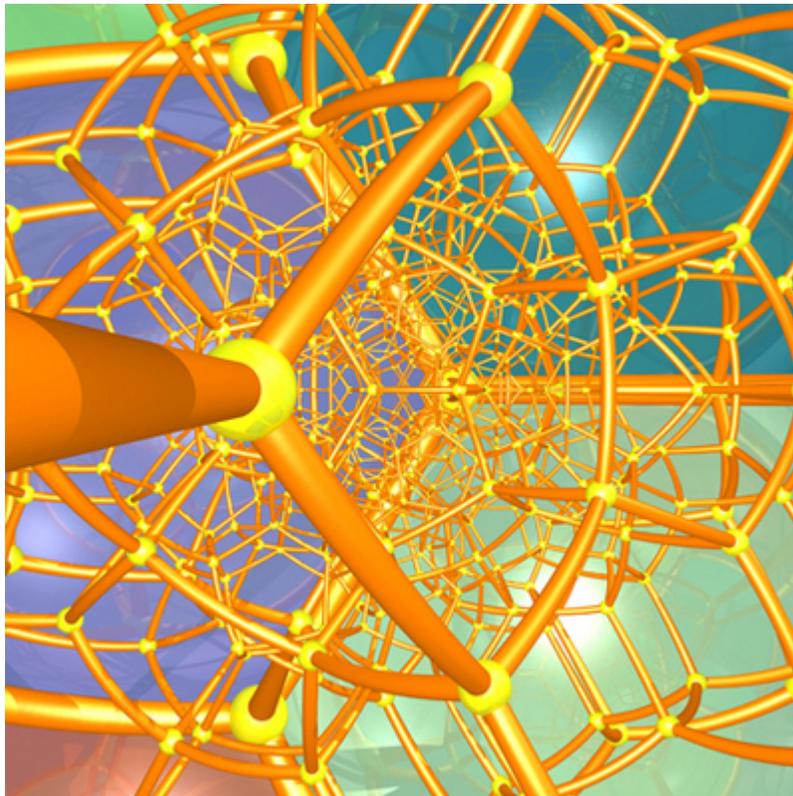


DEPARTMENT OF  
MATHEMATICS  
WEST CHESTER UNIVERSITY

HANDBOOK  
FOR  
MATHEMATICS MAJORS



2012-2013

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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## TABLE OF CONTENTS

	<b>Page</b>
Introduction	5
Mathematics at West Chester University	5
Quality Teaching	6
Auxiliary Teaching Support	6
Technical and Related Support	6
The Faculty and the Department's Mission	7
Careers in the Mathematical Sciences	7-9
Degree Programs	9
BA Mathematics	10-12
BS in Education – Mathematics	13-16
BS Mathematics	17-22
Minor Programs of Study in the Department of Mathematics	23
Financial Aid and Scholarship Opportunities	23
General Education Requirements	24
Calendar of Course Offerings	25
Placement of Electives in Groups	26
Advice for Planning Your Program	27
Courses Recommended for Graduate Study	28
Recommended Computer Science Courses	28
Mathematics Placement	28
Advanced Placement	28-29
Independent Study and Individualized Instruction	29
Evaluation of Majors	29
Repeat Policy	30
Completion of the Major	30
Special Student Support Programs	31
The Department's Scholarships/Awards Program	32
Departmental Socials	32
General Education Writing Courses	33
Public Speaking	34
Descriptions of Mathematics Courses	35-44
Faculty and Staff	45-46

## 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 mathematics 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 to no more than thirty. 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, MATLAB, MiniTab, and SAS. Computational Mathematics Laboratories are located in UNA 103 & 109 next to the Student Tutorial Center. Desktop computers and a large and current software library are available in the Student Tutorial Center.

The department also 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 on the Department's Web site [math.wcupa.edu](http://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, or 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, operations 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, 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.

### **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 breaking 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 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.

## **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 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.

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 (BA), Bachelor of Science in Education (BSED), Bachelor of Science in Applied Mathematics (BS), Master of Arts in Mathematics (MA) and Master of Science in Applied Statistics (MS).

- 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 one of 5 areas of applied mathematics: Mathematical Finance, Actuarial Science, Industrial Mathematics, Computational Mathematics, or 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 The Nature of Mathematics (2)  
MAT 261 Calculus III (3)  
MAT 311 Linear Algebra (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 12 credits of electives in upper division mathematics courses.

### Cognate Requirements

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

### Foreign Language Requirement

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 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 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 concentrations 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  
2125/2131**

**FIRST SEMESTER**

MAT 161 Calculus I	4
WRT 120 Effective Writing I	3
SPK 208 or SPK 230	3
Student Elective (Gen Ed)*	3
Humanities Elective	3

Total s.h. 16

**SECOND SEMESTER**

MAT 162 Calculus II	4
MAT 200 Nature of Math	2
CSC 141 Computer Science I	3
WRT 200** Creative Writing	3
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 441 Adv Calc I	3
PHY 180 Physics II	4
Foreign Language (202)	3
Minor Requirement	3
Social Science Elective	3

Total s.h. 16

**FIFTH SEMESTER**

MAT 411 Algebra I	3
MAT 421 Math Stat I	3
Mathematics Elective	3
Diverse Communities Elective	3 J

Total s.h. 12

**SIXTH SEMESTER**

Algebra Elective	3
Mathematics Elective	3
Mathematics Elective	3
Minor Requirement	3
Minor Requirement	3

Total s.h. 15

**SEVENTH SEMESTER**

Analysis Elective	3
Mathematics Elective	3
Minor Requirement	3
Interdisciplinary Elective	3 I
Student Elective (Gen Ed)	3

Total s.h. 15

**EIGHTH SEMESTER**

Applied Math Elective	3
Minor Requirement	3
Minor Requirement	3
Arts Elective	3
Student Elective (Gen Ed)	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 (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.
3. MAT 401 may be used as a math elective and a W course.
4. LIT 165 may be used as both a humanities elective and a W course.
5. WOS 225 may be used as either an I or a J course (not both) and a W course.

\* MAT 121 Statistics I is strongly recommended.

\*\*Any of the following may be substituted: WRT 204,205,206,208,220; see page 33 on General Education Writing: WRT Courses for course descriptions.

## **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 The Nature of Mathematics (2)
- MAT 261 Calculus III (3)
- MAT 311 Linear Algebra (3)
- MAT 331 Foundations of Geometry (3)

Upper division courses in mathematics.

- MAT 401 History of Mathematics (3)
- MAT 411 Algebra I (3)
- MAT 414 Theory of Numbers (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 Computer Science I (3)
- PSY 100 Introduction to Psychology (3)

### Mathematics Education Requirements

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

### Required Education Courses

HIS 444, EDA 103, EDA 303, EDP 359, LAN/ENG 382, EDS 306, EDR 347, EDS 411, EDS 412

**Bachelor of Science in Education, Mathematics  
Sample Four Year Program  
2125/2131**

**FIRST SEMESTER**

MAT 121 Statistics	3
MAT 161 Calculus I	4
SPK 208 or 230	3
WRT120 Effective Writing	3
PSY 100 <sup>2</sup> Intro Psych	3

Total s.h. 16

**SECOND SEMESTER**

MAT 162 Calculus II	4
MAT 200 Nature of Math	2
WRT 200 Critical Writing*	3
Gen Ed Behavioral /Soc Sci	3
CSC 141 <sup>2</sup> Computer Science I	3

Total s.h. 15

**THIRD SEMESTER**

MAT 261 Calculus III	3
MAT 311 Linear Algebra	3
PHY 170 Physics I <sup>2</sup>	4
EDA 103	3
Humanities elective (HIS 444) <sup>2</sup>	3

Total s.h. 16

**FOURTH SEMESTER**

MAT 331 Geometry	3
MAT 441 Adv. Calculus I	3
PHY 180 Physics II <sup>1</sup>	4
Humanities elective (LIT/CLS) <sup>5+23</sup>	
EDP 359	3

Total s.h. 16

**FIFTH SEMESTER**

MAT 350 Found of Math Ed	3
MAT 401 History of Math	3 <b>W</b>
MAT 411 Algebra I	3
EDA 303	2
Interdisciplinary Elective	3 <b>I</b>
Gen Ed Elective	3

Total s.h. 17

**SIXTH SEMESTER**

MAT 354 Tech Tchng Sec Math	3 <b>W</b>
MAT 414 Number Theory	3
Applied Mathematics Elective	3
LAN/ENG 382	3 <b>J</b>
EDS 306	3 <b>W</b>

Total s.h. 15

**SEVENTH SEMESTER**

MAT 421 Math. Statistics I	3
Analysis Elective	3
EDR 347	3
Gen Ed Arts	3
Math Elective	3

Total s.h. 15

**EIGHTH SEMESTER**

EDS 411/412 Student Teaching	12
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Total s.h. 12

Program Total s.h. 122

**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 3 s.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, including at least one at the 300 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.
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 33 for course descriptions

**2125 B.S.ED. SECONDARY MATHEMATICS TEACHING MAJOR – 122 CREDITS**

<b>Name:</b>		<b>Date Major Declared:</b>			
PAPA Series Tests: Reading, Math, 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):					
	<b>CREDITS</b>	<b>COURSE</b>	<b>SEMESTER</b>	<b>GRADE</b>	<b>REP/W*</b>
<b>GENERAL EDUCATION REQUIREMENTS (48 LESS 18 ATTRIBUTED TO MAJOR REQUIREMENTS = 27 CREDITS)</b>					
<b>WRT 120</b>	3				
<b>WRT 200, 204, 205, 206, 208, or 220</b>	3				
<b>MATHEMATICS (3 CREDITS OF MAT 161 below)</b>	3				
<b>SPK 208 OR 230</b>	3				
<b>DIVERSE COMMUNITIES “J” COURSE (LAN/ ENG 382 below)</b>	3				
<b>SCIENCE (3 CREDITS OF PHY 170 below)</b>	3				
<b>SCIENCE (CSC 141 below)</b>	3				
<b>BEHAVIOR &amp; SOCIAL SCI PSY 100</b>	3				
<b>BEHAVIOR &amp; SOCIAL SCI (ANT, SOC, ECO, GEO, OR PSC)</b>	3				
<b>HUMANITIES (HIS 444 below)</b>	3				
<b>HUMANITIES (LIT 165 W)</b>	3				
<b>ARTS (ART CINEMATOGRAPHY MUSIC PHOTOGRAPHY THEATRE)</b>	3				
<b>GENERAL EDUCATION ELECTIVE (LAN/ ENG 382 below)</b>	3				
<b>INTERDISCIPLINARY “T” COURSE</b>	3				
<b>GENERAL EDUCATION ELECTIVE</b>	3				
<b>WRITING INTENSIVE COURSES: EDS 306, MAT 354, MAT 401</b>					
<b>EDUCATION REQUIREMENTS (35 CREDITS)</b>					
HIS 444 History of American 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	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				
<b>COGNATE REQUIREMENTS (11 CREDITS)</b>					
PHY 170 Physics I	4				
PHY 180 Physics II	4				
CSC 141 Computer Science I	3				

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

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

## 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 PAPAs (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 FHG 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.

<u>Finance</u>	<u>Actuarial</u>	<u>Industrial</u>	<u>Computational</u>	<u>Statistics</u>
MAT 406	MAT 345	MAT 425	MAT 325	MAT 345
MAT 409	MAT 403	MAT 445	MAT 413	MAT 421
MAT 421	MAT 406	MAT Elective*	MAT 425	MAT 422
MAT 345 or 422	MAT 421	MAT Elective*	MAT 427, 443 or 493	STA 311
	MAT 422			
	STA 311			

### 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.

\*Industrial MAT electives to be chosen from among MAT 325, 413, 427, 443, and 493

Bachelor of Science in Applied Mathematics, Mathematical Finance Concentration  
**Sample Four Year Program, 2125/2131**

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
<b>Total semester hours</b>	<b>16</b>	<b>Total semester hours</b>	<b>15</b>

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
<b>Total semester hours</b>	<b>16</b>	<b>Total semester hours</b>	<b>15</b>

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 <sup>W</sup> Technical Writing **	3	Free elective	3
ACC 201 Financial Accounting I	3	Student Elective (Gen Ed)	3
<b>Total semester hours</b>	<b>15</b>	<b>Total semester hours</b>	<b>15</b>

SEVENTH SEMESTER		EIGHTH SEMESTER	
MAT 406 Mathematics of Finance+	3	MAT 345 or MAT 422	3
FIN 337 or FIN 344	3	Behavioral/Social Science elective	3
Free elective	3	Free elective	3
Free elective	3	Free elective	3
Internship/Independent study	4		
<b>Total semester hours</b>	<b>16</b>	<b>Total semester hours</b>	<b>12</b>

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 33 for course descriptions

\*\* Any of the following may be substituted: ENG 368, 371, or 375.

+ Refer to page 25 to determine when this course will be offered.

Bachelor of Science in Applied Mathematics, Actuarial Science Concentration  
**Sample Four Year Program, 2125/2131**

FIRST SEMESTER

MAT 161 Calculus I	4
WRT 120 Effective Writing I	3
ECO 111 Principles of Economics 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

MAT 261 Calculus III	3
MAT 311 Linear Algebra	3
SPK 230 Bus & Prof Speech	3
Science elective	3
Student Elective (Gen Ed)	3

Total semester hours 15

FOURTH SEMESTER

MAT 319 Applied Statistics	3
MAT 343 Differential Equations	3
Interdisciplinary Course	3
Science elective	3
Student Elective (Gen Ed)	3

Total semester hours 15

FIFTH SEMESTER

MAT 362 Calculus IV	3
MAT 421 Mathematical Statistics I	3
ECO 112 Principles of Economics II	3
ENG 371 <sup>W</sup> Technical Writing**	3
ACC 201 Financial Accounting I	3

Total semester hours 15

SIXTH SEMESTER

MAT 345 Applied Probability+	3
MAT 422 Mathematical Statistics II	3
STA 311 Statistical Computing	3
FIN 325 Corporate Finance	3
Free elective	3

Total semester hours 15

SEVENTH SEMESTER

MAT 406 Mathematics of Finance+	3
ECO 340 Intermediate Micro	3
Humanities elective	3
Free elective	3
Internship/Independent study	2

Total semester hours 14

EIGHTH SEMESTER

MAT 403 Fund. of Actuarial Science+	3
FIN 330 Principles of Insurance	3
Behavioral/Social Science elective	3
Free elective	3
Free elective	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. 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 33 for course descriptions

\*\* Any of the following may be substituted: ENG 368, 371, or 375.

+ Refer to page 25 to determine when this course will be offered.

Bachelor of Science in Applied Mathematics, Industrial Mathematics Concentration  
**Sample Four Year Program, 2125/2131**

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
CSC 141 Computer Science I	3
Arts elective	3

Total semester hours 15

THIRD SEMESTER

MAT 261 Calculus III	3
MAT 311 Linear Algebra	3
PHY 170 Physics I	4
Interdisciplinary Course	3
Student Elective (Gen Ed)	3

Total semester hours 16

FOURTH SEMESTER

MAT 343 Differential Equations	3
MAT 319 Applied Statistics	3
PHY 180 Physics II	4
Behavioral/Social Science elective	3
Humanities elective	3

Total semester hours 16

FIFTH SEMESTER

MAT 362 Calculus IV	3
MAT 445 Complex Variables+	3
PHY 300 Mechanics	3
Diverse Communities Course	3
Free elective	3

Total semester hours 15

SIXTH SEMESTER

MAT Elective++	3
PHY 240 Intro to Modern Physics	3
ENG 371 <sup>w</sup> Technical Writing**	3
Free elective	3
Behavioral/Social Science elective	3

Total semester hours 15

SEVENTH SEMESTER

MAT 425 Numerical Analysis+	3
PHY 350 Heat and Thermo	3
MAT Elective++	3
Free elective	3
Student Elective (Gen Ed)	3

Total semester hours 15

EIGHTH SEMESTER

Free elective	3
Free elective	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 33 for course descriptions

\*\* Any of the following may be substituted: ENG 368, 371, or 375.

+ Refer to page 25 to determine when this course will be offered.

++To be chosen from among MAT 325, 413, 427, 443, and 493.

Bachelor of Science in Applied Mathematics, Computational Mathematics Concentration  
**Sample Four Year Program, 2125/2131**

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 151 Discrete Mathematics	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
CSC 141 Computer Science I	3
Interdisciplinary Course	3
Behavioral/Social Science elective	3

Total semester hours 15

FIFTH SEMESTER

MAT 362 Calculus IV	3
MAT 413 Computer Algebra+	3
CSC 142 Computer Science II	3
Free elective	3
Student Elective (Gen Ed)	3

Total semester hours 15

SIXTH SEMESTER

ENG 371 <sup>w</sup> Technical Writing**	3
CSC 240 Computer Science III	3
Free elective	3
Free elective	3
Science elective	3

Total semester hours 15

SEVENTH SEMESTER

MAT 425 Numerical Analysis+	3
MAT 427, 443, or 493+	3
CSC 241 Data Structures	3
Free elective	3
Internship/Independent study	2

Total semester hours 14

EIGHTH SEMESTER

MAT 325 Computational Math+	3
CSC 242 Computer Organization	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. 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 33 for course descriptions

\*\* Any of the following may be substituted: ENG 368, 371, or 375.

+ Refer to page 25 to determine when this course will be offered.

Bachelor of Science in Applied Mathematics, Statistics Concentration  
**Sample Four Year Program, 2125/2131**

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

MAT 261 Calculus III	3
MAT 311 Linear Algebra	3
Interdisciplinary Course	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 <sup>W</sup> 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 33 for course descriptions

\*\* Any of the following may be substituted: ENG 368, 371, or 375.

+ Refer to page 25 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, 261, and 311	14 semester hours
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Approved Electives	6 semester hours
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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 titled "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, 25 University Avenue, Suite #030, 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 1 \_\_\_\_\_ WRT 2 \_\_\_\_\_

MAT 261 \_\_\_\_\_ SPK \_\_\_\_\_

Diverse Communities Elective LAN/ENG 382 (For B.S. Ed students)

Interdisciplinary Elective \_\_\_\_\_

## Distributive Requirements (21 s.h.)

**Science (6 s.h.)** Select a course from **TWO DIFFERENT AREAS.**

CSC 141 and PHY 170 fulfill this requirement

**Behavioral and Social Sciences (6 s.h.)** Select a course from **TWO DIFFERENT AREAS.**

Anthropology: ANT 102 or ANT 103

Psychology: PSY 100

Sociology: SOC 200 or SOC 240

Economics: ECO 101, ECO 111, or ECO112

Geography: GEO 101 , GEO 103, GEO 204, SSC 200

Government: PSC 100, PSC 101, PSC 213

**Humanities (6 s. h.)** Select a course from **TWO DIFFERENT AREAS.**

Literature: LIT 165, CLS 165, CLS 260, CLS 261

History: HIS 101, HIS 102, HIS 150, HIS 151, or HIS 152, AMS 200

Philosophy: PHI 101 or PHI 180

**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 PHY 180 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 courses. Those with more than 70 need take only one. **In all cases, at least one course at the 300 or 400 level must be taken at WCU.**

## Calendars of Course Offerings

Courses will generally be offered according to the following schedule:

### **Every Semester:**

MAT 121, MAT 161, MAT 162, MAT 200, MAT 261, MAT 311, MAT 343, MAT 350, MAT 354, MAT 401, MAT 441

### **Every Fall Semester:**

MAT 362, MAT 411, MAT 421

### **Every Spring Semester:**

MAT 122, MAT 319, MAT 331, MAT 412, MAT 414, MAT 422, STA 311

### **Alternate Fall Semesters:**

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

### **Alternate Spring Semesters:**

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

### **Summers :**

MAT 414 (even years)

### **As needed (subject to demand):**

MAT 321, MAT 332, MAT 381, MAT 405, MAT 432, MAT 442, MAT 444, MAT 493

## Placement of Electives in Groups

Algebra	Analysis	Applied Mathematics
MAT 412 Algebra II MAT 413 Computer Algebra MAT 414 Number Theory	MAT 343 Differential Equations** MAT 362 Calculus IV MAT 432 Topology MAT 442 Advanced Calculus II MAT 443 Applied Analysis I MAT 444 Applied Analysis II MAT 445 Complex Variables	MAT 319 Applied Statistics MAT 325 Computational Math MAT 343 Differential Equations** MAT 345 Applied Probability MAT 403 Fundamentals of Actuarial Science MAT 406 Math of Finance MAT 409 Financial Calculus MAT 422 Mathematical Statistics II MAT 425 Numerical Analysis MAT 427 Optimization MAT 493 Modeling

\*\*MAT 343 **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 (W)  
MAT 405 Special Topics in Mathematics  
MAT 490 Seminar in Mathematics

## **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](mailto: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 typically takes place during the middle of the preceding semester. Students schedule classes online at [mywcu.edu](http://mywcu.edu), 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, 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 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 majors are generally encouraged to take courses in computer science in addition to CSC 141 (required of all majors). The following courses are recommended.

CSC 142 Computer Science II  
CSC 240 Computer Science III  
CSC 241 Data Structures  
CSC 321 Database Management Systems

### **Mathematics Placement**

#### **Initial Placement**

Students with a math SAT less than 590 are initially placed in MAT 110 – Precalculus, 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 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	MAT 108	MAT 161	MAT 161
Calculus BC	MAT 161	MAT 162	MAT 162
Statistics	MAT 121	MAT 121	MAT 121

### **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 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 Department's secretary.

#### **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 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 in MAT 161 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 is considered the first attempt. The second time a student completes a course for a grade is considered the second attempt and the first repeat. The third time a student completes a course for a grade 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.

### **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 MAT 350 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 instructor's course syllabus.

Also available to mathematics students is free tutoring by members of the Anderson Mathematics Club. The tutors 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

### **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 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 Anderson Mathematics Club students 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 WRT 200 or above is not required to take WRT 120. 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 WRT 120. Those with a score of 610 or above are not required to take WRT 120 but must take one of the following WRT 200, 204, 205, 206, 208, or 220.

## **PUBLIC SPEAKING – Students and Advisors**

There seems to be a misunderstanding about students receiving credit for SPK 199. Please note if a student has been awarded with SPK 199 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.

SPK 208 – Public Speaking

SPK 230 - Business & Professional Speech Communication and

**SPK 199** – Transfer Credit

SPK 199 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 MAT 001

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.

### **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 MAT 105, MAT 107, MAT 110, 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.

**MAT 122 Statistics II (3 s.h.)**

Prerequisite: MAT 121

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 MAT 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.)**

Prerequisite: MAT 161

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.

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 courses.

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

Prerequisite: 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 (3 s.h.)**

Prerequisite: MAT 202

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

**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 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: MAT 162 (or concurrently)

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 in 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 in 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 in MAT 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 in MAT 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.)**

Prerequisite: MAT 101 and MAT 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 350 Foundations of Mathematics Education (3 s.h.)**

Prerequisite: C or better in 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 MAT 102

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 362 Calculus IV (3 s.h.)**

Prerequisite: C or better in MAT 261 & MAT 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.

**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 18<sup>th</sup> century. Some Modern topics included.

This course counts towards the Writing Emphasis (W) requirement.

**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 Chairperson

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 & MAT 311. MAT 411 must precede MAT 412.

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 MAT 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 261 and MAT 343

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: C or better in MAT 261. MAT 441 must precede MAT 442.

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

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

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

**\*\*MAT 491 Internship in Applied Mathematics (2-4 s.h.)**

Prerequisite: 3.0 GPA in major and related cognate courses.

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

**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.

**STA 311 Introduction to Statistical Computing and Data Management**

Prerequisite: C or better in MAT 121 or MAT 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.

\*\*Denotes course that may be repeated for credit.

## Faculty and Staff

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