

## Department of Mathematics

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Except for one's native language, mathematics is central to more fields than any other. Whether one studies computer science, economics, engineering, science, social sciences, or the liberal arts, mathematics is the language for any educated person. The Department of Mathematics offers a full range of courses in applied and pure mathematics, mathematics education for elementary and secondary school certification, and statistics. All departmental courses are taught with a goal of transforming students' thinking and imagination. Core courses are designed to empower mathematics majors to handle situations in industry, graduate school, education, or other areas they may choose to pursue. Our professors are passionate about both teaching and research. As a result, mathematics majors not only find teachers who are thoughtful and caring but they also find professors who are active researchers and seek to engage majors in research opportunities and research seminars.

All mathematics degree programs give mathematics majors and minors the flexibility to select courses suited to a variety of interests and career goals. Advising plays an integral role in achieving these objectives. Consequently, all mathematics majors are assigned an advisor to assist with scheduling and career planning throughout their undergraduate years.

The department offers the following B.A., B.S., and ancillary programs:

Bachelor of Arts in Mathematics

Tracks: General, Teacher Certification

Bachelor of Science in Mathematics

Tracks: General, Pure Mathematics, Applied Mathematics, Statistics

Post-Baccalaureate Specialization in Mathematics

Minor in Mathematics

Double (Second) Major in Mathematics

All degrees emphasize traditional mathematics, both as a basic science and as the major tool in solving problems, and include a range of electives tailored to meet the needs of the individual student. Careers such as cryptology, actuarial science, biomathematics, mathematical finance, and university research are open to our graduates because of a proper selection of courses and research opportunities.

In the twenty-first century, mathematics finds itself in an enviable position. Our culture is discovering the power and the beauty of mathematics. Many exciting areas of mathematics are interdisciplinary. The study of knot theory has found applications in the study of DNA. Number theory, an esoteric study until recent times, finds application in cryptology, a field essential to national security. The young professors who have recently joined our department, along with the department's established faculty, are able to offer possibilities in these new, exciting areas of mathematics.

## **Suggested Programs of Study**

A minor or double major in mathematics can considerably enhance the undergraduate experience for a variety of students, strengthen their resumes, and lead to a more satisfying career. Students are encouraged to seek advice from math faculty early in their decision-making stages. For students who wish to pursue a baccalaureate degree in mathematics the department offers six tracks. Among these tracks, the Bachelor of Arts in Mathematics, General Track, allows the maximum flexibility for both the general electives and the mathematics electives, while the language and the minor requirements of this degree ensure a well-rounded education. The Bachelor of Arts, Teaching Certification Track, is specifically designed for those planning to teach mathematics at the secondary (high school) level. The Bachelor of Science in Mathematics, General Track, allows maximum flexibility within the mathematics electives. The Pure Mathematics Track is intended for those considering the possibility of attending graduate school in a foundational area of mathematics. The Applied Mathematics Track leads to applications of computation to design, simulation, planning, control, and analysis of scientific, engineering, and medical phenomena. The Statistics Track leads to careers in data analysis and quality control related to engineering, economics, marketing, pharmaceuticals, and ecology. Students with any of the B.S. or B.A. degrees may choose from specialized graduate programs or careers in government, teaching, or industrial job markets.

## **Developmental Placement**

Students who score less than 200 on the mathematics portion of the THEA must begin in DMTH 0071. Students who score from 200 to 239 must begin in DMTH 0371. Students who score from 240 to 269 must begin in DMTH 0372. Students scoring at least 270 should not start in a DMTH course, but should choose the appropriate MATH course.

## **Mathematics Teaching Certification**

Students wishing to secure a provisional secondary teaching certificate, with a teaching field in mathematics, need to consult the College of Education section of this bulletin for details concerning certification.

## **Post-Baccalaureate Specialization in Mathematics**

This program is available to students who already have a baccalaureate degree in a field other than mathematics but wish to obtain teacher certification in mathematics. The student must complete the following courses for the Post-Baccalaureate Specialization in Mathematics:

MATH 2305 – Discrete Mathematics

MATH 2318 – Linear Algebra

MATH 2413 – Calculus and Analytical Geometry I

MATH 2414 – Calculus and Analytical Geometry II

MATH 3322 – Introduction to Advanced Mathematics

MATH 3330 – Higher Geometry

MATH 3350 – Abstract Algebra I

MATH 3370 – Introduction to the Theory of Statistical Inference

MATH 3380 – Analysis I

## **Minor in Mathematics**

A minor in mathematics requires 21 hours of mathematics from Division I and Division II Courses as listed below, including at least nine hours from Division II.

Division I Courses: MATH 2305, 2318, 2413 (or 2460), 2414, 2415.

Division II Courses: MATH 3225, 3301, 3321, above 3321 but excluding 4321.

Students are encouraged to contact the Mathematics Department early to design plans that suits their interests. A wide variety of choices is available. Examples of possible Minor plans and their areas of concentration are as follows:

Pure math focus: MATH 2413, 2414, 3322, 3350, 3380, and 2415 or two courses from 2318, 3351, 3381, 4310, 4330, 4340.

Applied math focus: MATH 2413, 2414, 2415, 3301, 3370, and one course from 4302, 4310, or 4315.

Statistics focus: MATH 2413, 2414, 3225, 3370, and three courses from 4313, 4317, 4319, 4380.

### **Double (Second) Major in Mathematics**

Students pursuing a baccalaureate degree in a mathematically compatible field may opt to pursue a double major in mathematics. A double major requires 30 hours of mathematics (23 hours of Core Courses and 7 hours from Math 2415 or Mathematics Electives Courses as listed below). In addition, students must satisfy the 3 hours of Computer Science Requirement.

### **Minimum Degree Requirements**

#### **The Philosophy of Knowledge Core Curriculum Requirement**

See the General Information section of the General Catalog for the requirements related to courses in philosophy, humanities, composition, literature, communication, history, fine arts, political science, social science, and physical education. Total number of hours required is 48 of which 6 hours is in Mathematics and 8 hours is in Lab Science as listed below. For Bachelor of Arts in Mathematics (General or Teacher Certification Track) the Communication requirement is to be filled by Spanish 1311, German 1311, French 1311, or American Sign Language CMDS 2375. Certain elementary math courses that satisfy the Knowledge Core Requirement do not count toward a degree in mathematics.

#### **Minimum Grade Requirement**

Students must earn a grade of C or better in each mathematics course for it to be counted toward any degree or credential offered by the department. The same requirement is applied to any transfer credit. The prerequisites of any course or external exam must also be satisfied with a grade of C or better. The terms "completion", "satisfactory completion", "to have credit for", and similar expressions refer to a minimum grade of C. Students must maintain a grade point average of 2.00 or better within each component (major, minor, concentration, second major, or specialization) of their degree plans.

#### **Lab Science (Lab Sci) Requirement**

Students graduating with a Baccalaureate Degree in Mathematics are required to take 8 hours of sequential lab science courses chosen from BIOL 1406 and 1407, or CHEM 1411 and 1412, or GEOL 1403 and 1404, or PHYS 2425 and 2426. This requirement is listed as Lab Sci in the Standard Curriculum for B.S. and B.A Degree Programs below.

#### **Computer Science (COSC) Requirement**

Students graduating with a Baccalaureate Degree or a Second Major in Mathematics are required to take at least one programming course chosen from COSC 1336, COSC 1337, or COSC 3306. This requirement is listed as COSC in the Standard Curriculum for B.S. and B.A. Degree Programs. COSC 3306 is recommended for majors who have considerable programming experience. COSC 1336 requires COSC 1173 as a co-requisite. Students who pursue the Applied Mathematics Track are encouraged to consider more advanced computer programming courses. Students who are considering mathematics courses with a programming component (such as MATH 3321 or 4315) are encouraged to contact the instructor of the course in advance.

#### **Minor or Concentration Requirement**

Students who pursue a Bachelor of Arts in Mathematics must choose a minor department in consultation with their advisor. Those who pursue Teacher Certification will have Pedagogy as their minor. Students who pursue a B.S. degree may choose a coherent group of courses from several departments as their concentration or professional area in consultation with their advisor.

A minor or concentration requires a minimum of 21 hours, of which 9 hours must be at junior or senior level.

### **The General Electives Requirement**

Students who pursue a B.S. degree have 12 hours of general electives while the students who pursue a B.A. degree have 6 hours of general electives. Students select these courses in consultation with their advisors.

### **The Mathematics Core Requirement**

All B.S. and B.A. degrees in mathematics require satisfactory completion of the following courses (23 hours). Of these, 6 hours may be counted toward the Philosophy of Knowledge Core Curriculum Requirement, while the other 17 hours are noted as Mathematics Core Requirement in each degree plan.

Math 2318 – Linear Algebra I  
Math 2413 – Calculus I  
Math 2414 – Calculus II  
Math 3322 – Introduction to Advanced Mathematics  
Math 3350 – Abstract Algebra I  
Math 3370 – Introduction to the Theory of Statistical Inference  
Math 3380 – Analysis I

### **The Mathematics Electives Requirement**

Students who pursue a degree in mathematics have a certain number of hours of mathematics electives from specified areas depending on their chosen track. The approved electives are listed below.

B.A. (General track) has 9 hours of math electives from any area.  
B.A. (Teacher Certification) has no math electives.  
B.S. (General Track) has 15 hours of math electives from any area.  
B.S. (Pure Math Track) has 3 hours of math electives from any area.  
B.S. (Applied Math Track) has 18 hours of math electives from applied math or statistics areas or 4310 or 4330. At least 9 hours must be in applied math area.  
B.S. (Statistics Track) has 12 hours of math electives, at least one course from 4313, 4319, and the remaining from applied math area or 2415, or 4330.

The following is the list of approved electives for B.S., B.A. (general track), and Double/Second Major in mathematics.

General area:

Math 4131, 4231, or 4331 – Special Problems

Pure math area:

Math 3330 – Higher Geometry  
Math 3351 – Abstract Algebra II  
Math 3381 – Analysis II  
Math 4310 – Complex Variables  
Math 4330 – Advanced Linear Algebra  
Math 4340 – Topology

Applied math area:

Math 3301 – Differential Equations  
Math 3321 – Discrete Structures  
Math 4302 – Partial Differential Equations  
Math 4315 – Numerical Analysis  
Math 4316 – Numerical Methods  
Math 4318 – Matrix Theory and Applied Linear Algebra

Statistics area:

Math 3225 – Statistical Analysis with SPSS or MINITAB

Math 4313 – Introduction to Linear Regression Analysis

Math 4317 – Introduction to Probability Theory and Stochastic Processes

Math 4319 – Introduction to Design of Experiments

Math 4380 – Theory of Statistical Inference

**National Exam Requirement**

Students graduating with a Baccalaureate Degree or a Double Major in Mathematics are required to take a national standardized examination. The exam presently being used is the Educational Testing Service and College Board of Achievement Test. The test results should be sent directly from the testing service to the Mathematics Department of Lamar University. Students must take the exam during the semester in which they complete the Mathematics Core Requirement.

**Bachelor of Arts (General Track) Requirements**

48 hours – The Philosophy of Knowledge Core Requirement

9 hours – Additional Foreign Language requirements (through 2312)

3 hours – A second Literature course

17 hours – Mathematics Core Requirement

5 hours – Additional Math Requirement

Math 2415 – Calculus III

Math 4131 – Research Seminar

9 hours – Mathematics Electives Requirement

3 hours – COSC Requirement

21 hours – Minor Requirement

6 hours – General Electives Requirement

121 hours – Total

**Bachelor of Arts (Teacher Certification Track) Requirements**

48 hours – The Philosophy of Knowledge Core Requirement

9 hours – Additional Foreign Language requirements (through 2312)

3 hours – A second Literature course

17 hours – Mathematics Core Requirement

15 hours – Additional Math Requirement

Math 2305 – Discrete Mathematics

Math 3300 – History of Mathematics

Math 3317 – Problem Solving

Math 3330 – Higher Geometry

Math 4321 – Topics in Secondary Mathematics

3 hours – COSC Requirement

24 hours – Teacher Certification Requirement

PEDG 2310, PEDG 3310, PEDG 3320, READ 3326,

PEDG 3380, PEDG 4380, PEDG 4620

6 hours – General Electives Requirement

125 hours – Total

**Bachelor of Science (General Track) Requirements**

48 hours – The Philosophy of Knowledge Core Requirement

17 hours – Mathematics Core Requirement

5 hours – Additional Math Requirement

Math 2415 – Calculus III

Math 4131 – Research Seminar

15 hours – Mathematics Electives Requirement

3 hours – COSC Requirement

21 hours – Concentration Requirement  
12 hours – General Electives Requirement  
121 hours – Total

**Bachelor of Science (Pure Math Track) Suggested Course Selections**

48 hours – The Philosophy of Knowledge Core Requirement  
17 hours – Mathematics Core Requirement  
20 hours – Additional Math Requirement  
    Math 2415 – Calculus III  
    Math 3301 – Differential Equations  
    Math 4310 – Complex Variables  
    Math 4340 – Topology  
    Math 4330 – Advanced Linear Algebra  
    Math 3381 – Analysis II  
    Math 4131 – Research Seminar  
3 hours – Mathematics Electives Requirement (any area)  
3 hours – COSC Requirement  
21 hours – Concentration Requirement  
12 hours – General Electives Requirement  
124 hours – Total

**Bachelor of Science (Applied Math Track) Suggested Course Selections**

48 hours – The Philosophy of Knowledge Core Requirement  
17 hours – Mathematics Core Requirement  
5 hours – Additional Math Requirement  
    Math 2415 – Calculus III  
    Math 4131 – Research Seminar  
9 hours – Mathematics Electives Requirement (from Applied Math area)  
9 hours – Mathematics Electives Requirement (from Applied Math or Statistics area or 4310 or 4330)  
3 hours – COSC Requirement  
21 hours – Concentration Requirement  
12 hours – General Electives Requirement  
124 hours – Total

**Bachelor of Science (Statistics Track) Suggested Course Selections**

48 hours – The Philosophy of Knowledge Core Requirement  
17 hours – Mathematics Core Requirement  
11 hours – Additional Math Requirement  
    Math 3225 – Statistical Analysis with SPSS or MINITAB  
    Math 4315 – Numerical Analysis  
    Math 4317 – Introduction to Probability Theory and Stochastic Processes  
    Math 4380 – Theory of Statistical Inference  
12 hours – Mathematics Electives Requirement from the following list (must include 4313 or 4319 or both):  
    Math 2415 – Calculus III  
    Math 4313 – Introduction to Regression Analysis  
    Math 4319 – Introduction to Design of Experiments  
    Math 4330 – Advanced Linear Algebra  
    Any Mathematics Elective from Applied Math area  
3 hours – COSC Requirement  
21 hours – Concentration Requirement  
12 hours – General Electives Requirement  
124 hours – Total

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## Standard Curricula for B.S. and B.A. Degree Programs

### Bachelor of Arts in Mathematics, General Track

#### First Year

Fall Semester		Spring Semester	
MATH 2413	4	MATH 2414	4
ENGL 1301	3	ENGL 1302	3
HIST 1301	3	HIST 1302	3
COMM(LANG 1311)	3	LANG 1312	3
PEGA	1	PHIL 1370	3
Total	14	Total	16

#### Second Year

Fall Semester		Spring Semester	
MATH 2415	4	MATH 3322	3
MATH 2318	3	Lab Sci	4
Lab Sci	4	Engl Lit	3
Engl Lit	3	LANG 2312	3
LANG 2311	3	Minor elective	3
Total	17	Total	16

#### Third Year

Fall Semester		Spring Semester	
MATH 3350	3	Math elective*	3
MATH 3380	3	Math elective*	3
COSC	3	Soc Sci	3
Minor elective	3	Fine Arts	3
Elective	3	Minor elective	3
Total	15	Total	15

#### Fourth Year

Fall Semester		Spring Semester	
MATH 3370	3	Math elective*	3
POLS 2301	3	POLS 2302	3
Minor elective	3	Minor elective	3
Minor elective	3	Minor elective	3
MATH 4131	1	Elective	3
Total	13	Total	15

Total Number of Hours 121

\* Chosen from MATH 3225, 3301, 3321, 3330, 3351, 3381, 4302, 4310, 4313, 4315, 4316, 4317, 4318, 4319, 4330, 4340, 4360, 4380, 4x31

## Bachelor of Arts in Mathematics, Teacher Certification Track

First Year			
Fall Semester		Spring Semester	
MATH 2413	4	MATH 2414	4
ENGL 1301	3	MATH 2305	3
Lab Sci	4	Lab Sci	4
PEGA	1	ENGL 1302	3
COMM (LANG 1311)	3	LANG 1312	3
Total	15	Total	17
Second Year			
Fall Semester		Spring Semester	
MATH 2318	3	FINE ARTS	3
MATH 3317	3	MATH 3322	3
HIST 1301	3	HIST 1302	3
Engl Lit	3	Engl Lit	3
PHIL 1370	3	PEDG 2310	3
LANG 2311	3	LANG 2312	3
Total	18	Total	18
Third Year			
Fall Semester		Spring Semester	
MATH 3350	3	MATH 3300	3
MATH 3380	3	Soc Sci	3
PEDG 3310	3	POLS 2302	3
PEDG 3320	3	READ 3326	3
POLS 2301	3	Elective	3
elective	3	COSC	3
Total	18	Total	18
Fourth Year			
Fall Semester		Spring Semester	
MATH 3370	3	PEDG 4620	6
MATH 4321	3		
PEDG 3380	3		
PEDG 4380	3		
MATH 3330	3		
Total	15	Total	6
Total Number of Hours			125

## Bachelor of Science in Mathematics, General Track

### First Year

Fall Semester		Spring Semester	
MATH 2413	4	MATH 2414	4
ENGL 1301	3	ENGL 1302	3
PHIL 1370	3	HIST 1302	3
HIST 1301	3	Fine Arts	3
PEGA	1	COMM	3
Total	14	Total	16

### Second Year

Fall Semester		Spring Semester	
MATH 2415	4	MATH 3322	3
MATH 2318	3	Math elective*	3
Lab Sci	4	Lab Sci	4
Engl Lit	3	POLS 2302	3
POLS 2301	3	Minor elective	3
Total	17	Total	16

### Third Year

Fall Semester		Spring Semester	
MATH 3350	3	Math elective*	3
MATH 3380	3	Math elective*	3
COSC	3	Soc Sci	3
Minor elective	3	Elective	3
Elective	3	Minor elective	3
Total	15	Total	15

### Fourth Year

Fall Semester		Spring Semester	
MATH 3370	3	Math elective*	3
Minor elective	3	Math elective*	3
Minor elective	3	Minor elective	3
Elective	3	Minor elective	3
MATH 4131	1	Elective	3
Total	13	Total	15

Total Number of Hours 121

\*Chosen from MATH 3225, 3301, 3321, 3330, 3351, 3381, 4302, 4310, 4313, 4315, 4316, 4317, 4318, 4319, 4330, 4340, 4360, 4380

## Bachelor of Science in Mathematics, Pure Mathematics Track

### First Year

Fall Semester		Spring Semester	
MATH 2413	4	MATH 2414	4
ENGL 1301	3	ENGL 1302	3
PHIL 1370	3	HIST 1302	3
HIST 1301	3	Fine Arts	3
PEGA	1	COMM	3
Total	14	Total	16

### Second Year

Fall Semester		Spring Semester	
MATH 2415	4	MATH 3301	3
MATH 2318	3	MATH 3322	3
Lab Sci	4	Lab Sci	4
Engl Lit	3	POLS 2302	3
POLS 2301	3	Minor elective	3
Total	17	Total	16

### Third Year

Fall Semester		Spring Semester	
MATH 3350	3	MATH 3381	3
MATH 3380	3	MATH 4330	3
COSC	3	Soc Sci	3
Minor elective	3	Elective	3
Elective	3	Minor elective	3
Total	15	Total	15

### Fourth Year

Fall Semester		Spring Semester	
MATH 3370	3	MATH 4340	3
MATH 4310	3	Math elective*	3
Minor elective	3	Minor elective	3
Minor elective	3	Minor elective	3
Elective	3	Elective	3
MATH 4131	1	Total	15
Total	16		

Total Number of Hours 124

\* Chosen from MATH 3225, 3321, 3330, 3351, 4302, 4313, 4315, 4316, 4317, 4318, 4319, 4360, 4380, 4x31

## Bachelor of Science in Mathematics, Applied Mathematics Track

### First Year

Fall Semester		Spring Semester	
MATH 2413	4	MATH 2414	4
ENGL 1301	3	ENGL 1302	3
PHIL 1370	3	HIST 1302	3
HIST 1301	3	Fine Arts	3
PEGA	1	COMM	3
Total	14	Total	16

### Second Year

Fall Semester		Spring Semester	
MATH 2415	4	MATH 3322	3
MATH 2318	3	Applied math elective**	3
Lab Sci	4	Lab Sci	4
Engl Lit	3	POLS 2302	3
POLS 2301	3	Minor elective	3
Total	17	Total	16

### Third Year

Fall Semester		Spring Semester	
MATH 3350	3	Applied math elective**	3
MATH 3380	3	Math elective*	3
COSC	3	Soc Sci	3
Minor elective	3	Elective	3
Elective	3	Minor elective	3
Total	15	Total	15

### Fourth Year

Fall Semester		Spring Semester	
MATH 3370	3	Applied math elective**	3
Math elective*	3	Math elective*	3
Minor elective	3	Minor elective	3
Minor elective	3	Minor elective	3
Elective	3	Elective	3
MATH 4131	1	Total	15
Total	16		

Total Number of Hours 124

\*\* Chosen from MATH 3301, 3321, 4302, 4315, 4316, 4318.

\*Chosen from above list or MATH 3225, 4310, 4313, 4317, 4319, 4330, 4380, 4x31.

## Bachelor of Science in Mathematics, Statistics Track

### First Year

Fall Semester		Spring Semester	
MATH 2413	4	MATH 2414	4
ENGL 1301	3	ENGL 1302	3
PHIL 1370	3	HIST 1302	3
HIST 1301	3	Fine Arts	3
COMM	3	Elective	3
Total	16	Total	16

### Second Year

Fall Semester		Spring Semester	
MATH 3370	3	MATH 3322	3
MATH 2318	3	MATH 3225	2
Lab Sci	4	Lab Sci	4
Engl Lit	3	POLS 2302	3
POLS 2301	3	Minor elective	3
		PEGA	1
Total	16	Total	16

### Third Year

Fall Semester		Spring Semester	
MATH 3350	3	MATH 4380	3
MATH 3380	3	MATH 4315	3
COSC	3	Soc Sci	3
Minor elective	3	Elective	3
Elective	3	Minor elective	3
Total	15	Total	15

### Fourth Year

Fall Semester		Spring Semester	
MATH 4313 or 4319	3	MATH 4317	3
MATH elective*	3	MATH elective*	3
MATH elective*	3	Minor elective	3
Minor elective	3	Minor elective	3
Minor elective	3	Elective	3
Total	15	Total	15

Total Number of Hours 124

\* Chosen from MATH 2415, 3301, 3321, 4313, 4316, 4318, 4319, 4330

## Mathematics Courses (MATH)

- 1314 College Algebra  
Linear and quadratic equations and inequalities, determinants, matrices, systems of equations, binomial theorem, exponential and logarithmic functions, theory of equations.  
*Prerequisites: 270 Math THEA or C or better in DMTH 0372.*  
*If THEA exempt: 500 MATH SAT or 19 Math ACT.*  
*Prepares for: MATH 1325, 1342, 1350, 3312.*
- 1316 Trigonometry  
Study of trigonometric functions, graphs, identities, inverse trigonometric functions, trigonometric equations, and applications of trigonometry. Recommended for students who have not had high school trigonometry.  
*Prerequisites: 270 Math THEA or C or better in DMTH 0372.*  
*If THEA exempt: 500 MATH SAT or 19 Math ACT.*  
*Prepares for: MATH 2310, 2413, 3313.*
- 1320 Geometric Structures  
Development of a mathematical way of thinking through a coherent first-hand experience. Emphasis on the student's deductive powers and ability to use language precisely and efficiently. Study of Euclidean geometry; Hilbert's axioms, neutral geometry, hyperbolic geometry; the axiomatic method; and an introduction to consistency, independence, and completeness of axiom systems.  
*Prerequisites: 270 Math THEA or C or better in DMTH 0372.*  
*If THEA exempt: 500 MATH SAT or 19 Math ACT.*
- 1325 Calculus for Business Applications  
An introduction to calculus. The derivative, applications of the derivative, techniques of differentiation, exponential and natural logarithmic functions, an introduction to integral calculus.  
*Prerequisites: Grade of C or better in MATH 1314, or its equivalent.*  
*Prepares for: MATH 2305, 2413.*
- 1342 Elementary Statistics  
Non-calculus based introduction to statistics, statistical measures of data, statistical description of data, elementary probability, random variables, binomial and normal distributions, estimation, testing hypotheses.  
*Prerequisites: Grade of C or better in MATH 1314 or its equivalent.*  
*Prepares for: MATH 3370.*
- 1350 Fundamentals of Math I  
Concepts of sets, functions, numeration systems, number theory and properties of the natural numbers, integers, rational, and real number systems, with an emphasis on problem solving and critical thinking. This course is designed for students seeking EC-4 or 4-8 teacher certification.  
*Prerequisites: Grade of C or better in MATH 1314 or its equivalent.*  
*Prepares for: MATH 3313.*
- 1360 Honors College Algebra  
Generally covers same topics as MATH 1314.

*Prerequisites: 270 Math THEA or C or better in DMTH 0372.  
If THEA exempt: 500 MATH SAT or 19 Math ACT.  
Prepares for: MATH 2312.*

- 2305 **Discrete Mathematics**  
An introduction to combinatorial mathematics and finite mathematics required in the study of computer science. Topics include elementary set theory, relations and function, combinatorics, and introduction to graph theory with special emphasis on trees and search algorithms, an introduction to recurrence relations and generating functions, and finite state machines.  
*Prerequisites: Students should be currently enrolled in or have received a grade of C or better in MATH 1325, 2376, 2413, 2460, or 3316.  
Prepares for: MATH 3321.*
- 2310 **Mathematical Modeling I**  
This course is specifically designed for students who will become teachers in grades 4-8. Students will examine characteristics of situations to select or create math models in algebra, geometry, and trigonometry using real world situations.  
*Prerequisites: Grade of C or better in MATH 1314 or its equivalent.*
- 2312 **Precalculus Mathematics**  
Intensive review of algebra, trigonometry and analytic geometry.  
*Prerequisites: 270 Math THEA or C or better in DMTH 0372.  
If THEA exempt: 500 MATH SAT or 19 Math ACT.  
Prepares for: MATH 2376, 2413, 2460.*
- 2318 **Linear Algebra**  
A first course in linear algebra, including vector and matrix arithmetic, solutions of linear systems and the Eigenvalue-Eigenvector problem, elementary vector spaces, and linear transformation theory.  
*Prerequisites: Mathematics majors should be currently enrolled in or have received a grade of C or better in MATH 2413 or its equivalent; 4-8 teacher certification students should be currently enrolled in or have received a grade of C or better in MATH 3316 or its equivalent.  
Prepares for: MATH 3321, 4315, 4330.*
- 2376 **Calculus for the Social and Life Sciences**  
Sets, functions, limits, derivatives and applications, introduction to integral calculus. Designed for students majoring in social and life sciences and students seeking 4-8 math teacher certification.  
*Prerequisites: Grade of C or better in MATH 1314 or its equivalent.  
Prepares for: MATH 2305, 2413.*
- 2413 **Calculus and Analytical Geometry I**  
Functions, limits, derivatives of algebraic, trigonometric, exponential and logarithmic functions, curve sketching, related rates, maximum and minimum problems, definite and indefinite integrals with applications.  
*Prerequisites: Grade of C or better in MATH 2312 or its equivalent.  
Prepares for: MATH 2305, 2318, 2414.*
- 2414 **Calculus and Analytical Geometry II**  
Methods of integration, polar co-ordinates, parametric equations, sequences and series, and vectors.  
*Prerequisites: Grade of C or better in MATH 2413 or its equivalent.  
Prepares for: MATH 2415, 3301, 3321, 3322, 3370.*

- 2415 Calculus and Analytical Geometry III  
Functions of several variables, partial derivatives, vector analysis, and multiple integrals.  
*Prerequisites: Grade of C or better in MATH 2414 or its equivalent.*  
*Prepares for: MATH 4302, 4310.*
- 2460 Honors Calculus and Analytic Geometry I  
Generally covers same topics as MATH 2413.  
*Prerequisites: Grade of C or better in MATH 2312 or its equivalent.*  
*Prepares for: MATH 2414.*
- 3225 Statistical Analysis with SPSS or MINITAB  
Introduction to data analysis with SPSS, correlation, regression, prediction, choice of appropriate statistics, presentation of data.  
*Prerequisites: Grade of C or better in Math 1342 or consent of Instructor.*
- 3300 History of Mathematics  
Historical origin and development of mathematical concepts through the sixteenth century. Topics include Egyptian and Babylonian mathematics, Greek mathematics, and early European mathematics.  
*Prerequisites: Junior standing and grade of C or better in six hours of mathematics.*
- 3301 Ordinary Differential Equations  
First order equations: modeling and population dynamics, stability, existence and uniqueness theorem for nonlinear equations, Euler's method. Second order equations: nonlinear equations via reductions methods, variation of parameters, forced mechanical vibrations, resonance and beat. Laplace Transform: general forcing functions, the convolution integral. Systems of ODEs: eigenvalues and phase plane analysis.  
*Prerequisites: Grade of C or better in MATH 2414 or its equivalent.*  
*Prepares for: MATH 4302, 4315.*
- 3311 Foundations of Mathematics I  
Introduction to mathematical logic and the language and nature of proofs. Applications to sets, mathematical induction, relations, and functions.  
*Prerequisites: Grade of C or better in nine semester hours of mathematics.*  
*Prepares for: MATH 3314, 3315.*
- 3312 Probability, Statistics, and Statistical Modeling  
This course is specifically designed for students who will become teachers in Grades EC-4 and 4-8. It includes principles and applications of probability and statistics with an emphasis on using real-world data collected, organized, and analyzed by the students.  
*Prerequisites: Grade of C or better in MATH 1314 or its equivalent.*
- 3313 Elementary Geometry  
The development of Euclidean geometry, introduction to proofs, concepts of measurement and co-ordinate geometry.  
*Prerequisites: Grade of C or better in MATH 1350 or MATH 1316 or its equivalent.*  
*Prepares for: MATH 3316.*
- 3314 Foundations of Mathematics II  
This course is specifically designed for students who will become teachers in grades 4-8. It includes principles and applications of axioms, theorems, and proofs for the natural numbers, integers, and real numbers.  
*Prerequisites: Grade of C or better in MATH 3311 or its equivalent.*
- 3315 Elementary Number Theory

A development of the elementary theory of numbers, Diophantine equations, congruences, Fibonacci numbers, and magic squares.

*Prerequisites: Grade of C or better in MATH 3311 or its equivalent.*

3316 Calculus Concepts – Mathematical Modeling II

This course is specifically designed for students who will become teachers in grades 4-8. It includes principles and conceptual foundations of calculus and applications to middle school mathematics.

*Prerequisites: Grade of C or better in MATH 3313 or its equivalent.*

*Prepares for: MATH 2318.*

3317 Problem Solving

Study of heuristics and strategies used in solving problems, with extensive practice in solving word problems involving skills in arithmetic, algebra, geometry, and logic.

*Prerequisites: Grade of C or better in nine semester hours of mathematics.*

3321 Discrete Structures

Combinatorics, graphs, Boolean algebra, algebraic structures, coding theory, finite state machines, machine design, and computability.

*Prerequisites: Grade of C or better in MATH 2318 and 2414, and satisfactory completion of COSC Requirement.*

3322 Introduction to Advanced Mathematics

An introduction to logic and methods of proof with applications to basic set operations, relations, functions, cardinality, and the real number system.

*Prerequisites: Grade of C or better in MATH 2414 or its equivalent.*

*Prepares for: MATH 3330, 3350, 3380, 4330.*

3330 Higher Geometry

Axiomatic and set-theoretic treatment of geometry, analysis of the metric and synthetic approaches to Euclidean geometry, introduction to non-Euclidean geometries.

*Prerequisites: Grade of C or better in MATH 3322 or consent of the instructor.*

3350 Abstract Algebra I

An introduction to abstract algebraic structures concentrating mainly in group theory. Topics in group theory include cyclic groups, normal subgroups, quotient groups, homomorphisms, isomorphisms, permutation groups, the Sylow theorems, and the structure theorem for finite abelian groups.

*Prerequisites: Grade of C or better in MATH 3322 or its equivalent.*

*Prepares for: MATH 3351.*

3351 Abstract Algebra II

Continuation of MATH 3350. The abstract algebraic structures studied here include rings, fields, and modules. MATH 3351 is strongly recommended for undergraduates contemplating graduate study in mathematics.

*Prerequisites: Grade of C or better in MATH 3350 or its equivalent.*

3370 Introduction to the Theory of Statistical Inference

A calculus-based introduction to statistics, probability, special probability distributions, nature of statistical methods, sampling theory, estimation, testing hypotheses.

*Prerequisites: Grade of C or better in MATH 2414 or its equivalent.*

*Prepares for: MATH 4380.*

3380 Analysis I

The real number system, Completeness Axiom, metric spaces, sequences, compactness, continuity, differentiation, Intermediate Value Theorem, Extreme Value Theorem, the Riemann integral, Fundamental Theorem of Calculus.

*Prerequisites: Grade of C or better in MATH 3322 or its equivalent.*

*Prepares for: MATH 3381, 4340.*

- 3381 Analysis II  
Stieltjes integral, convergence, uniform convergence, sequences and series of functions, bounded variation, the Implicit Function Theorem.  
*Prerequisites: Grade of C or better in MATH 3380 or its equivalent.*
- 4131 Special Problems  
Special advanced problems in mathematics to suit the needs of individual students.  
*Prerequisites: Consent of Instructor.*
- 4231 Special Problems  
Special advanced problems in mathematics to suit the needs of individual students.  
*Prerequisites: Consent of Instructor.*
- 4302 Partial Differential Equations  
Boundary value problems with simple geometries in 1, 2, or 3 space dimensions for the heat equation, wave equation, and potential (Laplace) equation, separation of variables, Fourier Series, Sturm-Liouville eigenvalue problems and Helmholtz equation, Rayleigh Quotient, introduction to finite difference methods.  
*Prerequisites: Grade of C or better in MATH 2415, 3301 or their equivalents.*
- 4310 Complex Variables  
Complex numbers, analytic functions, complex line integrals, Cauchy integral formula, and applications.  
*Prerequisites: Grade of C or better in MATH 2415 or its equivalent*
- 4313 Introduction to Regression Analysis  
Simple linear regression, theory of least squares, multivariate analysis, theory of the general linear model, application to real life data, modeling, and interpretation of computer-generated graphical and numerical results in regression analysis.  
*Prerequisites: Grade of C or better in MATH 3370 or its equivalent.*
- 4315 Numerical Analysis  
Algorithms for solving linear and non-linear equations and systems thereof, interpolating polynomials, finite difference approximations of derivatives, techniques of numerical integration, one-step and multi-step methods for solving ordinary differential equations and systems thereof.  
*Prerequisites: MATH 2318, 3301, and satisfactory completion of COSC Requirement.*  
*Prepares for: MATH 4316.*
- 4316 Topics in Applied Numerical Methods  
Topics chosen from linear programming, optimization, numerical simulation, or other fields of interest to students and instructor.  
*Prerequisites: Grade of C or better in MATH 4315 or its equivalent.*
- 4317 Introduction to Probability Theory and Stochastic Processes  
Probability, well-known distributions, conditional probability, Bayes' formula, Markov chain, counting process, Poisson process, Chapman-Kolmogorov equations, gambler's ruin, branching process.  
*Prerequisites: Grade of C or better in MATH 3370 or its equivalent*

- 4319 Introduction to Design of Experiments  
Basic statistical concepts, analysis of variance, randomized blocks, Latin-squares, general factorial designs,  $2^k$  and  $3^k$  designs, modeling and analysis using MINITAB or SPSS.  
*Prerequisites: Grade of C or better in MATH 3370 or its equivalent*
- 4321 Topics in Secondary Mathematics Education  
Introduction to essential topics for pre-service 8-12 mathematics educators. Topics include quantitative reasoning, algebraic thinking, geometry, spatial reasoning, measurement, precalculus, mathematics models, and AP Calculus and Statistics.  
*Prerequisites: Completion of all other mathematics content courses.*
- 4330 Advanced Linear Algebra  
Vector spaces, linear transformations, matrices, determinants, Eigenvalues, Eigenvectors, canonical forms, bi-linear mappings and quadratic forms.  
*Prerequisites: Grade of C or better in MATH 2318, 3322 or their equivalents.*
- 4331 Special Problems  
Special advanced problems in mathematics to suit the needs of individual students.  
*Prerequisites: Consent of Instructor.*
- 4340 Topology  
An introduction to point set topology, including metrizable, compactness, embeddings, Urysohn's lemma, and homotopy.  
*Prerequisites: Grade of C or better in MATH 3380 or its equivalent.*
- 4380 Theory of Statistical Inference  
A formal introduction to statistical inference, sampling theory, general principles of statistical inference, goodness of fit tests, regression and correlation, and analysis of variance.  
*Prerequisites: Grade of C or better in MATH 3370 or its equivalent.*