting firms.

Many branches of the local, state, and federal governments employ mathematicians working under various job titles such as cryptanalyst, statistician, operation researcher, and actuary.

Career Choices

Statistician

The Random House Dictionary of the English Language (the unabridged edition) defines statistics as "A science that deals with the collection, analysis, and interpretation of numerical facts or data and

that, by the use of mathematical theories of probability, imposes order and regularity on aggregates of more or less disparate elements". Statisticians apply their mathematical knowledge to the design of surveys and experiments. They collect, process, 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.

Operations Research Analyst

Operations research (OR) 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 braking of enemy code. Following the war, numerous peacetime applications emerged placing OR 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 OR analysts address questions related to strategy, forecasting, resource allocation, facilities layout, inventory control, personnel allocation, and delivery or distribution systems.

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 causality 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.

Mathematics Teacher

University and college 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 tenured-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.

In addition to fulfilling the requirements for admission to the teacher education program and completing the professional education component of the program offered by the School of Education, students are required to complete two mathematics education courses offered by the Department of Mathematics. These courses emphasize teaching methods and provide on site observations of the middle or secondary school classrooms.

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.

Degree Programs

The Department of Mathematics offers programs leading to the Bachelor of Arts degree in Mathematics (B. A.), Bachelor of Science in Education (B. S. Ed.), and Bachelor of Science in Applied Mathematics (B. S.). MA in Mathematics and MS in Applied Statistics.

- The BA in Mathematics enables each student, through selection of a minor or area of concentration, to prepare for many careers including college professor, actuary, statistician, or as a mathematician in industry or government.

- The BSED in Mathematics features a strong program in mathematics while the student earns state certification to teach mathematics in the middle, junior high or senior high levels.

- The BS in Applied Mathematics degree provides students with a wide choice of career oriented programs by allowing the declaration of a concentration in 5 areas of applied mathematics; Mathematical Finance, Actuarial Science, Industrial Mathematics, Computational Mathematics and Statistics. The program is designed to position its graduates for a career in applied mathematics.

BA in Mathematics

In the first two years, mathematics majors are given a solid foundation in mathematics through courses that capture their interest and encourage them to continue in the mathematics program. The calculus is the introductory course for mathematics majors. 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.

Core Requirements

Lower division courses in mathematics.

MAT 161 Calculus I (4)
MAT 162 Calculus II (4)
MAT 200 Nature of Mathematics (2)
MAT 311 Linear Algebra (3)
MAT 261 Calculus III (3)

Upper division courses in mathematics.

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

Program Requirements

Upper division electives in mathematics are to be taken so that:
- Each student takes one course from a list of courses in analysis,
- Each student takes one course from a list of courses in applied mathematics,
- Each student takes one course from a list of courses in algebra, and
- Each student takes an additional 9 credits of electives in upper division mathematics courses.

Cognate Requirements

PHY 170 Physics I (4)
PHY 180 Physics II (4)
CSC 141 Introduction to Computer Science (3)

Foreign Language Requirement

The equivalent of completing the second half of the intermediate year of an approved foreign language; Russian, French and German (without the culture cluster option) is required.

<u>Requirement of a Minor</u>

Students completing the BA degree are required to complete either a minor or,
with the prior approval of the student's advisor and the Mathematics Department Chairperson, an
additional nine (9) credit hours of upper division mathematics. The discipline chosen for the minor
will reflect the post-baccalaureate goals of the student. The Department recommends fulfilling this
requirement by completing one of the tracks within the department or by completing a minor in the
natural sciences (Astronomy, Biology, Chemistry, Earth Sciences, Geology, and Physics), Computer
Science, Economics, or Finance. Other minors or concentration may be selected with the approval
of the student's advisor and the Mathematics Department Chairperson. When departmental
approvals are necessary, documentation will be kept in the student's advising folder

Bachelor of Arts in Mathematics
Sample Four Year Program
2115/2121

FIRST SEMESTER

MAT 161 Calculus I	4
WRT 120 Effective Writing I	3
Arts Elective	3
Humanities Elective	3
SPK 208 or SPK 230	3
Total s.h.	16

SECOND SEMESTER

MAT 162 Calculus II	4
CSC 141 Intro Comp Sci	3
WRT200* Creative Writing	3
Mat 200 Nature of Math	2
Humanities Elective	3
Total s.h.	15

THIRD SEMESTER

MAT 261 Calculus III	3
MAT 311 Linear Algebra	3
PHY 170 Physics I	4
Foreign Language (201)	3
Social Science Elective .	3
Total s.h.	16

FOURTH SEMESTER

MAT 411 Algebra I	3
PHY 180 Physics II	4
Foreign Language (202)	3
MAT 441 Adv Calc I	3
Social Science Elective	3
Total s.h.	16

FIFTH SEMESTER

Mathematics Elective	3
MAT 421 Math Stat I	3
Minor Requirement	3
Diverse Communities Elective	3
Total s.h.	12

SIXTH SEMESTER

Algebra Elective	3
Applied Math Elective	3
Analysis Elective	3
Minor Requirement	3
Minor Requirement	3
Total s.h.	15

SEVENTH SEMESTER

Mathematics Elective	3
Mathematics Elective	3
Student Elective (Gen Ed)**	3
Student Elective (Gen Ed)	3
Interdisciplinary Elective	3
Total s.h.	15

EIGHTH SEMESTER

Minor Requirement	3
Minor Requirement	3
Student Elective (Gen Ed)	3
Minor requirement	3
Mathematics Elective	3
Total s.h.	15
Total Program s.h.	120

NOTES:
1. PHY 170 and CSC 141 may be used to fulfill the 6 s.h science distributive requirement.
2. Three writing-emphasis 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.

*Any of the following may be substituted: WRT 204,205,206,208,220 see page on General Education Writing: WRT Courses for course descriptions.
** Mat121 Statistics I is strongly recommended.

BSED in Mathematics*

The program is divided into a lower division curriculum and an upper division curriculum. The lower division part of the program provides students with a solid foundation in mathematics through courses intended to capture the students' interest and encourage continued study in the mathematics program. The calculus is the introductory course for mathematics majors. The upper division part of the program provides mathematics majors with an introduction to the fundamental concepts underlying secondary school level mathematics as well as training in methods of secondary school level mathematics education. The program requires two courses at an advanced level in each of the areas of algebra, analysis, and applied mathematics, as well as two courses in mathematics education methods.

Core Requirements

Lower division courses in mathematics.

> MAT 161 Calculus I (4)
> MAT 162 Calculus II (4)
> MAT 200 (2) Nature of Mathematics
> MAT 311 Linear Algebra (3)
> MAT 331 Geometry (3)
> MAT 261 Calculus III (3)

Upper division courses in mathematics

> MAT 401 History of Mathematics (3)
> MAT 411 Algebra I (3)
> MAT 414 Number Theory (3)
> MAT 421 Mathematical Statistics I (3)
> MAT 441 Advanced Calculus I (3)

Core Electives

Upper division electives in mathematics are to be taken so that:

- Each student takes one course from a list of courses in analysis
- Each student takes one course from a list of courses in applied mathematics, and one other math elective

Cognate Requirements

- PHY 170 Physics I (4)
- PHY 180 Physics II (4)
- CSC 141 Introduction to Computer Science (3)
- PSY 100 Introduction to Psychology (3)

Mathematics Education Requirements

- MAT 350 Foundation of Mathematics Education (3)
- MAT 354 Techniques of Teaching Secondary Mathematics (3)

Required Education Courses

HIS 444	EDA 103
EDA 303	EDP 359
LAN/ENG 382	EDS 306
EDR 347	

Placement of Electives in Groups

Algebra	Analysis	Applied Mathematics
MAT412 Algebra II MAT 413 Computer Algebra MAT 414 Number Theory	MAT 343 Differential Equations** MAT 432 Topology MAT 442 Advanced. Calculus II MAT 443 Applied Analysis I MAT 444 Applied Analysis II MAT 445 Complex Variables. MAT 362 – Calculus IV	MAT 325 Computational Math MAT 343 Differential Equations** MAT 345 Applied Probability MAT 403 Fundamentals of Actuarial Science MAT 409 Financial Calculus MAT 422 Mathematical Statistics II MAT 425 Numerical Analysis. MAT 427 Optimization MAT 493 Modeling MAT 319 Applied Stat MAT 406 Math of Finance

MAT 343 **can not be credited to both areas.

Other Upper-Division Electives:

MAT 321 Combinatorics
MAT 405 Topics
MAT 490 Seminar

*Recent guideline changes from the Pennsylvania Department of Education will soon lead to new program requirements in secondary education 7-12 programs in English, Mathematics, Social Studies, and the Sciences (Biology, Chemistry, Earth Science, Physics). Teacher education faculty from WCU are working to address the new guidelines through new or amended program requirements. The new requirements apply to certification students entering these programs in fall 2011 and will be published in a forthcoming addendum.

Bachelor of Science in Education, Mathematics
Sample Four Year Program
2115/2121

FIRST SEMESTER			SECOND SEMESTER	
MAT 121-Statistics	3		MAT 162 Calculus II	4
MAT 161 Calculus I	4		MAT 200 Nature of Math	2
SPK 208 or 230	3		WRT 200 Critical Writing*	3
WRT120 Effective Writing	3		Gen Ed Behavioral /Soc Sci	3
PSY 100[2]	3		CSC 141[2]	3
Total s.h.	16		Total s.h.	15

THIRD SEMESTER			FOURTH SEMESTER	
MAT 261 Calculus III	3		MAT 331 Geometry	3
MAT 311 Linear Algebra	3		MAT 441 Adv. Calculus	3
PHY 170 Physics I[2]	4		PHY 180 Physics II[1]	4
EDA 103	3		Humanities elective (LIT/CLS)[5+2]	3
Humanities elective (HIS 444)[2]	3		EDP 359	3 I
Total s.h.	16		Total s.h.	16

FIFTH SEMESTER			SIXTH SEMESTER	
MAT 411 Algebra I	3		Applied Mathematics Elective	3
MAT 401 History of Math	3W		MAT 414 Number Theory	3
MAT 350 Found of Math Ed	3		MAT 354 Tech Tchg Sec Math	3 W
EDA 303	3		LAN/ENG 382	3 J
Gen Ed Elective	3		EDS 306	3 W
Total s.h.	15		Total s.h.	15

SEVENTH SEMESTER			EIGHTH SEMESTER	
MAT 421 Math. Statistics	3		EDS 411/412 Student Teaching	12
Analysis Elective	3			
EDR 347	3 J			
Gen Ed Arts	3		Total s.h.	12
Math Elective	3			
Total s.h.	15		Program Total s.h.	120

NOTES:
1. PHY 180 fulfills 3 s.h of the 9 s.h. of gen. ed. electives
2. PHY 170, and CSC 141 fulfill the science distributive requirement; PSY 100 fulfills 3 s.h. of the social science distributive requirement; HIS 444 fulfills 3s. h. of the humanities distributive requirement. LIT 165 meets a W requirement.
3. Each student must take at least three approved writing-emphasis courses at West Chester University. Transfer students entering with 40-70 credits must take two writing emphasis courses and those entering with more than 70 credits must take one.
4. **W** indicates a course that may be used to fulfill the writing emphasis requirement.
5. Formal Admission requires a 3 credit literature course. (LIT or CLS prefix)
*Any of the following may be substituted: WRT 204,205,206,208,220 see page 31 for course descriptions

→ **PRAXIS Mathematics sub-scores must be submitted by the student as a required part of the graduation clearance process.**

2115 B.S.ED. SECONDARY MATHEMATICS TEACHING MAJOR – 122 CREDITS

Name:	Date Major Declared:

Praxis PPST Series Tests: 10710-Reading, 10730-Math, 20720-Writing (Sophomore Year, Required for Formal Admission):

Date of Formal Admission to Teacher Education Program (after 48 credits of study and 2.8/3.0 GPA*):

Praxis 10061-Mathematics Content Knowledge Test (Must take prior to student teaching and earn passing score to graduate):

	CREDITS	COURSE	SEMESTER	GRADE	REP/W**
GENERAL EDUCATION REQUIREMENTS (48 LESS 21 ATTRIBUTED TO MAJOR REQUIREMENTS = 27 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 (EDP 359 below)	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 165 W)	3				
ARTS (ART CINEMATOGRAPHY MUSIC PHOTOGRAPHY THEATRE)	3				
GENERAL EDUCATION ELECTIVE (LAN/ ENG 382 below)	3				
GENERAL EDUCATION ELECTIVE	3				
GENERAL EDUCATION ELECTIVE	3				
WRITING INTENSIVE COURSES: EDS 306, MAT 354, MAT 401					
EDUCATION REQUIREMENTS (35 CREDITS)					
HIS 444 History of Education	3				
EDA 103 Foundations of Special Education	3				
EDA 303 Special Education Process & Procedures	2				
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 359 Assessment for Learning – Mathematics "I"	3				
EDS 306 Princ Tch & Field Exp in Sec School "W"	3				
MAT 350 Foundations of Mathematics Education	3				
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				

MATHEMATICS COURSES (49 CREDITS)					
MAT 121 Statistics I	3				
MAT 161 Calculus I	4				
MAT 162 Calculus II	4				
MAT 200 Nature of Mathematics	2				
MAT 261 Calculus III	3				
MAT 311 Linear Algebra	3				
MAT 331 Geometry	3				
MAT 401 History of Mathematics "W"	3				
MAT 441 Advanced Calculus	3				
MAT 411 Algebra I	3				
MAT 421 Mathematical Statistics I	3				
MAT 414 Number Theory	3				
MAT 354 Secondary Mathematics Methods "W"	3				
Applied Mathematics Elective	3				
Analysis Elective	3				
Mathematic Elective	3				

*Students applying to Teacher Education must have 2.8 GPA (starting 9-1-02). Students formally admitted to Teacher Education starting 9-1-03 must graduate with 3.0 GPA.

REQUIREMENTS FOR FORMAL ADMISSION TO TEACHER EDUCATION

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 350/354. The following are the requirements for formal admission.

> 48 earned credits
> A 2.8 cumulative GPA
> A passing grade in all three PPSTs (Reading, Math, Writing)
> 6 earned credits in college level mathematics
> 3 earned credits in college level English
> 3 earned credits in English Literature
> Approval of the Department of Mathematics and CoE.

Candidates for teacher certification must meet all other requirements of the Pennsylvania Department of Education for certification including a grade of at least C in both halves of student teaching and a final overall cumulative GPA of 3.0.

Clearances Required Prior to Participating in Early Field Experiences

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

> a) The Pennsylvania State Police Criminal Record Check
> b) The Pennsylvania Child Abuse Clearance, and
> c) Verification of a negative reading on a TB test

Forms for these clearances are available in the Teacher Education Center (251 FGH Library)

BS in Mathematics

Students enrolled in this program are required to declare a concentration. Current concentrations include Actuarial Science, Statistics, Mathematics of Finance, Industrial Mathematics, and Computational Mathematics. The concentration must be selected no later than the second semester of the sophomore year. Students generally spend most of the first two years taking core requirements common to all concentrations or certain prerequisites. Mathematics and cognates (courses in fields closely related to mathematics) required for a specific concentration are normally taken during the final two years of the program. The mathematics courses are aimed at linking the course content to applications in the real world. Cognates are aimed at demonstrating the pervasiveness and importance of mathematics in other applied-oriented disciplines.

Core Requirements for all Concentrations - 25 credits

Lower division courses in mathematics

       MAT 161 Calculus I (4)
       MAT 162 Calculus II (4)
       MAT 200 Nature of Mathematics (2)
       MAT 261 Calculus III (3)
       MAT 311 Linear Algebra (3)
       MAT 319 Applied Statistics (3)
       MAT 343 Differential Equations (3)
       MAT 362 Calculus IV (3)

Upper division courses in mathematics

       Depending on concentration, an additional 12 – 18 credits of upper division mathematics courses are required.

Finance	**Actuarial**	**Industrial**	**Computational**	**Statistics**
MAT 421	MAT 421	MAT 445	MAT 413	MAT 421
MAT 409	MAT 422	MAT 425	MAT 425	MAT 422
MAT 406	STA 311	MAT Elective	MAT 325	STA 311
MAT Elective	MAT 406	MAT Elective	MAT Elective	MAT 345
	MAT 345			
	MAT 403			

Program Requirements

Before the end of the second year, students must declare a concentration in one of the following areas: Mathematical Finance, Actuarial Science, Statistics, Computational Mathematics, and Industrial Mathematics.

Cognate Requirements

Depending on concentration, an additional 12 – 25 credits of courses in closely related fields are required. Please see sample four-year plans for each concentration for specific courses.

FIRST SEMESTER		SECOND SEMESTER	
MAT 161 Calculus I	4	MAT 162 Calculus II	4
WRT 120 Effective Writing I	3	MAT 200 Nature of Mathematics	2
ECO 111 Principles of Economics I	3	WRT 200 Intermediate Comp*	3
Humanities elective	3	Diverse Communities Course	3
Student Elective (Gen Ed)	3	Arts elective	3
Total semester hours	16	Total semester hours	15

THIRD SEMESTER		FOURTH SEMESTER	
MAT 261 Calculus III	3	MAT 319 Applied Statistics	3
MAT 311 Linear Algebra	3	MAT 343 Differential Equations	3
PHY 170 Physics I	4	Interdisciplinary Course	3
SPK 230 Bus & Prof Speech	3	CSC 141 Computer Science I	3
Humanities elective	3	Student Elective (Gen Ed)	3
Total semester hours	16	Total semester hours	15

FIFTH SEMESTER		SIXTH SEMESTER	
MAT 362 Calculus IV	3	MAT 409 Financial Calculus+	3
MAT 421 Mathematical Statistics I	3	FIN 325 Corporate Finance	3
ECO 112 Principles of Economics II	3	Free elective	3
ENG 371 ^{W} Technical Writing **	3	Free elective	3
ACC 201 Financial Accounting I	3	Student Elective (Gen Ed)	3
Total semester hours	15	Total semester hours	15

SEVENTH SEMESTER		EIGHTH SEMESTER	
MAT 406 Mathematics of Finance+	3	MAT Elective	3
FIN Elective	3	Behavioral/Social Science elective	3
Free elective	3	Free elective	3
Free elective	3	Free elective	3
Internship/Independent study	4		
Total semester hours	16	Total semester hours	12

Total Program semester hours   120

NOTES:
1. MAT 261, a **three** credit course, is used to fulfill **three** credits of the General Education Mathematics requirement.
2. PHY 170, a **four** credit course, and CSC141, a **three** credit course, are used to fulfill **six** credits of the General Education Science requirement.
3. ECO111, a **three** credit course, is used to fulfill **three** credits of the General Education Social and Behavioral Science requirement.
4. Three writing-emphasis courses are required. At least one 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.

*Any of the following may be substituted: WRT 204,205,206,208,220 see page 31 for course descriptions
** Any of the following may be substituted: ENG 368, 371, or 375. + Refer to page 24 to determine when this course will be offered.

Bachelor of Science in Applied Mathematics, Actuarial Science Concentration
Sample Four Year Program, 2115/2121

FIRST SEMESTER		SECOND SEMESTER	
MAT 161 Calculus I	4	MAT 162 Calculus II	4
WRT 120 Effective Writing I	3	MAT 200 Nature of Mathematics	2
ECO 111 Principles of Economics I	3	WRT 200 Intermediate Comp*	3
Humanities elective	3	Diverse Communities Course	3
Student Elective (Gen Ed)	3	Arts elective	3
Total semester hours	16	Total semester hours	15

THIRD SEMESTER		FOURTH SEMESTER	
MAT 261 Calculus III	3	MAT 319 Applied Statistics	3
MAT 311 Linear Algebra	3	MAT 343 Differential Equations	3
SPK 230 Bus & Prof Speech	3	Interdisciplinary Course	3
Science elective	3	Science elective	3
Student Elective (Gen Ed)	3	Student Elective (Gen Ed)	3
Total semester hours	15	Total semester hours	15

FIFTH SEMESTER		SIXTH SEMESTER	
MAT 362 Calculus IV	3	STA 311 Statistical Computing	3
MAT 421 Mathematical Statistics I	3	MAT 422 Mathematical Statistics II	3
ECO 112 Principles of Economics II	3	ECO 340 Intermediate Micro	3
ENG 371 ^{W} Technical Writing**	3	FIN 325 Corporate Finance	3
ACC 201 Financial Accounting I	3	Free elective	3
Total semester hours	15	Total semester hours	15

SEVENTH SEMESTER		EIGHTH SEMESTER	
MAT 406 Mathematics of Finance+	3	MAT 403 Fund. of Actuary Science+	3
MAT 345 Applied Probability +	3	FIN 330 Principles Of Insurance	3
Humanities elective	3	Behavioral/Social Science elective	3
Free elective	3	Free elective	3
Internship/Independent study	2	Free elective	3
Total semester hours	14	Total semester hours	15

Total Program semester hours   120

NOTES:
1. MAT 261, a **three** credit course, is used to fulfill **three** credits of the General Education Mathematics requirement.
2. ECO111, a **three** credit course, is used to fulfill **three** credits of the General Education Social and Behavioral Science requirement.
3. Three writing-emphasis courses are required. At least one 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.

*Any of the following may be substituted: WRT 204,205,206,208,220 see page 31 for course descriptions
** Any of the following may be substituted: ENG 368, 371, or 375.
+ Refer to page 24 to determine when this course will be offered.

Bachelor of Science in Applied Mathematics, Industrial Mathematics Concentration
Sample Four Year Program, 2115/2121

FIRST SEMESTER

MAT 161 Calculus I	4
WRT 120 Effective Writing I	3
SPK 230 Bus & Prof Speech	3
Humanities elective	3
Student Elective (Gen Ed)	3
Total semester hours	**16**

SECOND SEMESTER

MAT 162 Calculus II	4
MAT 200 Nature of Mathematics	2
WRT 200 Intermediate Comp*	3
Diverse Communities Course	3
Arts elective	3
Total semester hours	**15**

THIRD SEMESTER

MAT 261 Calculus III	3
MAT 311 Linear Algebra	3
CSC 141 Computer Science I	3
Interdisciplinary Course	3
Student Elective (Gen Ed)	3
Total semester hours	**15**

FOURTH SEMESTER

MAT 343 Differential Equations	3
MAT 319 Applied Statistics	3
PHY 170 Physics I	4
Behavioral/Social Science elective	3
Humanities elective	3
Total semester hours	**16**

FIFTH SEMESTER

MAT 362 Calculus IV	3
PHY 240 Intro. to Modern Physics	3
PHY 180 Physics II	4
Free elective	3
Free elective	3
Total semester hours	**16**

SIXTH SEMESTER

MAT 445 Complex Variables+	3
MAT Elective	3
ENG 371^W Technical Writing**	3
Free elective	3
Behavioral/Social Science elective	3
Total semester hours	**15**

SEVENTH SEMESTER

MAT 425 Numerical Analysis+	3
PHY 300 Mechanics	3
Free elective	3
Free elective	3
Student Elective (Gen Ed)	3
Total semester hours	**15**

EIGHTH SEMESTER

MAT Elective	3
PHY 350 Heat and Thermo.	3
Free elective	3
Internship/Independent study	3
Total semester hours	**12**

Total Program semester hours   120

NOTES:
1. MAT 261, a **three** credit course, is used to fulfill **three** credits of the General Education Mathematics requirement.
2. PHY 170, a **four** credit course, and CSC141, a **three** credit course, are used to fulfill **six** credits of the General Education Science requirement.
3. Three writing-emphasis courses are required. At least one 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.

*Any of the following may be substituted: WRT 204,205,206,208,220 see page 31 for course descriptions
** Any of the following may be substituted: ENG 368, 371, or 375.
+ Refer to page 24 to determine when this course will be offered.

Bachelor of Science in Applied Mathematics, Computational Mathematics Concentration
Sample Four Year Program, 2115/2121

FIRST SEMESTER		SECOND SEMESTER	
MAT 161 Calculus I	4	MAT 162 Calculus II	4
WRT 120 Effective Writing I	3	MAT 200 Nature of Mathematics	2
SPK 230 Bus & Prof Speech	3	WRT 200 Intermediate Comp*	3
Humanities elective	3	Diverse Communities Course	3
Student Elective (Gen Ed)	3	Arts elective	3
Total semester hours	16	Total semester hours	15

THIRD SEMESTER		FOURTH SEMESTER	
MAT 151 Discrete Mathematics	3	MAT 319 Applied Statistics	3
MAT 261 Calculus III	3	MAT 343 Differential Equations	3
MAT 311 Linear Algebra	3	CSC 141 Computer Science I	3
Humanities elective	3	Interdisciplinary Course	3
Behavioral/Social Science elective	3	Behavioral/Social Science elective	3
Total semester hours	15	Total semester hours	15

FIFTH SEMESTER		SIXTH SEMESTER	
MAT 362 Calculus IV	3	ENG 371^{W} Technical Writing**	3
MAT 413 Computer Algebra+	3	MAT Elective	3
CSC 142 Computer Science II	3	CSC 240 Computer Science III	3
Free elective	3	Free elective	3
Student Elective (Gen Ed)	3	Science elective	3
Total semester hours	15	Total semester hours	15

SEVENTH SEMESTER		EIGHTH SEMESTER	
MAT 425 Numerical Analysis+	3	MAT 325 Computational Math.+	3
CSC 241 Data Structures	3	CSC 242 Computer Organization	3
Free elective	3	Free elective	3
Free elective	3	Free elective	3
Internship/Independent study	2	Student Elective (Gen Ed)	3
Total semester hours	14	Total semester hours	15

Total Program semester hours   120

NOTES:
1. MAT 261, a **three** credit course, is used to fulfill **three** credits of the General Education Mathematics requirement.
2. CSC141, a **three** credit course, is used to fulfill **three** credits of the General Education Science requirement.
3. Three writing-emphasis courses are required. At least one 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.

*Any of the following may be substituted: WRT 204,205,206,208,220 see page 31 for course descriptions
** Any of the following may be substituted: ENG 368, 371, or 375.
+ Refer to page 24 to determine when this course will be offered.

Bachelor of Science in Applied Mathematics, Statistics Concentration
Sample Four Year Program, 2115/2121

FIRST SEMESTER

MAT 161 Calculus I	4
WRT 120 Effective Writing I	3
MAT 121 Statistics I	3
Humanities elective	3
Student Elective (Gen Ed)	3
Total semester hours	16

SECOND SEMESTER

MAT 162 Calculus II	4
MAT 200 Nature of Mathematics	2
WRT 200 Intermediate Comp*	3
Diverse Communities Course	3
Arts elective	3
Total semester hours	15

THIRD SEMESTER

Interdisciplinary Course	3
MAT 261 Calculus III	3
MAT 311 Linear Algebra	3
Humanities elective	3
Behavioral/Social Science elective	3
Total semester hours	15

FOURTH SEMESTER

MAT 319 Applied Statistics	3
MAT 343 Differential Equations	3
SPK 230 Bus & Prof Speech	3
Science elective	3
Free elective (department approval)	3
Total semester hours	15

FIFTH SEMESTER

MAT 421 Mathematical Statistics I	3
ENG 371 ^{W} Technical Writing**	3
Free elective	3
Related Cognate Elective	3
Science elective	3
Total semester hours	15

SIXTH SEMESTER

MAT 422 Mathematical Statistics II	3
Related Cognate Elective	3
Behavioral/Social Science elective	3
Free elective	3
Free elective	3
Total semester hours	15

SEVENTH SEMESTER

MAT 362 Calculus IV	3
Related Cognate Elective	3
Free elective	3
Internship/Independent study	2
Student Elective (Gen Ed)	3
Total semester hours	14

EIGHTH SEMESTER

STA 311 Statistical Computing	3
MAT 345 Applied Probability+	3
Free elective	3
Free elective	3
Student Elective (Gen Ed)	3
Total semester hours	15

Total Program semester hours   120

NOTES:
1. MAT 261, a **three** credit course, is used to fulfill **three** credits of the General Education Mathematics requirement.
2. Three writing-emphasis courses are required. At least one 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

*Any of the following may be substituted: WRT 204,205,206,208,220 see page 31 for course descriptions
** Any of the following may be substituted: ENG 368, 371, or 375.
+ Refer to page 24 to determine when this course will be offered.

Minor Programs of Study in the Department of Mathematics

- **Minor in Mathematics:**

Baccalaureate students may receive transcript recognition for a minor area of study in mathematics by completing four required courses and two electives selected from the approved list.

Required Courses MAT 161, 162, 311, and 261	14 semester hours
Approved Electives	6 semester hours

Any two 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.

- **Minor in Elementary School Mathematics (K-8)**

Required Courses

MAT 101, 102, 121, 312, 313, 351, 352

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.

Financial Aid and Scholarship Opportunities

The purpose of the financial aid program at West Chester University is to provide financial assistance and counseling. Financial Aid is a supplement to a family's contribution and is to be used to help meet the tuition costs.

Since West Chester University is a state-owned institution, tuition and fees are reasonable when compared to those of privately owned institutions. Through grants and scholarships, student employment opportunities, or loans, students may be able to secure monies to defray their educational expenses. West Chester University's Financial Aid Office offers a publication titles "Financing Youth Education – Financial Aid and Scholarship Opportunities for First Year and Transfer Students". Questions concerning financial aid may be directed to the Office of Financial Aid, 138 Elsie O. Bull Center, West Chester University, West Chester, PA 19383, 610-436-2627. Office hours are from 8 a.m. to 4:30 p.m., Monday through Friday.

General Education Program

Academic Foundations (18 s.h.)

WRT 2 __ __   _____   WRT 2 __ __   _____

MAT 261 _____   SPK __ __ __   _____

Diverse Communities Elective   __EDA/EDR 41   (For B.S. Ed students)__
Interdisciplinary Elective   __EDF 300 (For B.S. Ed students)__

Distributive Requirements (21 s.h.)

    Science (6 s.h)

        CSC141 and PHY170 fulfill this requirement

    Behavioral and Social Sciences (6 s.h.) Select a course from two different areas.

        Anthropology: ANT102 or ANT103
        Psychology: PSY 100
        Sociology: SOC200 or SOC240
        Economics: EC0101, ECO111, or ECO112
        Geography: GEO101 , GEO103, GEO204, SSC 200
        Government: PSC100, PSC101, PSC213

    Humanities (6 s. h.)

        Literature: LIT165, CLS165, CLS260, CLS261
        History: HIS101, HIS102, HIS150, HIS151, or HIS152, AMS 200
        Philosophy: PHI101 or PHI180

The Arts (3 .s.h.) Any course in the following areas. Art, cinematography, dance, music, photography or theatre

    ___ ___ ___   _____

Student Electives: (9 s. h.)

    ___ ___ ____   _____
    ___ ___ ___   _____
    ___ ___ ___   _____

Three credits of Phy180 may be used to satisfy this requirement.

Writing Emphasis Courses (9 s. h.) Three courses at least one at the 300 or 400 level

    ___ ___ ___   _____

    ___ ___ ___   _____

    ___ ___ ___   _____

Transfer students who enter with 40 – 70 credits must take two writing emphasis course. Those with more than 70 need take only one.

Calendars of Course Offerings

Course will generally be offered according to the following schedule:

Every Semester:

MAT 161, 162, 200, 261

Every Fall Semester:

MAT 311, MAT 350, MAT 362, MAT 401, MAT 411 & MAT 421

Every Spring Semester:

MAT 122, MAT 319, MAT 331, MAT 343, MAT 414, MAT 354, MAT 412, MAT 422, MAT 441, STA311

Alternate Fall Semesters:

MAT 406 (odd years), MAT 413 (even years), MAT 425 or MAT 427(even years), MAT 443(odd), MAT 445 (even).

Alternate Spring Semesters:

MAT 325 (odd years), MAT 345 (odd years), MAT 403 (even years), MAT 409 (odd years),

Summers

MAT 414 (even years), MAT 445 (odd years)

Advice for Planning Your Program

- **You and Your Advisor**

Prior to your first semester as a major in Mathematics, you will be assigned an advisor from among the Department Faculty. You should make an appointment to meet with your advisor by contacting the Department secretary Barbara Maleno (610-436-2440 or email bmaleno@wcupa.edu). Your advisor serves as mentor, interpreting University policy, explaining the nature of mathematics courses (both required and elective) and, most importantly, being that mentor to whom you can turn for help and advice.

Your advisor can help you plan your program of study including the selection of a minor or area of concentration. Your advisor can also help you plan your entire program to help assure that you can complete your program in the timeframe that you had anticipated. You also need to schedule an appointment with your advisor to obtain clearance to access self scheduling (Student View), to review your tentative schedule, and to update your departmental journal. It is important that you maintain periodic contact with your advisor to help monitor your academic progress and help assure that your graduation time-table is on target.

- **Scheduling**

The scheduling of classes for a given semester takes place typically during the middle of the preceding semester. Students schedule classes, using computers located in convenient locations throughout the campus. Available classes for a given semester, their meeting times and locations are accessed through the computer's "Student View" Program. Your advisor will provide you with a "Sample four year program" which maps out a suggested arrangement for your eight semesters at West Chester University. You are responsible for scheduling classes for each semester with the advice and consent of your advisor.

- **Planning Toward Graduation**

As you approach your junior year, it is important that you and your advisor project your last four semesters of classes, making sure that you meet all requirements for graduation. In particular, you will want to be sure that you attain three "writing emphasis: courses and one "interdisciplinary" course and one "diverse communities" course before graduation, as well as the prescribed "general education" requirements. Your advisor can be quite helpful in defining the nature of certain electives in mathematics that are available during a given semester. While you are responsible to see that all graduation requirements are met, your advisor can be a valuable resource.

Courses Recommended for Graduate Study

The following set of courses are recommended for students intending to enter a graduate program

In pure or applied mathematics:.

MAT 421 Mathematical Statistics I
MAT 343 Differential Equations
MAT 414 Number Theory
MAT 422 Mathematical Statistics II
MAT 412 Algebra II
MAT 432 Topology
MAT 442 Advanced Calculus II (or Mat444 Applied Analysis II)
MAT 445 Complex Variables

Recommended Computer Science Courses

Mathematics majors are generally encouraged to take course in computer science in addition to CSC141 (required of all majors). The following courses are recommended.

CSC142 Computer Science II
CSC240   Computer Science III
CSC241   Data Structures
CSC321   Database Management Systems

Mathematics Placement

Initial Placement

Students with a math SAT less than 590 are initially placed in MAT 110 – Pre Calculus and those whose score is equal to or above 590 are initially placed in MAT 161 – Calculus I.

Advanced Placement

Students who have had calculus in high school may want to take the Advanced Placement Exam of the College Entrance Examination Board. There are two exams: the AB test and the BC test. The latter covers more material. Exam is scored o, 1, 2, 3, 4, or 5. The Department's policy for granting of credit is as follows.

Course credit for success on AP exams in mathematics is awarded according to
the following chart.

AP Test	Score on AP Test		
	3	4	5
Calculus AB	MAT108	MAT161	MAT161
Calculus BC	MAT161	MAT162	MAT162
Statistics	MAT121	MAT121	MAT121

Special Courses of Study

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 can not 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 Department's secretary.

Individualized Study

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 Department's secretary.

The Evaluation of Majors

- **Admission**

New students (first year and transfers) are admitted as mathematics major by the Office of Admissions.

Admission as a mathematics major for students from other departments (internal transfers) is upon the approval of the chairperson of the Department of Mathematics. A grade of at least a C must be attained in Mat161 and all other course taken in the Mathematics Department is required for admission.

Retention

The student must meet the University's policy on retention given in the Undergraduate Catalog.

Mathematics majors must earn a grade of C or higher in a course that is a prerequisite for another. Otherwise the student will not be permitted to register for the course that requires the prerequisite.

The grades of all mathematics majors will be reviewed at the close of each academic year. Students who have not maintained at least a C average in their mathematics courses will be notified. Ensuing notifications may result in the student being terminated as mathematics major.

Repeats (University Policy covering undergraduate college-level courses)

- Students may repeat undergraduate college-level courses to improve a grade of F,D,C, or B .

- No student may use the repeat option more than five times TOTAL. For example, this means repeating five *DIFFERENT* courses once each, or repeating each of two different courses twice (four repeats) and one additional course once.

- A single course may not be repeated more than twice

- A replacement for the grade in the first attempt occurs automatically at the completion of the second attempt of a repeated course. This constitutes one of the five available repeats.

- The first time a student completes a course for a grade it is considered the first attempt. The second time a student completes a course for a grade it is considered the second attempt and the first repeat. The third time a student completes a course for a grade it is considered the third attempt and the second repeat. The most recent grade (regardless of whether it is higher or lower) will be used for the GPA calculation. Students who complete a course with a fourth attempt or more are in violation of the Repeat Policy and will not earn credit.

- When a student completes a third attempt of a course, the grades for the second and third attempts will be used to calculate the cumulative grade point average.

- Students may repeat undergraduate college-level courses to improve a grade of F, D, C, or B. Students will NOT be permitted to repeat courses for credit beyond five repeats, or beyond two repeats for a single course.

- **Completion of the Major**

Students must fulfill the University's requirements for graduation as given in the undergraduate catalog.
Students in the BSED program must attain at least a C in MAT350 and a grade of at least a C in all course prerequisites for MAT350 prior to being permitted to student teach.

Special Student Support Programs

- **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 instructors course syllabus.

Also available to mathematics students is free tutoring by members of the Anderson Mathematics Club. The tutors are juniors 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 through out the mathematics building

- **Computer Consulting**

The Mathematics Department has 2 computer labs, UNA 103 & UNA 109. These computers have all of the mathematics software needed for classes. Mathematics majors can obtain access to these labs Monday through Friday 7 a.m.-10 p.m. Weekend access will be granted 9 a.m.to 11 p.m. by providing your ID# with the department secretary.

Anderson Mathematics Club

The Anderson 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 like: Speakers on careers in mathematics, an open forum with current students teachers, visits to schools or to regional mathematics or mathematics education activities, the annual Thanksgiving Dinner which Anderson Mathematics Club students host and prepare a turkey dinner for current and retired mathematics and mathematics education faculty.

Mathematics Honor Society

Students with an outstanding average in their mathematics courses may be invited to join our honor society. Pi Mu Epsilon specifics can be found on the Honor Society Bulletin Board near the Mathematics Office on the first floor of 25 University Avenue.

- **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.

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, students, and their parents.

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

Department Socials

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.

RESEARCH WRITING COURSES:
general education writing course options

WRT 200: Critical Writing and Research (formerly WRT121)
Read about, discuss and research academic, personal, and social purposes of "research." Design, conduct and write individual and collaborative research projects.

WRT204: Critical Writing: Approaches to Popular Culture
Read about, discuss and research how music, movies and advertising influence our values and attitudes.   Write about these forms of "pop culture."

WRT205: Critical Writing: Investigating Experience
Read about, discuss and research how people analyze their own and others' past and present experiences. Write about individual experiences and their social components.

WRT206: Critical Writing: The Multidisciplinary Imagination
Read about, discuss and research how people get ideas in various fields of knowledge and professions. Write about theories of creativity and consider how imagination contributes to success in your personal, academic, and professional lives.

WRT208: Critical Writing: Entering the Public Sphere
Read about, discuss and research how publishing happens in newspapers, magazines, web pages and other venues. Write about public issues (such as current political events) and publish your own writing in a class-produced newsletter.

WRT220: Critical Writing: Special Topics

Special theme designed by the instructor—see course catalogue for details each semester. Spring 2004 topics include:
- Writing on Sports
  Read about, discuss and research the culture of sports and its role in society. Choose your own sports-related topic on which to write.
- Writing about the Apocalypse
  Read about, discuss and research the religious and cultural importance of St. John's Book of Revelation. Write about how the concept of the Apocalypse influences various positions on weapons of mass destruction, terrorism, and various political perspectives.

Students and advisors: ALL of the courses listed are designed to:
- improve students' abilities to conduct academic research and produce college-level research-based writing;
- follow WRT 120;
- fulfill the requirement for the second of the two general education composition courses (previously, 121/200 was required—these courses teach equivalent skills);
- allow students to choose a course based on personal or professional interests.

A student who places into and passes WRT200 or above is not required to take WRT120. Entering freshmen with an SAT Verbal score below 500 are placed in ENG 020. Those with Sat Verbal above 500 and below 610 must take WRT120. Those with a score of 610 or above are not required to take WRT120 but must take one of the following WRT200, 204,205,206,208, or 220.

PUBLIC SPEAKING – Students and Advisors

There seems to be a misunderstanding about students receiving credit for SPK199. Please note if a student has been awarded with SPK199 credit this does indeed fulfill their general education communications requirement. Therefore there are three designations that will fulfill and complete the general education communication requirement.

SPK208 – Public Speaking
SPK230 - Business & Professional Speech Communication and
SPK199 – Transfer Credit

SPK199 courses do map into a student's degree progress report indicating they have completed the communications requirement.

Catalog Descriptions of Mathematics Courses

MAT 000 Fundamentals of Algebra   (3 s.h.)

A preparatory course to remediate basic algebraic skills. Students scoring between 440-480 on the mathematics section of the Scholastic Aptitude Test (SAT) and who do not pass the mathematics placement test are required to take this course prior to any other mathematics course. Credits earned in 000-level courses do not count towards the 120 hours of credit needed for graduation. The course must be passed with a grade of C- or better.

MAT 001 Fundamental Skills in Arithmetic   (3 s.h.)

A course designed to remediate basic arithmetic skills and to introduce elementary algebra. In general, students placed in **MAT 001** have scored below 440 on the math SAT. Students are being prepared to take Fundamentals of Algebra (**MAT 000**) and must earn at least a C- to enroll in that course. A student in **MAT 001** does not earn credit toward graduation for this course. Elementary and special education majors in need of algebraic and/or arithmetic remediation must enroll in **MAT 001** and successfully pass with a grade of C- or better before being permitted to enroll in MAT 101.

MAT 101 Mathematics for Teachers of Children I   (3 s.h.)

Prerequisite: Math SAT greater than 480 or above or successful completion of MAT001

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.

MAT 102 Mathematics for Teachers of Children II   (3 s.h.)

Prerequisite: MAT 101

Development of real numbers; geometry; measurement; probability and statistics; problem solving. For students seeking Certification in Grades PK-4 or 4-8 only. PREREQ: MAT 101

MAT 103 Introduction to Mathematics   (3 s.h.)

Prerequisite: MATH SAT 480 or above or successful completion of MAT 000

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.

MAT 104 Introduction to Applied Mathematics   (3 s.h.)

Prerequisite: MATH SAT 480 or above or successful completion of MAT 000

This course is designed to help prepare students to understand almost any quantitative issue 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.

MAT 105 College Algebra and Trigonometry   (3 s.h.)

A unified course in algebra and trigonometry.

MAT 107 College Algebra   (3 s.h.)

Prerequisite: SAT Math score of 480 or above or passing the Department' placement test, or obtaining at least a C- in MAT 000

A thorough treatment of college algebra. Topics covered include the study of polynomial, exponential, and logarithmic functions, plus systems of linear equations..

MAT 108 Brief Calculus   (3 s.h.)

Prerequisite: C or better in MAT105, MAT107, MAT110, or a Math SAT score of 590 or above

An intuitive approach to the calculus of one and several variables with emphasis on conceptual understanding and practical application,

MAT 110 Precalculus   (3 s.h.)

Prerequisite: a passing grade on the Department's placement exam

A preparation for MAT 161, Calculus I. Topics include polynomial and rational functions, algebra of functions, graphs of functions, transcendental functions, trigonometry, series, induction, and complex numbers.

MAT 121 Statistics I   (3 s.h.)

Prerequisite: Math SAT of 480 or above or successful completion of MAT 000.

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

MTL 121 Statistics Lab I   (1 s.h.)

Prerequisite or Corequisite MAT 121

Introduces the student to using and programming the computer to solve statistical problems and to aid the student in understanding statistical concepts.

MAT 122 Statistics II   (3 s.h.)

Prerequisite: MAT121

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

MAT 151 Introduction to Discrete Mathematics   (3 s.h.)

Prerequisite: Math SAT of 480 or above or successful completion of MAT 000.

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

MAT 161 Calculus I (4 s.h.)

Prerequisite: C or better in Mat 110 or Math SAT score of 590 or better or successfully pass challenge exam or C or better in 202.

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

MAT 162 Calculus II (4 s.h.)

Prerequisite: MAT 161 with a grade of C or better.

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

MAT 200: The Nature of Mathematics (2 s.h.)

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.

Prerequisite: Mat161

Course should be taken by the end of the sophomore year and passed with a grade of at least a C before enrolling in higher-level mathematics course.

MAT 202: Elementary Functions and Essential Calculus I (3 s.h.)

PREREQ: MAT 102

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.

MAT 203: Elementary Functions and Essential Calculus II (3s.h.)

PREREQ: MAT 202

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

MAT 221 Applied Statistics (3 s.h.)

Prerequisite: CSC 141 (or equivalent) and MAT 162 (or equivalent).

Probabilities, discrete and continuous probability distributions, methods of estimation, and hypothesis testing.

MAT 261 Calculus III   **(3 s.h.)**

Prerequisite: C or better in MAT 162

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.

MAT 301: The Scientific Revolution   **(3 s.h.)**

This course addresses how modern science began in the seventeenth century. It includes introductions to the heroes of science – Copernicus, Kepler, Galileo and Newton. By examining its origins in the seventeenth century, the course addresses the nature of modern science.

This course counts toward both the Interdisciplinary (I) and Writing Emphasis (W) requirements.

MAT 302:   Mathematics and Social Justice   (3 s.h.)

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

MAT 309 Topics in Mathematics for the Elementary Teacher (3 s.h.)

Prerequisite: MAT 102

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 metric system with practice in the classroom. Additional topics in applied mathematics will be considered.

MAT 311 Linear Algebra   **(3 s.h.)**

Prerequisite: Concurrent or prerequisite Mat 162

An introduction to linear algebra. Topics covered include matrices, systems of linear equations, vector spaces, linear transformation, determinants, eigenvalues, spectral theorem, and triangulation.

MAT 312 Algebra for Teachers-Grades 4-8   (3 s.h)

Prerequisite: MAT 102

Formal structure of groups, rings, and fields with examples from the elementary curriculum. Topics from linear algebra including matrices, determinants, and linear programming.

MAT 313 Geometry for Teachers – Grades 4-8   (3 s.h.)

Prerequisite: MAT 102

Modern informal approach to two- and three-dimensional geometric figures, measurement, similarity, congruence, coordinate geometry, and the postulational method.

MAT 319 Applied Statistics   (3 s.h.)

Prerequisite: Mat 261 or concurrently

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.

MAT 321 Combinatorics and Graph Theory   (3 s.h)

Prerequisite: C or better is 162

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.

MAT 325 Computational Mathematics   (3 s.h.)

Prerequisite: C or better is 162

This course is designed to introduce the student 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, application of techniques from numerical analysis to data driven problems, and the use of computers in solution techniques.
Prerequisite: C or better in MAT 162

Mat 330 Using Technology in Teaching Elementary School Mathematics (3 s.h.)

PREREQ: MAT 101 and 102

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

MAT 331 Foundations of Geometry   (3 s.h.)

Prerequisite: C or above in MAT 162

Geometric foundations from an advanced viewpoint. Topics are chosen from euclidean and noneuclidean geometries.

MAT 332 Differential Geometry   (3 s.h.)

Prerequisite: C or better in MAT 261 & Mat 311

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

MAT 343 Differential Equations   (3 s.h)

Prerequisite: C or better in Mat 162, prerequisite or concurrent Mat 311

The general theory of nth 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.

MAT 345 Applied Probability (3 s.h.)

Prerequisites: C or better in MAT 261

Upon completion of this course, a student should know the standard concepts and methods of stochastic modeling. In addition, the student should have a better understanding of the applications of stochastic processes to other disciplines, including biology, management, social sciences and statistics.

MAT 349 Teaching Mathematics in Early Childhood (3 s.h)

Prerequisite: MAT 101

Concepts, learning aids, syllabi, texts, and methods in early childhood mathematical teaching.

MAT 350 Foundations of Mathematics Education (3 s.h.)

Prerequisite: C or better MAT 261

Historical overview of mathematics education with emphasis on influential curricular programs, implications of learning theory, significance of research, identification of current issues, organizational alternatives for the classroom, and evaluation resources..

MAT 351 Methods for Teaching Children Mathematics I (3 s.h)

Prerequisite: MAT 101 and MAT102

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

MAT 352 Methods for Teaching Children Mathematics II (3 s.h.)

Prerequisite: MAT 351

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.

MAT 354 Techniques of Teaching Secondary School Mathematics (3 s.h.)

Prerequisite: MAT 350

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

MAT 357 Teaching to Diverse Learners (3 s.h.)

Prerequisite: MAT 102

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.

MAT 362 Calculus IV   (3 s.h.)

Prerequisite: C or better in MAT 261 & 311

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.

MAT 381 Discrete Mathematics   (4 s.h.)

Prerequisite: C or better in Mat 162

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, modeling, cardinality, recursions, induction, graphs, and algebra.

**MAT 390 Seminar in Mathematics Education   (3 s.h.)

Prerequisite: Formal admission to teacher education.

This course is the capstone course for Grade 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 experiences may be required.   PREREQ

MAT 400 History of Mathematics for Elementary Teachers   (3 s.h.)

Prerequisite: MAT 312 and MAT 313

History and development of elementary mathematics from primitive times to the discovery of calculus. Problems of the period are considered.
Development of mathematics from the Babylonian era to the 18th century. Some modern topics included

MAT 401 History of Mathematics   (3 s.h.)

Prerequisite: C or better in Mat 261

Development of mathematics from the Babylonian era to the 18th century. Some Modern topics included.

MAT 403 Fundamentals of Actuarial Science   (3 s.h.)

Prerequisite: C or better in MAT 261

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.

**MAT 405 Special Topics in Mathematics   (3 s.h.)

   Prerequisite: Consent of Department Chairman

   Topics and prerequisites announced at the time of offering.

MAT 406 Mathematics of Finance   (3 s.h.)

   Prerequisite: C or better in MAT 261

   Students completing this course will understand the mathematical theory of interest in a
   deterministic setting. They will become familiar with compound interest and the time
   value of money and learn how the two are used to compute the present value of future
   payments. Students will be able to calculate both the present and accumulated values of
   annuities and the price of bonds. They will be able to determine yield rates on
   investments and the time required to accumulate a given amount or repay a given loan
   amount. In addition, they should be able to apply interest theory to amortization of lump
   sums, fixed income securities, depreciation, mortgages, etc.

MAT 409 Financial Calculus   (3 s.h.)

   Prerequisite: C or better in MAT 261

   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 pricing more complicated derivatives, such as call options
   on dividend-paying securities and exotic options.

MAT 411-412 Algebra I-II   (3 s.h.) (3 s.h.)

   Prerequisite: C or better in Mat 261 & 311.

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

MAT 413 Computer Algebra   (3 s.h.)

   Prerequisite: C or better in MAT 162 and MAT 311.

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

MAT 414 Theory of Numbers   (3 s.h.)

   Prerequisite: C or better in MAT 261

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

MAT 421-422 Mathematical Statistics I-II   (3 s.h), (3 s.h)

   Prerequisite: C or better in MAT 261. MAT 421 must precede 422.

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.

MAT 425 Numerical Analysis   (3 s.h.)

Prerequisite: C or better in CSC 141, Mat 343 and MAT 261

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

MAT 427 Introduction to Optimization Techniques   (3 s.h.)

Prerequisite: C or better in MAT 261 and 311.

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.

MAT 432 Topology   (3 s.h.)

Prerequisite: C or better in Mat 261

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

MAT 441-442 Advanced Calculus I-II   (3 s.h) (3 s.h)

Prerequisite: MAT 261. MAT 441 must precede 442.

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

MAT 443-444 Applied Analysis I-II   (3 s.h) (3 s.h.)

Prerequisite: C or better in MAT 261 and 311, MAT 443 must precede 444

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

MAT 445 Complex Variables   (3 s.h.)

Prerequisite: C or better in MAT 261

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

**MAT 490 Seminar in Mathematics   (3 s.h.)

Prerequisite: Senior standing and consent of Department Chairperson.

Topics in mathematics selected for their significance and student/instructor interest. Independent study and student reports, oral and written.

** May be taken again for credit.

MAT 493 Mathematical Modeling   **(3 s.h.)**

     Prerequisite: C or better in MAT 261 and MAT 343.

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

MAT 499 Independent Study   **(1-3 s.h.)

     Prerequisite: Written Permission of the instructor

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

** May be taken again for credit

STA 311 Introduction to Statistical Computing and Data Management

     Prerequisite: C or better in Ma 121 or 421   **(3 s.h.)**

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

Faculty and Staff

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