

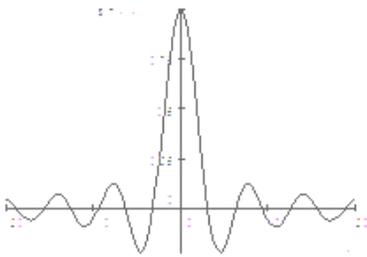
$$\lim_{x \rightarrow 0} \frac{\log_b(1+x)}{x} = \log_b e$$

$$e^{i\theta} = \cos \theta + i \sin \theta$$

Cabrini College

$$\sum_{n=1}^{\infty} \frac{1}{n^2} = \frac{\pi^2}{6}$$

Department of Mathematics Handbook



$$k \left(\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} \right) = \frac{\partial u}{\partial t}$$

$$\int_{-\infty}^{\infty} e^{-x^2} dx = \sqrt{\pi}$$

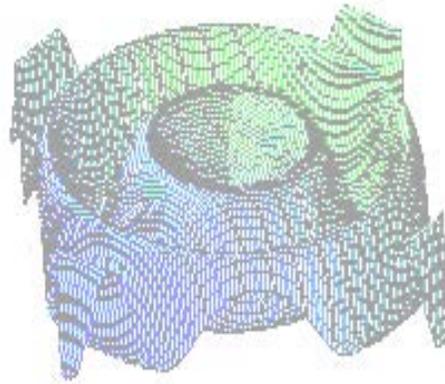


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Introduction

On behalf of all the faculty of the Mathematics Department at Cabrini College, welcome! We are very glad and honored that you have chosen Cabrini as the college at which you will pursue your degree in mathematics. Mathematics has been called the “Queen and Servant of the Sciences.”

From antiquity to the present day, men and women have been working to uncover her power and beauty. From unlocking the mysteries of the atom to the mysteries of the universe, from forecasting the weather to forecasting the stock market, mathematics has played a vital role in helping humanity understand its surroundings. The faculty of the Mathematics Department at Cabrini will do all we can to challenge and support you as you prepare to join the ranks of mathematicians.

Career Opportunities

A degree in mathematics opens many opportunities for you. Some of our graduates choose to complete the concentration in secondary education with the goal of becoming secondary math teachers. However, this is by no means the only door open to a graduate with a mathematics degree. Other careers for which a mathematics major would be well prepared include accounting and finance, actuarial science and insurance, law, industry, economic forecasting, engineering, research, medicine and statistics. The program at Cabrini will also give you a solid preparation for graduate school if you decide to pursue mathematics further.

Good sources of detailed information about careers that will be open to you with a degree in mathematics and interviews with math graduates include the book *101 Careers in Mathematics*, available from Dr. Brown and in the Career Services office and the websites www.maa.org/students/undergrad/career.html and www.maa.org/careers, sponsored by the Mathematical Association of America; www.ams.org/profession/career-info/career-index and www.ams.org/early-careers, sponsored by the American Mathematical Society; www.siam.org/careers, sponsored by the Society for Industrial and Applied Mathematics; www.math.com/students/advice/careers.html; and www.coolmath.com/careers.htm

About the Mathematics Department

There are three fulltime faculty members in the Mathematics Department and several adjunct instructors. The Department plans to add a fourth fulltime professor in the fall of 2013. All the courses for the major and minor are taught by the fulltime faculty, with the exception of MAT 489, Mathematics Curriculum and Methods, which is taught by an experienced high school math teacher. The Department also provides courses for the general student body to fulfill the mathematics core of the curriculum. These courses are taught by both fulltime and adjunct instructors.

The Department offers a Bachelor of Science degree in mathematics as well as a minor in mathematics. A student majoring in math may opt to pursue a concentration in secondary education if he or she wishes to teach mathematics at the secondary level.

This option requires that the student take several education courses, which take up many of the free electives in the curriculum and would make it difficult although not impossible for a student to take a minor or double major in another area. If a student did not pursue the concentration in secondary education, he or she would have an ample number of free electives available to minor or double major in another area. Some recent

students have minored or double majored in Spanish, history, philosophy, accounting, elementary education, finance, chemistry, psychology and biotechnology.

The Department also offers a post baccalaureate secondary certification program in mathematics. Graduate students who enroll in this program take many of the same mathematics courses as undergraduate math majors, though there are some classes for the undergraduate major that are not required for the graduate students. Upon successful completion of the program, a person would not be awarded a degree in mathematics but would be certified to teach mathematics at the secondary level.

In the courses for the major, the class sizes can range from about 5 to 25. Typically the largest class is Calculus I, since mathematically strong students who are not math majors can take this to fulfill the mathematics core curriculum requirement.

Also, some other majors, such as chemistry and computer information science, require their students to take Calculus and some other upper level courses. Upper level mathematics courses typically have between 5 and 15 students in them.

Mathematics Department Faculty

Professor Carol H. Serotta, Associate Professor

Professor Serotta started at Cabrini in 1977. She has a Bachelor of Arts in mathematics, a Masters degree in education and a Masters degree in mathematics from the University of Pennsylvania. Her office is room 232 in Grace Hall and she can be reached at 610-902-8346 or cserotta@cabrini.edu.

Dr. John F. Brown, Associate Professor and Chair

Dr. Brown began teaching at Cabrini in 1999. He earned his Bachelor of Science and Master of Science degrees in mathematics from Rensselaer Polytechnic Institute and his Doctorate in mathematics from Boston University. His office is room 322 in the Iadarola Center. He can be reached at 610-902-8468 or via email at jbrown@cabrini.edu.

Dr. Elizabeth Bodine, Assistant Professor

Dr. Bodine joined the Cabrini faculty in 2010. She earned her Bachelor of Arts in mathematics from Linfield College and her Master of Science and Doctorate degrees in mathematics from Washington State University. Her office is room 325A in the Iadarola Center. She can be contacted at 610-902-1081 or at ebodine@cabrini.edu.

Declaring the Major or Minor

To enroll officially as a mathematics major or minor, a student must complete a Declaration of Major/Minor/Concentration form that is available at the Registrar's Office. The student should fill out the top portion and then take the form to the Department Chair. The Chair will complete the second portion of the form and assign the student an advisor. The Chair or student then must take the form to the Registrar's Office, where the major or minor will be entered into the student's record.

Advising

When a student submits the Declaration of Major/Minor/Concentration form to the Department Chair, the Chair will assign the student an advisor from among the fulltime mathematics faculty. If the student has declared a minor, the advisor will assist the student in picking the mathematics courses needed to complete the minor.

The student should consult with the minor advisor each semester until the requirements for the minor are completed. All other issues, such as selecting courses to fulfill the requirements for the major, the core, and elective credits, adding or dropping classes, and assistance with any other matters should be handled by the student in consultation with the advisor from his or her major.

For students who declare a major in mathematics, the advisor will be the primary source of academic guidance. The student should regularly consult with the major advisor to ensure that all requirements for the major as well as core and total credit requirements for graduation are on track to be met.

The advisor will monitor the student's progress and provide guidance on curricular or extracurricular issues that arise, including but not limited to academic performance and career and/or graduate school opportunities. It is important that the student and advisor feel comfortable with each other and have a good rapport.

Students pursuing the mathematics major with a concentration in secondary education should also consult regularly with Thomas Stretton, Ph.D., of the Education Department to make sure all requirements for secondary certification, including the required coursework, state testing, and field experiences are being met. His office is room 275 in Grace Hall, and his phone number is 610-902-8328.

Requirements for the Bachelor of Science Degree in Mathematics

The curriculum at Cabrini consists of three parts – the core, the major courses, and free electives. A student must successfully complete the core, the major coursework, and have enough credits from the free electives to have at least 123 credits in order to graduate.

Core Requirements

The core requirements consist of four parts – College Success Seminar, the Engagements with the Common Good, the Explorations, and the 21st Century Literacies.

College Success Seminar

- COL 101 College Success Seminar (taken in the first semester) (1 credit)

Engagements with the Common Good

- ECG 100 – taken in the first year (3 credits)
- ECG 200 – taken in the second year (3 credits)
- ECG 300 – taken in the third year (3 credits)

Explorations

These courses do not come from any particular department but rather are thematic in nature. A list of courses that may be used to fulfill each of the distribution requirements can be found in the college catalog.

- Heritage (H) (3 credits)
- Values and Commitments (V) (3 credits)
- The Individual and Society (I) (3 credits)
- Imagination, Creativity and Aesthetic Appreciation (A) (3 credits)

21st-Century Literacies

- Quantitative Literacy – Calculus I, which is required for the math major and minor, fulfills this requirement. If a student places out of Calculus I and starts in Calculus II, this requirement is waived (0 to 4 credits)
- Information Literacy – Fulfilled by taking IST 125, Information Management and Technology (3 credits)

- Cross Cultural/Foreign Language Literacy – Two semesters of a foreign language at the Beginning I level, one semester for students placed at the Beginning II or Intermediate I level or none required if a student demonstrates proficiency above the Intermediate I level (0 to 6 credits)
- Religious Literacy – Fulfilled by taking one course approved for Religious Literacy from the Religion Department (3 credits)
- Scientific Literacy – Fulfilled by taking two courses with integrated labs or separate labs in a science. Students majoring in mathematics are required to take Physics I and are encouraged to take Physics II as the other science course (7 – 8 credits)

Mathematics Courses Required for the Major

The Mathematics Department offers a Bachelor of Science degree in mathematics. A student may choose to pursue certification in secondary education if he or she wishes to become certified to teach mathematics at the secondary level.

Such a student will receive a Bachelor's degree in mathematics and must complete all requirements for that degree as well as those for the secondary education certification.

The faculty of the Mathematics Department recently changed the requirements for the major. These apply to students who enter Cabrini beginning in the fall of 2012. In addition, the Pennsylvania Department of Education revised the requirements for secondary certification for students who will complete their student teaching after May 2013.

Thus, there are five curricula a student in the Mathematics Department at Cabrini could follow:

- Students who entered Cabrini before fall 2012 and are not seeking secondary certification
- Students who entered Cabrini in fall 2012 or later and are not seeking secondary certification
- Students who entered Cabrini before fall 2012 and are seeking secondary certification, with student teaching to be completed by May 2013
- Students who entered Cabrini before fall 2012 and are seeking secondary certification, with student teaching to be completed after May 2013
- Students who entered Cabrini in fall 2012 or later and are seeking secondary certification, with student teaching to be completed after May 2013

Each course of study is laid out in the next section. For students who enroll at Cabrini beginning in fall 2012, secondary education will be a second major instead of a concentration.

Curriculum for Mathematics majors who entered Cabrini before fall 2012 and who are not seeking secondary certification

Students majoring in mathematics but not seeking secondary certification must successfully complete the following courses:

- MAT 130 Calculus I (4 credits)
This fulfills the core Quantitative Literacy requirement.
- MAT 131 Calculus II (4 credits)
- MAT 201 Linear Algebra (3 credits)
- MAT 215 (formerly MAT 310) Discrete Mathematics (3 credits)
- MAT 221 Introduction to Mathematical Proofs (3 credits)
- MAT 230 Calculus III (4 credits)
- MAT 231 Differential Equations (4 credits)
- MAT 301 Abstract Algebra (3 credits)
- MAT 313 (formerly MAT 212) Probability and Statistics (4 credits)
- IST 195 Introduction to Programming (3 credits)
- PHY 101 Physics I (4 credits)
This fulfills one of the core Scientific Literacy requirements.
- Three elective courses of at least 3 credits each at the 200 level or higher. At least two of these must be mathematics courses. The third may be a mathematics course, Internet Programming Languages (IST 200), or Data Structures and Algorithms (IST 285). Students not seeking secondary certification may not take Mathematics Curriculum and Methods (MAT 489) as one of the electives.

A possible schedule a student who **entered before fall 2012** and who is **not seeking secondary certification** could follow to fulfill the mathematics requirements would be:

First Year

<u>Fall</u>	<u>Spring</u>
MAT 130 (Calculus I) (4) ¹ Language I (3) PHY 101 (Physics I) (4) IST 125 (Info. Mgmt. & Tech.) (3) COL 101 (College Success) (1)	MAT 131 (Calculus II) (4) Language II (3) ² Scientific Literacy II (3 or 4) ³ ECG 100 (3) Free Elective (3)
15 credits	16 – 17 credits

Second Year

<u>Fall</u>	<u>Spring</u>
MAT 230 (Calculus III) (4) MAT 201 (Linear Algebra) (3) Individual and Society Exploration (3) Heritage Exploration (3) Free Elective (3)	MAT 231 (Differential Equations) (4) MAT 221 (Introduction to Proofs) (3) Aesthetics Exploration (3) ECG 200 (3) Free Elective (3)
16 credits	16 credits

Third Year

<u>Fall</u>	<u>Spring</u>
MAT 313 (Probability and Statistics) (4) ⁴ MAT 301 (Abstract Algebra) (3) ⁵ Religious Literacy (3) ECG 300 (3) Free Elective (3)	MAT 215 (Discrete Mathematics) (3) ⁶ Mathematics Elective I (3) IST 195 (Intro. to Programming)(3) Free Elective (3) Free Elective (3)
16 credits	15 credits

Fourth Year

<u>Fall</u>	<u>Spring</u>
Mathematics Elective II (3) Values Exploration (3) Free Elective (3) Free Elective (3) Free Elective (3)	Mathematics Elective III (3) Free Elective (3) Free Elective (3) Free Elective (3) Free Elective (3)
15 credits	15 credits

which would result in 124 – 125 credits.

¹ May be waived if a student had demonstrated a mastery of Calculus I from high school; in that case, a student may take Calculus II.

² If a second language course is not required, another core course or a free elective could be substituted.

³ Physics II is recommended.

⁴ Beginning in 2013, MAT 313 will be offered only in the spring.

⁵ Beginning in 2013, MAT 301 will be offered only in the spring.

⁶ Beginning in 2013, MAT 215 will be offered only in the fall.

Curriculum for Mathematics majors who enter Cabrini in fall 2012 or later and who are not seeking secondary certification

- MAT 130 Calculus I (4 credits)
This fulfills the core Quantitative Literacy requirement.
- MAT 131 Calculus II (4 credits)
- MAT 201 Linear Algebra (3 credits)
- MAT 215 (formerly MAT 310) Discrete Math (3 credits)
- MAT 221 Introduction to Proofs (3 credits)
- MAT 225 Introduction to Technology in Mathematics (1 credit)
- MAT 230 Calculus III (4 credits)
- MAT 231 Differential Equations (4 credits)
- MAT 301 Abstract Algebra (3 credits)
- MAT 313 (formerly MAT 212) Probability and Statistics (4 credits)
- MAT 410 (formerly MAT 305) Real Analysis (3 credits)
- IST 195 Introduction to Programming (3 credits)
- PHY 101 Physics I (4 credits)
This fulfills one of the core Scientific Literacy requirements.
- Three elective courses of at least 3 credits each at the 200 level or higher. At least two of these must be mathematics courses. The third may be a mathematics course, Internet Programming Languages (IST 200), or Data Structures and Algorithms (IST 285). Students not seeking secondary certification may not take Mathematics Curriculum and Methods (MAT 489) as one of the electives.

A possible schedule a student majoring in Mathematics who **entered Cabrini in fall 2012 or later** and who is **not seeking secondary certification** could follow to fulfill the requirements would be:

First Year

<u>Fall</u>	<u>Spring</u>
MAT 130 (Calculus I) (4) ⁷ Language I (3) PHY 101 (Physics I) (4) IST 125 (Info. Mgmt. & Tech.) (3) COL 101 (College Success) (1)	MAT 131 (Calculus II) (4) Language II (3) ⁸ Scientific Literacy II (3 or 4) ⁹ ECG 100 (3) Free Elective (3)
15 credits	16 – 17 credits

Second Year

<u>Fall</u>	<u>Spring</u>
MAT 215 (Discrete Mathematics) (3) MAT 230 (Calculus III) (4) MAT 225 (Technology in Math) (1) Individual and Society Exploration (3) Heritage Exploration (3) Free Elective (3)	MAT 221 (Introduction to Proofs) (3) MAT 231 (Differential Equations) (4) IST 195 (Intro. to Programming) (3) ECG 200 (3) Free Elective (3)
17 credits	16 credits

Third Year

<u>Fall</u>	<u>Spring</u>
MAT 201 (Linear Algebra) (3) Mathematics Elective I (3) Religious Literacy (3) ECG 300 (3) Free Elective (3)	MAT 301 (Abstract Algebra) (3) MAT 313 (Probability and Statistics) (4) Aesthetics Exploration (3) Free Elective (3) Free Elective (3)
15 credits	16 credits

Fourth Year

<u>Fall</u>	<u>Spring</u>
MAT 410 (Real Analysis) (3) Mathematics Elective II (3) Values Exploration (3) Free Elective (3) Free Elective (3)	Mathematics Elective III (3) Free Elective (3) Free Elective (3) Free Elective (3) Free Elective (3)
15 credits	15 credits

which would result in 125 – 126 credits.

⁷ May be waived if a student had demonstrated a mastery of Calculus I from high school; in that case, a student may take Calculus II.

⁸ If a second language course is not required, another core course or a free elective could be substituted.

⁹ Physics II is recommended.

Curriculum for Mathematics majors seeking secondary certification who entered Cabrini before fall 2012 and who will have completed student teaching by May 2013

Students in this category need to complete:

- MAT 130 Calculus I (4 credits)
This fulfills the core Quantitative Literacy requirement.
- MAT 131 Calculus II (4 credits)
- MAT 201 Linear Algebra (3 credits)
- MAT 215 (formerly MAT 310) Discrete Mathematics (3 credits)
- MAT 221 Introduction to Mathematical Proofs (3 credits)
- MAT 222 (formerly MAT 402) History of Mathematics (3 credits)
- MAT 230 Calculus III (4 credits)
- MAT 231 Differential Equations (4 credits)
- MAT 301 Abstract Algebra (3 credits)
- MAT 313 (formerly MAT 212) Probability and Statistics (4 credits)
- MAT 407 Geometry (3 credits)
- MAT 489 Mathematics Curriculum and Methods (3 credits)
This should be taken in the fall immediately preceding student teaching.
- IST 195 Introduction to Programming (3 credits)
- PHY 101 Physics I (4 credits)
This fulfills one of the core Scientific Literacy requirements.

In addition, they must complete the courses required for secondary education certification, which include

- A literature course
- EDU 304 Foundations of Education (3 credits)
- PSY 320¹⁰ Developmental Psychology (3 credits)
- PSY 330 Educational Psychology (3 credits)
- SEC 202 Sophomore Field Experience in Secondary Education (full year, .5 credits per semester)
- SEC 302 Junior Field Experience in Secondary Education (full year, 1 credit per semester)
- SEC 303 Reading and Communication in Content Areas (3 credits)
- SEC 389 Seminar in Secondary Education (4 credits)
This should be taken in the fall immediately preceding student teaching.
- SEC 402 Senior Field Experience in Secondary Education (2 credits)
- SEC 490 Student Teaching and Practicum (12 credits)

To gain Pennsylvania secondary certification, a student must be admitted to the Education Department as well as be enrolled in the mathematics program. Admission to the Education Department requires, among other things, that a student pass the General Praxis exam in basic mathematics, reading and writing (usually taken in the first year) and maintains an overall grade point average of 3.00.

In addition, a student must pass the state administered Praxis II exam in mathematics. This is usually taken in the junior or senior year. A passing grade is a prerequisite for being placed in a student teaching assignment. For addition information on these and other requirements, see Thomas Stretton, Ph.D., (Grace Hall 275, 902-8328) of the Education Department.

¹⁰ Introduction to Psychology (PSY 101) is a prerequisite for PSY 320. PSY 101 will also fulfill the Individual and Society Exploration requirement.

A possible schedule for a student who is **seeking secondary certification, started at Cabrini before fall 2012 and will complete student teaching by May 2013** would be:

First Year

<u>Fall</u>	<u>Spring</u>
MAT 130 (Calculus I) (4) ¹¹ Language I (3) PHY 101 (Physics I) (4) IST 125 (Info. Mgmt. & Tech.) (3) COL 101 (College Success) (1)	MAT 131 (Calculus II) (4) Language II (3) ¹² Scientific Literacy II (3 or 4) ¹³ ECG 100 (3) PSY 101 (Introduction to Psychology) (3) ¹⁴
15 credits	16 – 17 credits

Second Year

<u>Fall</u>	<u>Spring</u>
MAT 201 (Linear Algebra) (3) MAT 230 (Calculus III) (4) PSY 320 (Developmental Psychology) (3) Aesthetics Exploration (3) Heritage Exploration (3) SEC 202 (Soph. Field Experience) (.5)	MAT 221 (Introduction to Proofs) (3) MAT 231 (Differential Equations) (4) EDU 304 (Foundations of Education) (3) ECG 200 (3) IST 195 (Intro. to Programming) (3) SEC 202 (Soph. Field Experience) (.5)
16.5 credits	16.5 credits

Third Year

<u>Fall</u>	<u>Spring</u>
MAT 313 (Probability and Statistics) (4) ¹⁵ MAT 301 (Abstract Algebra) (3) ¹⁶ Religious Literacy (3) PSY 330 (Educational Psychology) (3) ECG 300 (3) SEC 302 (Junior Field Experience) (1)	MAT 215 (Discrete Mathematics) (3) ¹⁷ MAT 222 (History of Mathematics) (3) MAT 407 (Geometry) (3) ¹⁸ SEC 303 (Reading and Writing in Content Area) (3) Literature course (3) SEC 302 (Junior Field Experience) (1)
17 credits	16 credits

Fourth Year

<u>Fall</u>	<u>Spring</u>
MAT 489 (Math Curr. and Methods) (3) SEC 389 (Sem. in Sec. Education) (4) Values Exploration (3) Free Elective (3) SEC 402 (Senior Field Experience) (2)	Student Teaching (12)
15 credits	12 credits

which would result in 124 – 125 total credits.

¹¹ May be waived if a student had demonstrated a mastery of Calculus I from high school; in that case, a student may take Calculus II.

¹² If a second language course is not required, another core course or a free elective could be substituted.

¹³ Physics II is recommended.

¹⁴ This would fulfill the Individual and Society Exploration requirement and is a prerequisite for Developmental Psychology.

¹⁵ Beginning in 2013, MAT 313 will be offered only in the spring.

¹⁶ Beginning in 2013, MAT 301 will be offered only in the spring.

¹⁷ Beginning in 2013, MAT 215 will be offered only in the fall.

¹⁸ Beginning in 2103, MAT 407 will be offered only in the fall.

Curriculum for Mathematics majors seeking secondary certification who entered Cabrini before fall 2012 and who will complete student teaching after May 2013

The Pennsylvania Department of Education recently changed the requirements for secondary certification. These affect students who will be doing their student teaching after spring of 2013.

Students in this category need to complete:

- MAT 130 Calculus I (4 credits)
This fulfills the core Quantitative Literacy requirement.
- MAT 131 Calculus II (4 credits)
- MAT 201 Linear Algebra (3 credits)
- MAT 215 (formerly MAT 310) Discrete Mathematics (3 credits)
- MAT 221 Introduction to Mathematical Proofs (3 credits)
- MAT 222 (formerly MAT 402) History of Mathematics (3 credits)
- MAT 230 Calculus III (4 credits)
- MAT 231 Differential Equations (4 credits)
- MAT 301 Abstract Algebra (3 credits)
- MAT 313 (formerly MAT 212) Probability and Statistics (4 credits)
- MAT 407 Geometry (3 credits)
- MAT 489 Mathematics Curriculum and Methods (3 credits)
This should be taken in the fall immediately preceding student teaching.
- IST 195 Introduction to Programming (3 credits)
- PHY 101 Physics I (4 credits)
This fulfills one of the core Scientific Literacy requirements.

In addition, they must complete the courses required for secondary education certification, which include

- A literature course
- EDU 304 Foundations of Education (3 credits)
- SPE 110 Introduction to Developmental Psychology and Learning Theory (3 credits)
- SPE 302 Assessment I (3 credits)
- SPE 320 Instructional Strategies for Learners with Diverse Needs (3 credits)
- SEC 202 Sophomore Field Experience in Secondary Education (full year, .5 credits per semester)
- EDU 200 English Language Learner Field Experience (1 credit)
- EDU 330 Inclusion Field Experience (1 credit)
- SEC 303 Communication in Content Area/Teaching ELL Students (3 credits)
- SEC 389 Seminar in Secondary Education (4 credits)
This should be taken in the fall immediately preceding student teaching.
- SEC 402 Senior Field Experience in Secondary Education (2 credits)
- SEC 490 Student Teaching and Practicum (12 credits)

To gain Pennsylvania secondary certification, a student must be admitted to the Education Department as well as be enrolled in the mathematics program. Admission to the Education Department requires, among other things, that a student pass the General Praxis exam in basic mathematics, reading and writing (usually taken in the first year) and maintains an overall grade point average of 3.00.

In addition, a student must pass the state administered Praxis II exam in mathematics. This is usually taken in the junior or senior year. A passing grade is a prerequisite for being placed in a student teaching assignment. For additional information on these and other requirements, see Thomas Stretton, Ph.D., (Grace Hall 275, 902-8328) of the Education Department.

A possible schedule for a student who is **seeking secondary certification, started at Cabrini before fall 2012 and will complete student teaching after May 2013** would be:

First Year

<u>Fall</u>	<u>Spring</u>
MAT 130 (Calculus I) (4) ¹⁹ Language I (3) PHY 101 (Physics I) (4) IST 125 (Info. Mgmt. & Tech.) (3) COL 101 (College Success) (1)	MAT 131 (Calculus II) (4) Language II (3) ²⁰ Scientific Literacy II (3 or 4) ²¹ ECG 100 (3) SPE 110 (Intro. Dev. Psych. & Learning Theory) (3) ²²
15 credits	16 – 17 credits

Second Year

<u>Fall</u>	<u>Spring</u>
MAT 201 (Linear Algebra) (3) MAT 230 (Calculus III) (4) Aesthetics Exploration (3) Heritage Exploration (3) SEC 202 (Soph. Field Experience) (.5) EDU 304 (Foundations of Education) (3)	MAT 221 (Introduction to Proofs) (3) MAT 231 (Differential Equations) (4) ECG 200 (3) IST 195 (Intro. to Programming) (3) SPE 302 (Assessment I) (3) SEC 202 (Soph. Field Experience) (.5)
16.5 credits	16.5 credits

Third Year

<u>Fall</u>	<u>Spring</u>
MAT 313 (Probability and Statistics) (4) ²³ MAT 301 (Abstract Algebra) (3) ²⁴ Religious Literacy (3) ECG 300 (3) SPE 320 (Instr. Strategies for Learners w/ Diverse Needs) (3) EDU 200 (ELL Field Experience) (1)	MAT 215 (Discrete Mathematics) (3) ²⁵ MAT 222 (History of Mathematics) (3) MAT 407 (Geometry) (3) ²⁶ SEC 303 (Reading and Writing in Content Area) (3) Literature course (3) EDU 330 (Inclusion Field Experience) (1)
17 credits	16 credits

Fourth Year

<u>Fall</u>	<u>Spring</u>
MAT 489 (Math Curr. and Methods) (3) SEC 389 (Sem. in Sec. Education) (4) Values Exploration (3) SEC 402 (Senior Field Experience) (2) Free Elective (3)	SEC 490 (Student Teaching) (12)
15 credits	12 credits

which would result in 124 – 125 total credits.

¹⁹ May be waived if a student had demonstrated a mastery of Calculus I from high school; in that case, a student may take Calculus II.

²⁰ If a second language course is not required, another core course or a free elective could be substituted.

²¹ Physics II is recommended.

²² This would fulfill the Individual and Society Exploration requirement.

²³ Beginning in 2013, MAT 313 will be offered only in the spring.

²⁴ Beginning in 2013, MAT 301 will be offered only in the spring.

²⁵ Beginning in 2013, MAT 215 will be offered only in the fall.

²⁶ Beginning in 2013, MAT 407 will be offered only in the fall.

Curriculum for Mathematics majors seeking secondary certification who enter Cabrini in fall 2012 or later and who will complete student teaching after May 2013

- MAT 130 Calculus I (4 credits)
This fulfills the core Quantitative Literacy requirement.
- MAT 131 Calculus II (4 credits)
- MAT 201 Linear Algebra (3 credits)
- MAT 215 (formerly MAT 310) Discrete Math (3 credits)
- MAT 221 Introduction to Proofs (3 credits)
- MAT 222 (formerly MAT 402) History of Mathematics (3 credits)
- MAT 225 Introduction to Technology in Mathematics (1 credit)
- MAT 230 Calculus III (4 credits)
- MAT 231 Differential Equations (4 credits)
- MAT 301 Abstract Algebra (3 credits)
- MAT 313 (formerly MAT 212) Probability and Statistics (4 credits)
- MAT 407 Geometry (3 credits)
- MAT 489 Mathematics Curriculum and Methods (3 credits)
This should be taken in the fall immediately preceding student teaching.
- One mathematics elective of at least 3 credits at the 200 level or higher
- IST 195 Introduction to Programming (3 credits)
- PHY 101 Physics I (4 credits)
This fulfills one of the core Scientific Literacy requirements.

In addition, they must complete the courses required for secondary education certification, which include

- A literature course
- EDU 304 Foundations of Education (3 credits)
- SPE 110 Introduction to Developmental Psychology and Learning Theory (3 credits)
- SPE 302 Assessment I (3 credits)
- SPE 320 Instructional Strategies for Learners with Diverse Needs (3 credits)
- SEC 202 Sophomore Field Experience in Secondary Education (full year, .5 credits per semester)
- EDU 200 English Language Learner Field Experience (1 credit)
- EDU 330 Inclusion Field Experience (1 credit)
- SEC 303 Communication in Content Area/Teaching ELL Students (3 credits)
- SEC 389 Seminar in Secondary Education (4 credits)
This should be taken in the fall immediately preceding student teaching.
- SEC 402 Senior Field Experience in Secondary Education (2 credits)
- SEC 490 Student Teaching and Practicum (12 credits)

To gain Pennsylvania secondary certification, a student must be admitted to the Education Department as well as be enrolled in the mathematics program. Admission to the Education Department requires, among other things, that a student pass the General Praxis exam in basic mathematics, reading and writing (usually taken in the first year) and maintains an overall grade point average of 3.00.

In addition, a student must pass the state administered Praxis II exam in mathematics. This is usually taken in the junior or senior year. A passing grade is a prerequisite for being placed in a student teaching assignment. For additional information on these and other requirements, see Thomas Stretton, Ph.D., (Grace Hall 275, 902-8328) of the Education Department.

A possible schedule for a student who is **seeking secondary certification, started at Cabrini in fall 2012 or later and will complete student teaching after May 2013** would be:

First Year

<u>Fall</u>	<u>Spring</u>
MAT 130 (Calculus I) (4) ²⁷ Language I (3) PHY 101 (Physics I) (4) IST 125 (Info. Mgmt. & Tech.) (3) COL 101 (College Success) (1)	MAT 131 (Calculus II) (4) Language II (3) ²⁸ Scientific Literacy II (3 or 4) ²⁹ ECG 100 (3) SPE 110 (Intro. Dev. Psych. & Learning Theory) (3) ³⁰
15 credits	16 – 17 credits

Second Year

<u>Fall</u>	<u>Spring</u>
MAT 215 (Discrete Mathematics) (3) MAT 230 (Calculus III) (4) MAT 225 (Technology in Math) (1) EDU 304 (Found. of Ed.) (3) Aesthetics Exploration (3) Heritage Exploration (3) SEC 202 (Soph. Field Experience) (.5)	MAT 221 (Introduction to Proofs) (3) MAT 231 (Differential Equations) (4) SPE 302 (Assessment I) (3) ECG 200 (3) IST 195 (Intro. to Programming) (3) SEC 202 (Soph. Field Experience) (.5)
17.5 credits	16.5 credits

Third Year

<u>Fall</u>	<u>Spring</u>
MAT 201 (Linear Algebra) (3) MAT 407 (Geometry) (3) Religious Literacy (3) SPE 320 (Instructional Strategies for Learners with Diverse Needs) (3) Values Exploration (3) EDU 330 (Junior Spec. Ed. Field Exp. (1)	MAT 301 (Abstract Algebra) (3) MAT 313 (Probability and Statistics) (4) MAT 222 (History of Math) (3) SEC 303 (Comm. in Content Area) (3) ECG 300 (3) EDU 200 (ELL Field Experience) (1)
16 credits	17 credits

Fourth Year

<u>Fall</u>	<u>Spring</u>
Mathematics Elective (3) MAT 489 (Math Curr. and Methods) (3) SEC 389 (Sem. in Sec. Education) (4) SEC 402 (Senior Field Experience) (2) Literature course (3)	SEC 490 (Student Teaching) (12)
15 credits	12 credits

which would result in 125 – 126 total credits.

²⁷ May be waived if the student has demonstrated a mastery of Calculus I from high school.

²⁸ If a second language course is not required, another core course or a free elective could be substituted.

²⁹ Physics II is recommended.

³⁰ This would fulfill the Individual and Society Exploration requirement.

Requirements for the Minor in Mathematics

The requirements for the minor in mathematics are

- MAT 130 Calculus I (4 credits)
- MAT 131 Calculus II (4 credits)
- Four mathematics courses of at least 3 credits each at the 200 level or higher, excluding MAT 489 (Mathematics Curriculum and Methods)

Placement/AP Credit

Students who have achieved a score of 3 or higher on the AP Calculus AB test or on the AB subscore of the Calculus BC test will be placed in Calculus II and will earn 4 credits for Calculus I. Students who have taken the AP Calculus BC test and achieved a score of 3 or higher will be placed in Calculus III and will earn 8 credits for Calculus I and II.

Students who earn a score of 3 or higher on the AP Statistics test will receive credit for MAT 118, Introduction to Statistics. Although earning 3 credits, this will not count toward the mathematics major.

Students who have taken the equivalent of Calculus I in high school and whose grade in that course indicates sufficient mastery of the material but who have not taken an AP test may be allowed to take Calculus II as the first mathematics course at Cabrini. However, no credits will be given for Calculus I.

If a student starts in Calculus II, the requirement for Calculus I will be waived.

Transfer Credits

Once a student has declared a mathematics major at Cabrini, he or she should take all mathematics courses at Cabrini. Under special circumstances, students may take courses for the major off campus with the permission of the Department Chair. A grade of C or higher must be attained for the course credits to transfer to Cabrini from another institution. The grades for the courses do not transfer.

Grade Requirements

A student must maintain an overall GPA of 2.00 in all courses required for the major or minor. If the GPA falls below this, the student is placed on probation by the department and has one semester to increase the GPA to the minimum standard.

If the student does not achieve the 2.00 GPA after the probationary semester, he or she will be dismissed from the major or minor unless the Department Chair grants an extension of an additional semester. No grade lower than a C- in a mathematics course will count toward fulfilling the requirements for the major or minor. Any mathematics course in which a student earns a grade below a C- must be retaken.

Course Descriptions

MAT 130 Calculus I

This course includes limits, continuity, differentiation, applications of the derivative and antiderivatives. *Offered fall and spring, 4 credits.*

MAT 131 Calculus II

This course includes indeterminate forms, integration, applications of integrals, techniques of integration, improper integrals and polar coordinates. *Prerequisite: MAT 130. Offered fall and spring, 4 credits.*

MAT 201 Linear Algebra

This course includes the algebra of matrices, solutions of systems of linear equations, vectors, vector spaces, inner product spaces, Gram-Schmidt orthogonalization process, linear transformations, determinants, and eigenvalues and eigenvectors. *Prerequisite: MAT 130. Offered fall, 3 credits.*

MAT 215 Discrete Mathematics

This course included topics chosen from logic, Karnaugh maps, circuit diagrams, set theory, number theory, combinatorics, probability, relations including congruence relations, functions, graphs and code theory, and algebraic structures. *Offered spring (beginning in 2013 – 14, MAT 215 will be offered only in the fall), 3 credits. (Formerly offered as MAT 310)*

MAT 221 Introduction to Mathematical Proofs

This course includes an introduction to logic and describes various techniques of mathematical proofs, including direct proofs, proofs by contrapositive, proofs by contradiction and proofs by induction. Examples will be drawn from many areas of mathematics. *Prerequisite: MAT 131 and MAT 215 or permission of the chair of the Mathematics Department. Offered spring, 3 credits.*

MAT 222 History of Mathematics

This course examines the evolution of mathematics from ancient civilizations through modern times. Topics include but are not limited to the history of geometry, calculus, probability, conics and analytic geometry, logic, number theory, arithmetic and algebra as well as the mathematicians who developed these concepts. *Prerequisite: MAT 130 or permission of the instructor. Offered spring, 3 credits. (Formerly offered as MAT 402)*

MAT 225 Introduction to Technology in Mathematics

In this course, students will be introduced to a variety of technological tools that are used in mathematical analysis and typesetting, including graphing calculators, Excel, Scientific Workplace, Mathematica and Geometer's Sketchpad. *Prerequisite: MAT 131. Offered fall, 1 credit.*

MAT 230 Calculus III

This course includes the study of vectors, functions of several variables, partial differentiation, multiple integrals and infinite sequences and series. *Prerequisite: MAT 131. Offered fall, 4 credits.*

MAT 231 Differential Equations

This course covers topics including first order differential equations, homogeneous and nonhomogeneous linear differential equations, and systems of linear differential equations. Physical applications of differential equations are studied. *Prerequisite: MAT 131. Offered spring, 4 credits.*

MAT 301 Abstract Algebra

This course covers topics including groups, rings and fields. *Prerequisite: MAT 221 or permission of the Chair of the Mathematics Department. Offered fall (beginning in 2013 – 14, MAT 310 will be offered only in the spring), 3 credits.*

MAT 313 Probability and Statistics

This course presents both descriptive and inferential statistics. Topics include data collection and classification, measures of central tendency and variability, probability concepts, discrete and continuous probability distributions, inferences about means, variances and proportions, confidence intervals, and p-values.

Prerequisite: MAT 131. Offered fall (beginning in 2013 – 14, MAT 313 will be offered only in the spring), 4 credits. (Formerly offered as MAT 212)

MAT 389 Topics in Mathematics

This series of one credit courses is designed to explore in depth a single topic in mathematics. Topics may include but are not limited to the metric system, calculators and calculation, math games, Montessori mathematics, problem solving in mathematics, math anxiety, math testing, and mathematics and gender. *This course may be repeated for credit if the topics are different. Offered upon sufficient enrollment, 1 credit per topic.*

MAT 399 Seminar

The seminar course involves the study of selected topics not offered in any other listed course. The topics may be selected by the students and a faculty member who is willing to teach the course. *Offered upon sufficient enrollment, 3 credits.*

MAT 401 Numerical Analysis

This course covers topics including polynomial approximation, interpolation, numerical differentiation, Gaussian quadrature, Newton-Cotes quadrature formulas, error analysis, Euler-Maclaurin sum formula, functional approximation, and solutions of nonlinear equations. *Prerequisite: MAT 230. Offered upon sufficient enrollment, 3 credits.*

MAT 406 Number Theory

The course covers topics including the properties of divisibility, prime numbers, congruences, Gaussian integers and Diophantine equations. *Prerequisite: MAT 221. Offered upon sufficient enrollment, 3 credits.*

MAT 407 Geometry

This course covers topics including Euclidean geometry, the parallel postulate, hyperbolic geometry and transformational geometry. *Prerequisite: MAT 221 or permission of the chair of the Mathematics Department. Offered spring (beginning in 2013 – 14, MAT 407 will be offered only in the fall), 3 credits*

MAT 410 Real Analysis

This course covers topics concerning the analysis of sets and sequences of real numbers and real-valued functions. Specific topics include countability, limits, convergence, continuity, differentiation, and integration. *Prerequisites: MAT 221 and MAT 230. Offered fall, 3 credits. (Formerly offered as MAT 305)*

MAT 430 Complex Variables

This course covers the arithmetic and algebraic properties of complex numbers, regions in the complex plane, functions of a complex function, mappings, analytic functions and their properties, and the derivatives and integrals of complex functions. *Prerequisites: MAT 221 and MAT 230. Offered upon sufficient enrollment, 3 credits.*

MAT 431 Partial Differential Equations

This course presents the derivation of the heat and wave equations, boundary value problems, the method of separation of variables, eigenvalues and eigenfunctions, the construction and properties of Fourier series, the method of eigenfunction expansion to solve nonhomogeneous partial differential equations, and Sturm-Liouville problems. *Prerequisites: MAT 230 and MAT 231. Offered upon sufficient enrollment, 3 credits.*

MAT 487 Departmental Practicum

Students assist faculty members in teaching a first year level mathematics course. *Prerequisite: Senior status secondary education major and recommendation of department faculty. Offered as required, variable credit, 3 credits maximum.*

MAT 489 Mathematics Curriculum and Methods

This course examines secondary school mathematics programs stressing organization and preparation of material for instruction. *This course may be taken only by students seeking secondary certification. Prerequisite: MAT 313, or permission of the chair of the Mathematics Department. Offered fall, 3 credits*

MAT 499 Independent Study

Topics are chosen by an individual student or small group of students in conjunction with a faculty member. *Prerequisite: approval of Department Chair and Dean of Academic Affairs. There is a fee for this course. Offered as needed, credit to be arranged.*

Technological Resources

Students majoring or minoring in Mathematics should own a graphing calculator such as the TI-83 or one comparable for use in Calculus I and II classes. In upper level Math classes, students may be required to use a more advanced calculator at the discretion of the instructor.

The Mathematics Department has available several technological resources for use by faculty and students. These include

- *Scientific Workplace*, a mathematical word processor/computer algebra/graphing software package. This software is installed on the Cabrini network and is available on most public computers on campus. It will accommodate up to nine simultaneous users.
- *Geometer's Sketchpad*, which is used in the Geometry course to allow users to examine the relationship between shapes, angles, and other geometric constructions. This software is installed on the computers in the library. It will accommodate up to twenty simultaneous users.
- *Mathematica*, a mathematical computer algebra/graphing software package. This software is installed on the computers in Iadarola Center in rooms 312, 325G and in the Math Resource Center.
- *Smart Boards*, which are available in many of the classrooms, may be used by the Mathematics instructors to present material in courses. Students taking MAT 489 may be instructed in their use.
- *Excel*, which is available to students on all computers on the campus network.

Library Resources

The Holy Spirit Library has over 500 mathematics books on its shelves and subscribes to several mathematics journals, including *Mathematics Magazine*, *Mathematics Teacher*, *Micromath*, *The College Math Journal*, *Math Horizons*, *Mathematics Teaching*, *Teaching Children Mathematics*, and *School Science and Mathematics*.

Full text access to almost 100 other journals is available in electronic format. The list of book and journals can be accessed at the Library's website, www.cabrini.edu/Library. Books may also be borrowed from the libraries of several local colleges and through interlibrary loan.

Department Website

The Mathematics Department maintains a website at www.cabrini.edu/Mathematics. There, students can get information about the department faculty, courses, students, and activities, as well as links to other sites that provide information on careers in mathematics.

Bulletin Board

A bulletin board on the wall in the Iadarola Center suite 325 is regularly updated with information about graduate schools, job postings and other opportunities for mathematics majors and minors.

Extracurricular Opportunities

The Mathematics Department offers several academic and social opportunities for students outside of the classroom.

Undergraduate Research

If a student wishes, he or she may collaborate with a faculty member on a research project. It is a wonderful opportunity for a student to delve deeply into an area that he or she may have been exposed to in a class or have an interest in. Several forums are available at which the student may present the work. These could range from a presentation to other members of the Mathematics Department to a presentation at a local conference.

Some recent graduates have explored topics such as the life of Sonya Kovaleski, the indeterminate form 0^0 , how to find the value of π by inscribing triangles in a unit circle, the mathematics behind Sudoku, an alternate way to solve nonhomogeneous linear differential equations, a numerical method that has cubic convergence for approximating roots of an expression, and the eigenvalues of a vibrating spring attached at both ends to springs.

Mathematics/Science Colloquium

Since 2001, the Mathematics Department has sponsored a Mathematics/Science Colloquium at which students or faculty members present topics in which they have an interest. The presentations are, for the most part, at a level that can be understood by an undergraduate mathematics or science major.

Faculty and students from Cabrini as well as nearby colleges are invited to attend. Some past talks include "Math and Stamps," "Math in the Old Testament," "Math and Art," "The Mathematics of Bar Codes," "Paradoxes in Probability," "Teaching with Cross Sums," and "Slices of Pi."

Math Club

Anyone interested in mathematics is invited to join the Math Club. The club meets every two to four weeks to plan activities to promote mathematics at the college and provide service to the local community. Activities that the club has sponsored or been involved in include showing popular movies or shows with mathematical connections, tutoring at a local grade school, participating in walks for the ALS Society, and assisting with a Career Fair for high school students.

For the past several years, the Club has sponsored an event on Pi Day (March 14) at which faculty and staff members have had pies thrown in their faces to raise money for the Special Olympics. In 2007, the Math Club was recognized by the college as the Group Service Contributor of the Year.

Sigma Zeta

Cabrini has a chapter of Sigma Zeta, the national honor society that recognizes outstanding student achievement in mathematics, science or computer science. To be admitted to the chapter, a student must be a major or minor in one of those areas; have completed at least 15 credits in mathematics (at the MAT 130 level or higher), information science (above the IST 125 level), or science; and have a minimum GPA of 3.00 in those courses and as well as an overall GPA of at least 3.00.

The induction ceremony occurs in the spring semester. For information about Sigma Zeta, contact Dr. Bodine of the Mathematics Department.

Cooperative Education/Internships

A student may apply for a cooperative education assignment or internship through the Office of Cooperative Education and Career Services. These experiences may carry credit and/or be paid. A student must have at least 45 college credits, including at least 15 credits from Cabrini, as well as approval of the Department Chair and the Director of Cooperative Education and Career Services, to be eligible.

For further information on requirements and opportunities for mathematics majors, contact the Office of Cooperative Education and Career Services on the first floor of Grace Hall.

Peer Tutoring/Classroom Coaching

The Center for Teaching and Learning and the Math Resource Center offer opportunities for Mathematics majors to be paid peer tutors and/or classroom coaches, assisting students at all levels of math who have questions with their math classes.

For further information about these programs, contact Diane Devanney in the Math Resource Center, room 318 in the Iadarola Center.

Honors in the Major

Students who meet certain requirements may graduate with honors in the major. To be eligible, a student must

- have a minimum GPA of 3.0 in all coursework
- have a minimum GPA of 3.5 in mathematics courses taken at Cabrini for the major
- be an active member in Sigma Zeta
- complete a research project under the supervision of a fulltime member of the faculty of the Mathematics Department and make a public presentation of the work at a local or national conference
- submit an application for honors with the Chair of the Department