

**Soave, Melissa**

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**From:** Shapiro, Daniel <shapiro@math.ohio-state.edu>  
**Sent:** Thursday, May 17, 2012 4:36 PM  
**To:** Soave, Melissa  
**Cc:** Shapiro, Daniel  
**Subject:** RE: Changes to Math Major Program  
**Attachments:** MathBA\_10h.pdf; ActSci\_BA\_8.pdf

Melissa,

Attached here are BA versions of the Math Major and Actuarial Science Major documents. As mentioned before, except for the first page, those documents are identical to the BS documents sent earlier.

Sincerely,  
Dan S.

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**From:** Soave, Melissa [soave.2@osu.edu]  
**Sent:** Thursday, May 17, 2012 4:04 PM  
**To:** Shapiro, Daniel  
**Subject:** RE: Changes to Math Major Program

Dr. Shapiro,

Just for recording keeping sake, could you forward the BA program with the change in red on the first page?

Many thanks,  
Melissa

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**From:** Shapiro, Daniel [mailto:shapiro@math.ohio-state.edu]  
**Sent:** Thursday, April 26, 2012 8:08 PM  
**To:** Soave, Melissa  
**Cc:** Fink, Steven; Hadad, Christopher; Shapiro, Daniel  
**Subject:** Changes to Math Major Program

Dear Melissa,

Semester program documents for the Math Major (BS and BA) were submitted and approved last July. Since that time, the Undergraduate Studies Committee of the Department of Mathematics decided to change some of the requirements. It seems worthwhile to submit those changes now so that they are in place before the semester system begins. I had planned to do this months ago, but some of us were still discussing the wording of the changed rules . . .

NOTE: All changes will be enforced **only** for those students who declare themselves as math majors in Summer 2012 or later.

The PDF file attached here is the full Major Program document for the Math BS, with the changes from the Summer 2011 version indicated in red font. I originally planned to submit only the pages containing changes, but the new seminar requirement caused small changes in many spots in that document. Submitting the whole document this was seemed clearer.

Please let me know what further steps to take in order to submit those changes appropriately.

Should I send less than the whole document, including only those pages containing significant changes?  
Would you prefer to have individual files (in Word or Excel) rather than the large PDF constructed from them?

Should the red font parts be converted back to black?

Do you need similar documentation for the Math BA major program, even though the only change in on the first page?

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Two of the changes included here involve a bit more than simple editing and bookkeeping. They are:

**(1) SEMINAR REQUIREMENT.**

Math majors are required to take **Math 1295**, a 1-credit *Introductory Seminar* (graded S/U). This seminar will run each Autumn and Spring semester, with meetings covering topics like:

- (1) overviews of mathematical fields of particular interest to undergraduate majors,
- (2) information about the different "tracks" within the math major,
- (3) presentations concerning internship opportunities, and careers related to math.

**(2) DOUBLE COUNTING POLICY.**

In recent years the number of students pursuing multiple majors and dual degrees has increased significantly. The most common programs involving math are:

Math Major - financial track, Actuarial Science Major, Statistics minor, Finance Major, Accounting Major.

The first three are in the College of Arts and Sciences and the last two are in the College of Business. The Undergraduate Studies Committee of the Department of Mathematics feels that it has become too easy for students to count certain math courses toward multiple degree programs. That committee approved the following Double Counting Policy as a way to reduce overlap among those programs:

Each of the courses Math 2568, Math 5520H, Math 4530, Math 5530H, Stat 4201, Stat 4202, may be counted toward a math major only if that course is not counted as a prerequisite or as a requirement for any other program.

Those courses (two each in linear algebra, probability, and mathematical statistics) are the ones that are most often counted toward multiple degree programs. Similar changes are planned for the Actuarial Science major and the Math minor.

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**Location of the changes in the attached file:**

- Double Counting Policy on page Rationale.3.
- Seminar Requirement on page Rationale.3. The seminar (Math 1295) is also inserted into each Major Program Form (pages A.Forms 2, 4, 6, 8,10 and 12), Curriculum Map (each page of Appendix B), Four-Year Plan (pages C.Plans 1, 3, 4, 5, 6), and into the Generic schedule (Appendix E).

We also made several smaller alterations, and corrected a few minor errors:

- clarify rules for honors contracts (on page Rationale.2).
- remove CSE prerequisites in the Education Track (on page C.Plans 3) to correspond to updated requirements in the MEd and BSEd programs.

- change course numbers for requirements in Computer Science, Business Finance, Molecular Genetics, and Biology to correct erroneous semester-system numbers recorded previously (pages A.Forms 6, C.Plans 4, C.Plans 6).
- Move CSE courses from Required to Prerequisite in the Financial Track because 1000-level courses cannot count toward a major program (page A.Forms 12).
- Remove the C- requirement for admission to Math 2415, at the insistence of ENG (page D.Transition 2).

There are some smaller, but similar, changes to make in the Actuarial Science Major and in the Mathematics Minor. But those are for another day.

Sincerely,  
Dan Shapiro

Daniel Shapiro  
Professor and Vice Chair  
Department of Mathematics - OSU

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From: Hadad, Christopher  
Sent: Tuesday, January 24, 2012 3:22 PM  
To: Shapiro, Daniel  
Subject: Re: Approved Math Proposals

Dan,

Melissa said that if you have any difficulty with curriculum.osu.edu, then you can send an email to her and cc Steve Fink and me with the information.

Best regards,

Christopher

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On Jan 24, 2012, at 3:18 PM, Soave, Melissa wrote:

You're welcome, Chris. And, it doesn't need to go through curriculum.  
An attachment of corrected pages is fine. The system isn't really set up for changes, yet.

Best,  
Melissa

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From: Hadad, Christopher [<mailto:hadad.1@osu.edu>]  
Sent: Tuesday, January 24, 2012 3:11 PM  
To: Soave, Melissa  
Cc: Fink, Steven; Vankeerbergen, Bernadette  
Subject: Re: Approved Math Proposals

Thanks, Melissa.

I have spoken to Dan Shapiro and he will submit a memo document via PACER in due course with the changed pages as attachments for the modified Math BA, BS and undergraduate minor proposals. Besides some changes to course numbers, Dan said that Math wants to make some changes for honors degrees. I guess that we will get the specifics soon.

Best regards,

Christopher

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Christopher M. Hadad  
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Associate Dean  
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To: Office of Academic Affairs  
From: Luis Casian, Chair, Department of Mathematics  
Date: January 2011  
Re: Semester program proposals for degree programs in the Department of Mathematics

The following programs in the Department of Mathematics are being converted from the quarter system to the semester system, with minimal changes:

1. BS in Mathematics
2. BA in Mathematics
3. Minor in Mathematics
4. BS in Actuarial Science
5. BA in Actuarial Science
6. MS in Mathematics
7. MMS in Mathematics
8. PhD in Mathematics

During the past year, the Department's Undergraduate Committee and Graduate Studies Committee have worked on semester conversions of those programs. This process involved frequent consultations with faculty members involved with particular courses or course sequences, and involved repeated editing of the conversion documents.

Many changes will also be made to the structure and flow of freshman-level math courses. Since those courses do not involve students enrolled in those eight programs, their changes are not discussed in these program conversion documents.

These proposed conversion plans and transition policies were approved by the Undergraduate and Graduate Committees, and were discussed during a faculty meeting in December 2, 2010. The semester conversion plans were approved by the Department's tenure-track faculty, by a vote of 49 yes and 0 no.

A handwritten signature in blue ink, appearing to read "Luis Casian".

Luis Casian  
Professor and Chair

## **Rationale for semester plans: Minors in Math**

The *standard minor in math* and *honors minor in math* for semesters are primarily direct conversions from previous minor programs in the quarter system. The only is to require all courses that count toward the minor to be math courses. (In an earlier version, at most four semester hours outside of math were allowed to count.)

In quarters, the standard math minor requires 20 credit hours, corresponding to 13.3 semester hours. This minimum is increased to 15 semester hours in order to allow a comparable number of elective courses:

Required Courses in quarters are 60% of the program (12 hours out of 20).

Required Courses in semesters are 66.7% of the program (10 hours out of 15).

The honors math minor involves a similar conversion. The second of three options is eliminated because in the semester system the amount of flexibility in course choices is reduced.

### **Transition plans.**

This minor program requires no special plans for the transition from quarters to semesters. All of the courses involved have analogues in both systems. For students involved in the year of transition, credit hours will be converted using the standard conversion factor.

The appendices below contain more detailed plans for the minor program.

#### **Appendix A:**

Requirements for a standard minor and an honors minor, in both quarter and semester systems.

#### **Appendix B:**

An advising sheet for the minor program.

#### **Appendix C:**

A Curriculum Map listing quarter and semester courses. Program Learning Goals are indicated for each semester course.

#### **Appendix D:**

A list of all undergraduate math courses proposed for the semester system.

**APPENDIX A:****Math Minor (Standard): QUARTERS****Requirements for a MATHEMATICS MINOR (non-Honors students)**

Mathematical methods are used today in the social, biological, and physical sciences. A minor program in mathematics is a useful supplement to a major program in many different areas. The Mathematics Department has a list of suggested electives to complement various major programs.

*The minor must include at least 20 credit hours of mathematics or statistics courses, as listed below. At least 15 of those 20 hours must be from math courses. To count toward the minor, each course must have a grade of C- or better. In addition, the CPHR for courses counted toward the minor must be at least 2.0.*

**0. Prerequisite courses**

Calculus: 151 – 152 - 153.

**I. REQUIRED COURSES**

A. Calculus: 254 (or the corresponding accelerated or honors courses).

B. Foundations of Higher Mathematics: 345 or 190H.

[Note: Math 366 may fulfill this requirement only if it is required for the student's major. Credits for 366 will not count toward the minor.]

C. Linear Algebra: 568 or 571 or 520H (Math 568 and 571 cannot both count on minor.)

**II. ELECTIVE COURSES**

To reach the 20 credit hour minimum, students may select courses from the following list.

- Differential Equations: 255 or 415 or 521H.
- Any 500 level math course, excluding 532 and 588. (Math 568 and 571 cannot both count in the minor.)
- Math 601, 602, 603.02, 606, 607, 618, 647, 648, 649, 665, 666, 701.
- Statistics 420, 421, or 610. Note: At least 15 of the 20 hours counted toward the minor must be in Math.

**III. RESTRICTIONS**

• Courses used to fulfill a student's major requirements **may not** be included in the 20 credit hours required for the minor. Such major courses may be used to fulfill requirements in part I, but none of those credit hours will count toward the minor.

• Each course counted toward the minor must have a grade of C- or better, and the CPHR for all courses counted toward this minor must be at least 2.0.

• Math 487H, 593, or 693 may not be counted in the mathematics minor.

• No more than 10 hours of transfer credit may count toward the mathematics minor.

**Math Minor (Honors): QUARTERS**  
**Requirements for an HONORS MATHEMATICS MINOR**

Mathematical methods are used today in the social, biological, and physical sciences. A minor program in mathematics is a useful supplement to a major program in many different areas. The Mathematics Department has a list of suggested electives to complement various major programs.

*Honors students are expected to complete the Honors Mathematics Minor and are required to fulfill one of the following additional requirements.*

Option #1:

- Complete at least 20 hours of math at the 200 level or above, including the REQUIRED COURSES.
- At least TWO of the courses **must be** Honors math courses.
- Courses that constitute the minor must have a CPHR of at least a 3.0.

Option #2:

- Complete at least 22 hours of math at the 200 level or above to include the REQUIRED COURSES
- At least ONE of the courses MUST BE an Honors math course
- Courses that constitute the minor must have a CPHR of at least a 3.2.

Option #3:

- Complete at least 25 hours of math at the 200 level or above to include the REQUIRED COURSES
- Courses that constitute the minor must have a CPHR of at least a 3.3.

**0. Prerequisite courses**

Calculus: 151 – 152 - 153.

**I. REQUIRED COURSES**

A. Calculus: 254 (or the corresponding accelerated or honors courses).

B. Foundations of Higher Mathematics: 345 or 190H.

[Note: Math 366 may fulfill this requirement only if it is required for the student's major. Credits for 366 will not count toward the minor.]

C. Linear Algebra: 568 or 571 or 520H (Math 568 and 571 cannot both count on minor.)

**II. ELECTIVE COURSES**

To reach the stated minimum hours in Option 1, 2 or 3, students may select courses from the following list.

- Differential Equations: 255 or 415 or 521H
- Any 500 level math course, excluding 532 and 588. (Math 568 and 571 cannot both count in the minor.)
- Math 601, 602, 603.02, 606, 607, 618, 647, 648, 649, 665, 666, 701.
- Statistics 420, 421, or 610. Note: At least 15 of the credit hours counted toward the minor must be in Math.

**III. RESTRICTIONS**

• Courses used to fulfill a student's major requirements **may not** be included in the credit hours required for the minor. Such major courses may be used to fulfill requirements in part I, but none of those credit hours will count toward the minor.

• Each course counted toward the minor must have a grade of C- or better, and the CPHR for all courses counted toward this minor must be at least at the level referenced in Option 1, 2 or 3.

• Math 487H, 593, or 693 may not be used on a minor.

• At least 15 of the credit hours counted toward the minor must be in Math.

• No more than 10 hours of transfer credit may be used on a minor.



**Math Minor: SEMESTERS****Requirements for a MATHEMATICS MINOR (non-Honors students)**

Mathematical methods are used today in the social, biological, and physical sciences. A minor program in mathematics is a useful supplement to a major program in many different areas. The Mathematics Department has a list of suggested electives to complement various major programs.

The minor includes at least 15 semester hours of mathematics courses, as listed below. To complete the Mathematics Minor, the student must have credit for the Required Courses, and each course counted toward the minor must have a grade of C- or better. In addition, the CPHR for courses counted toward the minor must be at least 2.0.

**I. REQUIRED COURSES** (10 credit hours)

- A. Multivariable Calculus: 2153, or 2173, or a corresponding accelerated or honors course.
- B. Foundations of Higher Mathematics: 3345 or 4181H.
- C. Linear Algebra: 2568 or 5520H.

**II. ELECTIVE COURSES** (at least 5 credit hours)

To reach the 15-semester hour minimum, a student may select courses from the following list:

- Differential Equations: 2255 or 2415.
- Any math course numbered 3000 – 5000, except for: 3532, 3588, 3618, x193, and 499x.

**III. RESTRICTIONS**

- Courses used to fulfill a requirement for a student's major **may not** counted toward the minor. Such major courses may be used to fulfill requirements in part I, but none of those credit hours will count toward the minor.
- No more than 8 hours of transfer credit may be counted toward the mathematics minor.

Note: Engineering majors graduating Sp14 or earlier may substitute Math 254 for the required course Math 2153 in the Math Minor.

**Honors Math Minor: SEMESTERS****Requirements for an HONORS MATHEMATICS MINOR**

Mathematical methods are used today in the social sciences as well as the physical and biological sciences. A minor program in mathematics is a useful supplement to a major program in many different areas.

*Honors students who minor in mathematics are expected to complete the Honors Mathematics Minor.*

To complete the Honors Mathematics Minor, a student must have credit for the Required Courses, and fulfill the requirements in one of the following two options. In addition, each course counted toward the minor must have a grade of C- or better,

Option #1:

- Complete at least 15 credit hours of math, chosen from the Required and Elective courses listed below.
- At least TWO of those courses **must be** honors math courses.
- Courses that constitute the minor must have a CPHR of at least a 3.0.

Option #2:

- Complete at least 18 credit hours of math, chosen from the Required and Elective courses listed below.
- Courses that constitute the minor must have a CPHR of at least a 3.3.

**I. REQUIRED COURSES** (10 credit hours)

- A. Multivariable Calculus: 2153, or 2173, or a corresponding accelerated or honors course.
- B. Foundations of Higher Mathematics: 3345 or 4181H.
- C. Linear Algebra: 2568 or 5520H.

**II. ELECTIVE COURSES** (at least 5 credit hours)

To reach the minimum credit hours for one of the options, a student may select courses from the following list:

- Differential Equations: 2255 or 2415
- Any math course numbered 3000 – 5000, except for: 3532, 3588, 3618, x193, and 499x.

**III. RESTRICTIONS**

- Courses used to fulfill a requirement for a student's major **may not** be counted toward the minor. (They are not included in the credit hours counted in Option 1 or Option 2.) Such major courses may be used to fulfill requirements in part I, but none of those credit hours will count toward the minor.

- No more than 8 hours of transfer credit may be counted toward the mathematics minor.

Note: Engineering majors graduating Sp14 or earlier may substitute Math 254 for the required course Math 2153 in the Math Minor.

**APPENDIX B: Mathematics Minor Program Form**

The Ohio State University  
College of the Arts and Sciences

Name \_\_\_\_\_

OSU email (name.n) \_\_\_\_\_ Student Number \_\_\_\_\_

This form should be submitted to your college or school office.

College/School of enrollment \_\_\_\_\_ Major \_\_\_\_\_

Expected date of graduation \_\_\_\_\_

Have you filled a degree application in your college office? YES \_\_\_ NO \_\_\_

Circle one: Standard Minor Honors Minor Option #1 Honors Minor Option #2

Course	Hours	Final Grade
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

Total Hours \_\_\_\_\_ GPA in Minor Courses \_\_\_\_\_ . Circle One: Original Revision

Approved by: \_\_\_\_\_  
Signature of Faculty Advisor or College/School Counselor Date

Print Name of Faculty Advisor or College/School Counselor

Academic Unit Campus phone and/or e-mail

Math Minor (20 quarter credit hours become 15 semester credit hours)								
Segment of minor program	Quarter course #	Quarter course name	Credit hours	Semester course #	Semester course name	Units	Learning outcome	Nature of conversion
<b>Prerequisites (15 quarter credit hours become 10 semester credit hours; some may double-count in GEC)</b>								
	Math 151.xx	Calculus and Analytic Geometry I	5	Math 1151	Calculus 1	5	1, 2*, 3	1151-1152 replace 151-152-153
	Math 152.xx	Calculus and Analytic Geometry II	5	Math 1152	Calculus 2	5	1, 2*, 3	
	Math 153.xx	Calculus and Analytic Geometry III	5					
<b>Core minor requirements (12 quarter credit hours become 10 semester credit hours)</b>								
	Math 254	Calculus and Analytic Geometry IV	5	Math 2153	Calculus 3	4	2*, 3	expands on 254
	Math 345	Foundations of Higher Mathematics	4	Math 3345	Foundations of Higher Mathematics	3	1**, 2**, 3*, 4**	expands on 345
	Math 568	Linear Algebra	3	Math 2568	Linear Algebra	3	2**, 3**, 4*	expands on 568 or 571
<b>Electives (8 quarter credit hours become 5 semester credit hours)</b>								
	Math 255 or Math 415 or	Differential Equations and Their Applications Ordinary and Partial Differential Equations	5 4	Math 2255 Math 2415	Differential Equations and Their Applications Ordinary and Partial Differential Equations	3 3	1, 2*, 3*, 4 1, 2*, 3*, 4	replaces 255 expands on Math 415
		any 500 level course, excluding Math 532 or Math 588 (A list of further possibilities is provided below.)	3, 4 5		any 3000 to 5000 level math course, excluding 3532 and 3588, (A list of further possibilities is provided below.)	3 or 5		
	Math 601	Mathematical Principles in Science I	3	Math 5101	Linear Mathematics in Finite Dimensions	3	3**, 4	math 5101 & 5102 replace 601, 602 & 603.02
	Math 602	Mathematical Principles in Science II	3	Math 5102	Linear Mathematics in infinite Dimensions	3	3**, 4	
	Math 607	Essentials of Numerical Analysis	5	Math 3607	Beginning Scientific Computing	3	3, 4**	new course, some of math 607 topics
	Math 618	Theory of Interest	4	Math 3618	Theory of Interest	3	3, 4*	replaces Math 618
	Math 647	Set Theory	3	Math 5001	Intro to Set Theory	3	1**, 3**, 4	expands on Math 647
	Math 648	Mathematical Logic I	3	Math 5051	Intro to Mathematical Logic	3	1**, 3**, 4	Math 5051 replaces Math 648 & 649
	Math 649	Mathematical Logic II	3					
	Math 665	Applied Differential Geometry I	4	Math 5756	Math Methods in Relativity Theory 1	3	3*, 4*	replaces 665
	Math 666	Applied Differential Geometry II	4	Math 5757	Math Methods in Relativity Theory 2	3	3*, 4*	replaces 666
	Math 701	Calculus of Variation & Tensors	5	Math 5451	Calculus of Variation & Tensor Calculus	3	3*, 4*	replaces 701
	Stat 420	Introduction to Mathematical Statistics I	5					
	Stat 421	Introduction to Mathematical Statistics II	5					
	Stat 610	Probability for Statistical Inference	5					
<b>Minor program learning outcomes</b>								
	<b>1</b>	Learn conceptual frameworks needed to study higher mathematics, including an introduction to mathematical reasoning, and an understanding of how to read and write proofs.						
	<b>2</b>	Acquire basic mastery of core areas of mathematics, including calculus, analysis and algebra.						
	<b>3</b>	Develop powerful mathematical problem solving skills.						
	<b>4</b>	Learn to effectively communicate mathematical understanding.						

<b>CHANGES in Math Course Numbers (sort by Semester #)</b> Aug 2011			
key: color = an essentially new course; indent = might not run. (temporary transition courses are not included)			
Semester #	Quarter #	Units	Semester Course Name
1050	50 + part of 75	5	Pre-College Mathematics 1
1075	104	4	Pre-College Mathematics 2
1116	116	3	Excursions in Mathematics
1118	-	3	Mathematics for Architects
1125	105 + part 106	5	Mathematics for Elementary Teachers 1
1126	part 106 + 107	5	Mathematics for Elementary Teachers 2
1130	130 + part 132	4	College Algebra for Business
1131	131 + part 132	5	Calculus for Business
1148	148 + part 150	4	College Algebra
1149	part 150 + 148	3	Trigonometry
1150	150 + 148	5	Pre-Calculus
1151	151 + part 152	5	Calculus 1
1152	part 152 + 153	5	Calculus 2
1156	151.03, 152.03	5	Calculus for the Biological Sciences
1157	-	5	Mathematical Modeling for the Biological Sciences
1161.01	161.01, 162.01	5	Accelerated Calculus 1
1161.02	161.02, 162.02	5	Accelerated Calculus 1 for Honors Engineers
1165	108 + part 110	5	Mathematics for Middle School Teachers 1
1166	109 + part 110	5	Mathematics for Middle School Teachers 2
1172	part 152+153+254	5	Engineering Mathematics A
1181H	161H + part 162H	5	Honors Calculus 1
1187	187	1 – 2	Problem Solving
1187H	187H, 487H	1 – 2	Honors Problem Solving
1193	193	1 – 5	Individual Studies
1194	194	1 – 5	Group Studies
1194H	194H	1 – 5	Honors Group Studies
1295	-	1	Introductory Seminar for math majors
2153	254	4	Calculus 3
2162.01	162.02, 263.02	5	Accelerated Calculus 2 for Math and Science
2162.02	162.01, 263.02	5	Accelerated Calculus 2 for Honors Engineers
2167	111	3	Calculus for Middle School Teachers
2168	212	3	History of Mathematics for Middle School Teachers
2173	part 152+153+254	3	Engineering Mathematics B
2174	part 568 + 415	3	Linear Algebra and Differential Equations
2177	part 254+568+415	4	Mathematical Topics for Engineers
2182H	part 162H + 263H	5	Honors Calculus 2
2191.01	ASC 489.01	2	Field Experience for credit
2191.02	ASC 489.02	0	Field Experience for non-credit
2193	193	1 – 5	Individual Studies
2194	294	1 – 5	Group Studies
2255	255	3	Differential Equations and Their Applications
2366	366	2	Introduction to Discrete Mathematics (for Business)
2415	415.xx	3	Ordinary and Partial Differential Equations
2566	566 + 366	3	Discrete Mathematics (for CIS, CSE, ECE)
2568	568/ 571, 572	3	Linear Algebra

**CHANGES in Math Course Numbers (sort by Semester #)** Aug 2011

Semester #	Quarter #	Units	Semester Course Name
3295	-	1	Senior Seminar for math majors
3345	345	3	Foundations of Higher Mathematics
3350	350	3	Introduction to Mathematical Biology
3532	532	3	Mathematical Foundations of Actuarial Science
3588	588	3	Practicum in Actuarial Science
3589	589	3	Introduction to Financial Mathematics
3607	part of 607	3	Beginning Scientific Computing
3618	618	3	Theory of Interest
4181H	190H, 191H	5	Honors Analysis 1
4182H	264H	5	Honors Analysis 2
4193	593	1 – 5	Individual Studies
4194	594	1 – 5	Group Studies
4504	504	3	History of Mathematics
4507	507	3	Geometry
4512	512 or 557	3	Applied Partial Differential Equations (for engineers)
4530	530	3	Probability
4545	-	4	Survey of topics in analysis (for Stat grad students)
4547	547+ part 548	3	Introductory Analysis 1
4548	part 548 + 549	3	Introductory Analysis 2
4551	513 or 551	3	Vector Analysis
4552	514 or 552	3	Complex Analysis
4556	556	3	Dynamical Systems
4557	557	3	Partial Differential Equations
4568	568/ 571, 572	3	Linear Algebra (for Eng grad students)
4573	573	3	Elementary Number Theory
4575	575	3	Combinatorial Mathematics and Graph Theory
4578	578	4	Discrete Mathematical Models
4580	580 + part 581	3	Abstract Algebra 1
4581	part 581 + 582	3	Abstract Algebra 2
4998	783	1 – 5	Undergraduate Research
4999	783	1 – 5	Undergraduate Thesis
4998H	783H	1 – 5	Honors Undergraduate Research
4999H	783H	1 – 5	Honors Undergraduate Thesis
5193	693	1 – 5	Individual Studies
5194	694	1 – 5	Group Studies
5194H	594H	1 – 5	Honors Group Studies
5520H	520H, 521H	5	Honors Linear Algebra and Differential Equations
5522H	522H	5	Honors Complex Analysis
5529H	594H (575H)	5	Honors Combinatorics
5530H	531H	5	Honors Probability
5540H	540H, 541H	5	Honors Differential Geometry
5576H	576H, 577H	5	Honors Number Theory
5590H	590H, 591H	5	Honors Abstract Algebra 1
5591H	592H	5	Honors Abstract Algebra 2
5630	630	3	Life Contingencies 1
5631	631	3	Life Contingencies 2
5632	632	3	Financial Economics
5633	-	3	Loss Models 1
5634	-	3	Loss Models 2

**Freshman & Sophomore Math Course Sequences:**

Standard:	1151	-	1152	-	2153	-	2568	-	{2255 or 2415}
Engineering:	1151	-	1172	-	2173	-	2174		
Engineering:	1151	-	1172	-	2177				
FEH:	1161.02	-	2162.02	-	2568	-	2415		
Honors Calculus:	1181H	-	2182H		Honors Analysis:	4181H	-	4182H	

# BS in Actuarial Science

Department of Mathematics, OSU

## TABLE OF CONTENTS.

0. Letter from Department Chair.
1. Program learning goals.
2. Rationale for changes.
3. List of semester courses.
4. Advising sheets for quarter system and semester system.
5. Four-year plan of courses
6. Application to enter the major.
7. Transition policies.
8. Curriculum map.



To: Office of Academic Affairs  
From: Luis Casian, Chair, Department of Mathematics  
Date: January 2011  
Re: Semester program proposals for degree programs in the Department of Mathematics

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During the past year, the Department's Undergraduate Committee and Graduate Studies Committee have worked on semester conversions of those programs. This process involved frequent consultations with faculty members involved with particular courses or course sequences, and involved repeated editing of the conversion documents.

Many changes will also be made to the structure and flow of freshman-level math courses. Since those courses do not involve students enrolled in those eight programs, their changes are not discussed in these program conversion documents.

These proposed conversion plans and transition policies were approved by the Undergraduate and Graduate Committees, and were discussed during a faculty meeting in December 2, 2010. The semester conversion plans were approved by the Department's tenure-track faculty, by a vote of 49 yes and 0 no.

A handwritten signature in blue ink, appearing to read "Luis Casian".

Luis Casian  
Professor and Chair



## 1. Program Learning Goals.

Students majoring in actuarial science will:

- (1) acquire a strong general background in mathematics, statistics, and relevant concepts from actuarial science and business;
- (2) develop analytical and problem solving skills;
- (3) be prepared to pass national actuarial examinations administered by the Society of Actuaries and the Casualty Actuarial Society.

## 2. Rationale for Changes in the Actuarial Sciences Major.

Changes to the actuarial science major can be summarized as follows:

- (a) *One required course in probability instead of two.*

Two probability courses (Math 530 and Stat 420) are currently required, but only one is required in the proposed semester program. The 3-credit course Math 530 alone does not provide enough preparation for students for the actuarial exam in probability, so an additional statistics course was required. Each of the semester courses Math 4530 and Stat 4201 will cover enough probability to prepare students for the actuarial exam, so the major requires students to take only one of those two courses.

- (b) *Change of one required course to elective.*

With changes in the curriculum of professional exams, the currently required Math 532 has become a course designed for exam preparation. We propose to drop the corresponding semester course Math 3532 as a requirement, and list it as an free elective course.

- (c) *New course sequence in loss models.*

Courses in the current major program cover topics for all the initial actuarial exams except one, Exam C/4: Construction and Evaluation of Models. In the semester plan, two elective courses are proposed, Math 5633 and 5634. With the addition of this two-course sequence, the courses will cover all five preliminary exams administered by the Society of Actuaries (SOA) and Casualty Actuarial Society (CAS). Students can take this sequence instead of Math 5630 and 5631 to fulfill part of the major requirements, and students on fast track can take both sequences while at OSU. The addition of this new sequence gives our students a more flexible and complete actuarial education.

(d) *Enrollment control: Creation of a Pre-Major.*

In recent years the number of actuarial science majors has increased sharply, from about 80 students in 2005 to 300 students at the end of 2010. This increase causes several symptoms of stress:

- More than one-quarter of current majors have marginal performance and struggle to find internships and jobs as actuaries.
- Actuarial advisors and coordinators are seriously overburdened.
- All courses taken by actuarial science majors are full, with waiting lists.

By analyzing grades in various courses taken fairly early by actuarial science majors, we found that the probability course is a reliable indicator of success. Therefore we plan to create a pre-major program to provide an early warning to the weakest students that this major might not be fruitful for them.

To apply to be an Actuarial Science major, a student must

- (1) have a cumulative GPA (for courses at Ohio State) of at least 3.0; and
- (2) either earn a B- or better in a Probability course taken at Ohio State (Math 4530, Stat 4201, or Math 5530H)\*; or pass one of the actuarial exams administered by SOA/CAS.

The number of students admitted to the major will equal the Actuarial Science Program's enrollment capacity. If the number of qualified applicants exceeds that capacity, admission to the major will be based on the student's grade point average in relevant math courses.

Students have until the second Friday of each semester to file an application to enter the major. An Actuarial Science Committee will review the files and notify applicants of the Committee's decisions. Students who have not gained admission to the major may reapply in subsequent semesters. Students who want their application to be reconsidered may file an appeal with the Actuarial Science Committee.

With this plan, together with advising by the math counselors and faculty advisers, nearly all pre-majors in Actuarial Science will know early in their third year whether they will be able to enter the major. Pre-majors who are not admitted to this major will most naturally move toward the financial track of the mathematics major.

---

\* May also use Math 530, Math 531H, or Stat 420 to fulfill this requirement.

(e) *Courses that count toward two degree programs.*

In recent years, many academically strong students majoring in actuarial science have worked toward double majors and dual degrees. The Department of Mathematics has implemented the following exclusion rule for courses in linear algebra, probability, and mathematical statistics. The goal is to ensure that actuarial science majors working toward a second bachelor's degree are designing programs that are reasonable disjoint from one another,

Double-counting rule for dual degrees:

For students pursuing a dual degree, any of the courses:

{ Math 2568, Math 5520H, Math 4530, Math 5530H, Stat 4201, Stat 4202 },  
may be counted toward an actuarial science major only if that course is not counted as a prerequisite or as a requirement for a degree in another College.

3. List of semester courses used by majors in Actuarial Science.

- Required Prerequisites
  - (a) Math 1151: Calculus I (5 cr)
  - (b) Math 1152: Calculus II (5 cr)
  - (c) CSE 2111: Modeling and Problem Solving with Spreadsheets and Databases (3 cr);  
or  
CSE 1222, Intro to Programming in C++ (3 cr); or  
CSE 1223, Intro to Programming in Java (3 cr)
  - (d) Econ 2001.01: Microeconomics (3 cr)\*
  - (e) Econ 2002.01: Macroeconomics (3 cr)\*
  - (f) AcctMIS 2000: Foundations of Accounting (3 cr)
- Required Courses
  - (g) Math 2153: Calculus 3 (4 cr)
  - (h) Math 2568: Linear Algebra (3 cr)
  - (i) Math 3618: Theory of Interest (3 cr)
  - (j) Stat 4201: Introduction to Mathematical Statistics I (4 cr)  
or Math 4530: Probability (3 cr)
  - (k) Stat 4202: Introduction to Mathematical Statistics II (4 cr)
  - (l) Math 3588: Practicum in Actuarial Science (3 cr)
  - (m) Math 5630: Life Contingencies 1 (3 cr); or  
Math 5633: Loss Models 1 (3 cr)
  - (n) Math 5631: Life Contingencies 2 (3 cr); or  
Math 5634: Loss Models 2 (3 cr)
  - (o) Math 5632: Financial Economics (3 cr)
  - (p) Bus Fin 2220 or 2120: Business Finance (3 cr)
- Recommended Courses (if not taken as a required course)
  - (q) Math 3532: Mathematical Foundations of Actuarial Science (3 cr)
  - (r) Math 4530: Probability (3 cr)
  - (s) Math 5630: Life Contingencies 1 (3 cr)
  - (t) Math 5631: Life Contingencies 2 (3 cr)
  - (u) Math 5633: Loss Models 1 (3 cr)
  - (v) Math 5634: Loss Models 2 (3 cr)

Students can complete this major by taking at most 18 credit hours per semester.

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\*Econ 2001.02 & 2002.02 are intended for economics majors. Those courses can substitute for the .01 courses .

4. Comparison of Advising Sheets for Quarters and Semesters.

Current advising form for quarters:

**MAJOR PROGRAM FORM (QUARTERS)**  
College of Arts and Sciences

			Actuarial Science
Name: last	first	middle	Major

OSU email address (name.n):	Student number:
Degree Sought (circle one): <b>BS</b> <b>BA</b>	Expected date of graduation (qtr/yr):

Have you filed a degree application in the college office? (circle one):      YES      NO
---

(NOTE: This form is NOT a degree application)

If completing two majors, list both of them below, and file a separate form for each one:

--	--

Part A: Required Prerequisites (and / or supplementary requirements)

Courses	Hours	Grade	Courses	Hours	Grade
Econ 200	5		Math 151	5	
Econ 201	5		Math 152	5	
Acct 310	5		Math 153	5	

Part B: Major Program (Minimum grade of "C-", and minimum grade average of "C" (2.00) required.)  
Core Requirements (Substitutions are rarely permitted)

Courses	Hours	Grade	Courses	Hours	Grade
Math 254	5		Math 618	4	
Math 568	3		Math 630	4	
Math 530	3		Math 631	4	
Math 532	3		Math 632	4	
Stat 420	5		Math 588	4	
Stat 421	5		Bus Fin 620	4	
CSE 200, 201, or 221	5				

53

Total of Part B only

Check whether this is:	x	
------------------------	---	--

See back for information about major programs.      original      revision

Distribution: One copy each - Faculty adviser, Student, College Office, 130 Denney Hall

Signature of faculty adviser	
Name of adviser (please print)	
Mathematics	292-
Department	Campus phone
	Date:

Proposed advising form for semesters:

**MAJOR PROGRAM FORM (SEMESTERS)**  
College of Arts and Sciences

			Actuarial Science
Name: last	first	middle	Major

OSU email address (name.n):	Student number:
Degree Sought (circle one): <b>BS</b> BA	Expected date of graduation (sem/yr):

Have you filed a degree application in the college office? (circle one):     YES     NO
---

(NOTE: This form is NOT a degree application)

If completing two majors, list both of them below, and file a separate form for each one:

--	--

Part A: Required Prerequisites (and / or supplementary requirements)

Courses	Hours	Grade	Courses	Hours	Grade
Econ 2001.01	3		Math 1151	5	
Econ 2002.01	3		Math 1152	5	
Acct 2000	3		CSE 2111, 1222, or 1223	3	

Part B: Major Program (Minimum grade of "C-", and minimum grade average of "C" (2.00) required.)

Core Requirements (Substitutions are rarely permitted)

NOTE: Honors math courses may substitute for corresponding non-honors courses.

Courses	Hours	Grade	Courses	Hours	Grade
Math 2153	4		Math 3588	3	
Math 2568	3		Math 3618	3	
Math 4530 or Stat 4201	3 or 4		Math 5630 & 5631 or Math 5633 & 5634	3 & 3	
Stat 4202	4				
Bus Fin 2220 or 2120	3 or 3		Math 5632	3	

32 or 33

Total of Part B only

Check whether this is:	x	
------------------------	---	--

See back for information about major programs.     original     revision

Distribution: One copy each - Faculty adviser, Student, College Office, 130 Denney Hall

--

Signature of faculty adviser

--

Name of adviser (please print)

Mathematics	292-
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Department

Campus phone

	Date:
--	-------

5. Four year plans.

**SAMPLE FOUR-YEAR PLAN**

Note. *Italic* indicates prerequisite courses, not counted in the major.

**Actuarial Science, Quarters**

	Au	Wi	Sp	Hours in major
YR 1.	<i>Math 151 (5)</i> CSE 200 (5) GECs	<i>Math 152 (5)</i> <i>Econ 200 (5)</i> GECs	<i>Math 153 (5)</i> <i>Econ 201 (5)</i> GECs	0
YR 2.	Math 254 (5) <i>Acct 310 (5)</i> GECs	Math 568 (3) GECs	GECs	13
YR 3.	Math 618 (4) Math 530 (3) GECs	Stat 420 (5) Bus Fin 620 (4) GECs	Math 588 (4) Math 532 (3) GECs SOA Exam P	21
YR 4.	Math 630 (4) SOA Exam FM	Math 631 (4) GECs	Math 632 (4) Stat 421 (5) GECs	17

**Actuarial Science, Semesters**

	Au	Sp	Hours in major
YR 1.	<i>Math 1151 (5)</i> CSE 2111, 1222, 1223 (3) <i>Econ 2001.01 (3)</i> GEs	<i>Math 1152 (5)</i> <i>Acct 2000 (3)</i> <i>Econ 2002.01 (3)</i> GEs	0
YR 2.	Math 2153 (4) Math 3618 (3) GEs	Math 2568 (3) Math 4530 (3) or Stat 4201 (4) SOA Exam FM	13 or 14
YR 3.	Stat 4202 (4) Math 5632 (3) SOA Exam P	Math 3588 (3) Bus Fin 2220 or 2120 (3) GEs	13
YR 4.	Math 5630* (3) GEs	Math 5631* (3) SOA Exam MFE	6

\* 5630-5631 may be replaced by 5633-5634.

6. Application to enter the major.

**Application to enter the Actuarial Sciences Undergraduate Major**

**The Ohio State University  
College of the Arts and Sciences**

**Full Name** \_\_\_\_\_

**OSU ID** \_\_\_\_\_

**OSU E-Mail (name.n)** \_\_\_\_\_

This completed and signed form should be submitted to your college office.

To be admitted as an Actuarial Science major, a student must

(1) have a cumulative GPA (for courses at Ohio State) of at least 3.0; **and**

(2) either

(i) earn B- or better in Math 4530, Stat 4201, or Math 5530H, taken at Ohio State; or

(ii) pass one of the actuarial exams administered by SOA/CAS.

**(1) Total hours of courses taken at OSU** \_\_\_\_\_ **GPA in those courses** \_\_\_\_\_

**(2):**

(i) (circle one) **Math 4530, Math 5530H, or Stat 4201** **Final Grade** \_\_\_\_\_

OR

(ii) **Actuarial Exam:** \_\_\_\_\_ **Date** \_\_\_\_\_

Attach a copy of official notice from SOA/CAS showing your passing of the exam.

**APPROVED BY:** \_\_\_\_\_

Signature of Math Dept. Representative

Date

\_\_\_\_\_  
Print Name of Math Dept. Representative

\_\_\_\_\_  
Academic Unit

\_\_\_\_\_  
Campus phone and/or e-mail



## 7. Transition Policies.

Except for probability, all courses and course sequences required by this major have simple and direct correspondences between quarter versions and semester versions. Further details of those correspondences appear on the Curriculum Map in Section 8 below.

Actuarial science majors will not have their graduation delayed because of the University's conversion to semesters.

### **Probability requirement.**

Rules are changing for Math 530 and Stat 420. In the quarter system, majors in actuarial science were required to have credit for both of those courses. With semesters, majors need credit for only one of the corresponding courses, Math 4530 or Stat 4201. In addition, for a student who has not passed one of the actuarial exams, the pre-major requires that student to take either Math 4530 or Stat 4201 at Ohio State, and to earn a grade of B- or better.

The pre-major requirements will apply to students who declare an Actuarial Science major in Autumn 2012 or later. Students who declare the major before Au12 are allowed to fulfill this requirement in two different ways:

- (1) pass both Math 530 and Stat 420, or
- (2) earn B- or better in one of Math 530 or Stat 420.

Transition plans and policies for all freshman and sophomore math courses are described in separate documents posted at the Math Department's web page

<http://www.math.ohio-state.edu/semesters>.

**Actuarial Science Major**  
Sample curricula for students at different stages of the semester transition

Graduating ≤ Sp12	Graduating Sp13	Graduating Sp14	Graduating Sp15	Graduating ≥ Sp16
(Au08)	(Au09)	(Au10)	(Au11)	(Au12)
Math 151 (Calc I) 5	Math 151 (Calc I) 5	Math 151 (Calc I) 5	Math 151 (Calc I) 5	Math 1151 (Calc 1) 5
Math 152 (Calc II) 5	Math 152 (Calc II) 5	Math 152 (Calc II) 5	Math 152 (Calc II) 5	Math 1152 (Calc 2) 5
Math 153 (Calc III) 5	Math 153 (Calc III) 5	Math 153 (Calc III) 5	Math 153 (Calc III) 5	CSE 2111 (Prob Solv) 3
CSE 200 (Prob Solv) 5	CSE 200 (Prob Solv) 5	CSE 200 (Prob Solv) 5	CSE 200 (Prob Solv) 5	Econ 2001.01 (Micro) 3
Econ 201 (Micro) 5	Econ 201 (Micro) 5	Econ 201 (Micro) 5	Econ 201 (Micro) 5	Econ 2002.01 (Macro) 3
Econ 202 (Macro) 5	Econ 202 (Macro) 5	Econ 202 (Macro) 5	Econ 202 (Macro) 5	GEs
GECs	GECs	GECs	GECs	
Math 254 (Cal IV) 5	Math 254 (Calc IV) 5	Math 254 (Calc IV) 5	Math 2153 (Calc 3) 4	Math 2153 (Calc 3) 4
Math 568 (Lin Alg) 3	Math 568 (Lin Alg) 3	Math 568 (Lin Alg) 3	Math 2568 (Lin Alg) 3	Math 2568 (Lin Alg) 3
Acct 310 (Fdn of Acct) 5	Acct 310 (Fdn of Acct) 5	Acct 310 (Fdn of Acct) 5	Acct 2000 (Fdn of Acct) 3	Acct 2000 (Fdn of Acct) 3
GECs	GECs	GECs	GEs	GEs
Math 618 (Thy of Int) 4	Math 618 (Thy of Int) 4	Math 3618 (Thy of Int) 3	Math 3618 (Thy of Int) 3	Math 3618 (Thy of Int) 3
Math 530 (Prob) 3	Math 530 (Prob) 3	Math 4530 (Prob) 3	Math 4530 (Prob) 3	Math 4530 (Prob) 3
Stat 420 (Math Stat I) 5	Stat 420 (Math Stat I) 5	Stat 4202 (Stat 2) 4	Stat 4202 (Stat 2) 4	Stat 4202 (Stat 2) 4
Bus Fin 620 (Finance) 4	Bus Fin 620 (Finance) 4	Bus Fin 2220 (Finance) 3	Bus Fin 2220 (Finance) 3	Bus Fin 2220 (Finance) 3
Math 588 (Practicum) 4	Math 588 (Practicum) 4	Math 3588 (Practicum) 3	Math 3588 (Practicum) 3	Math 3588 (Practicum) 3
Math 532 (Math Fdns) 3	Math 532 (Math Fdns) 3	GEs	GEs	GEs
GECs	GECs			
Math 630 (Act Math I) 4	Math 5630 (Life Ctg 1) 3	Math 5630 (Life Ctg 1) 3	Math 5630 (Life Ctg 1) 3	Math 5630 (Life Ctg 1) 3
Math 631 (Act Math II) 4	Math 5631 (Life Ctg 2) 3	Math 5631 (Life Ctg 2) 3	Math 5631 (Life Ctg 2) 3	Math 5631 (Life Ctg 2) 3
Math 632 (Act Math III) 4	Math 5632 (Fin Econ) 3	Math 5632 (Fin Econ) 3	Math 5632 (Fin Econ) 3	Math 5632 (Fin Econ) 3
Stat 421 (Math Stat II) 5	Stat 4202 (Stat 2) 4	GEs	GEs	GEs
GECs	GEs			

Actuarial Science Major 45 or 48 quarter credit hrs become 32 or 33 semester credit hrs.									
Segment of major program	Quarter course #	Quarter course name	Credit hours	Semester course #	Semester course name	Units	Learning outcome	Nature of conversion	
Prerequisites (30 quarter credit hours become 22 or 23 semester credit hours; some may double-count in GEC)									
	Math 151	Calculus and Analytic Geometry I	5	Math 1151	Calculus 1	5	1, 2, 3	Math 1151-1152 replace 151-152-153	
	Math 152	Calculus and Analytic Geometry II	5	Math 1152	Calculus 2	5	1, 2, 3		
	Math 153	Calculus and Analytic Geometry III	5						
	Acct 310	Foundations of Accounting	5	Acct 2000	Foundations of Accounting	3	1	Acct 2000 replaces Acct 310	
	Econ 200	Principles of Microeconomics	5	Econ 2001.01	Principles of Microeconomics	3	1	Econ 2001.01 replaces Econ 200	
	Econ 201	Principles of Macroeconomics	5	Econ 2002.01	Principles of Macroeconomics	3	1	Econ 2002.01 replaces Econ 200	
				CSE 2111, CSE 1223, or CSE 1222	Modeling & Pro Solv with Spreadsheets & Databases, or Intro to Computer Prog. in Java, or Intro to Computer Prog. in C++	3	1, 2*	replaces CSE 200, replaces CSE 201, replaces CSE 202	
Major requirements (45 or 48 quarter credit hours become 32 or 33 semester credit hours)									
	Math 254	Calculus and Analytic Geometry IV	5	Math 2153	Calculus 3	4	1*, 2*, 3	expands on 254	
	Math 568	Linear Algebra	3	Math 2568	Linear Algebra	3	1*, 2, 3	expands on 568 or 571	
	Math 530 or Stat 420	Probability Introduction to Mathematical Statistics I	3 or 5	Math 4530 or Stat 4201	Probability Introduction to Mathematical Statistics 1	3 or 4	1**, 2*, 3**	expands on Math 530, expands on Stat 420	
	Stat 421	Introduction to Mathematical Statistics II	5	Stat 4202	Introduction to Mathematical Statistics 2	4	1**, 2**, 3**	replaces Stat 421	
	Math 588	Practicum in Actuarial Science	4	Math 3588	Practicum in Actuarial Science	3	2*, 3**	replaces 588	
	Math 618	Theory of Interest	4	Math 3618	Theory of Interest	3	1*, 2**, 3**	expands on 618	
				One of the following two-course sequences:					
	Math 630	Actuarial Mathematics I	4	Math 5630	Life Contingencies 1	3	1*, 2**, 3**	replaces 630	
	Math 631	Actuarial Mathematics II	4	Math 5631	Life Contingencies 2	3	1*, 2**, 3**	replaces 631	
				Math 5633	Loss Models 1	3	1*, 2**, 3**	New courses.	
				Math 5634	Loss Models 2	3	1*, 2**, 3**		
	Math 632	Actuarial Mathematics III	4	Math 5632	Financial Economics	3	1*, 2**, 3**	expands on 632	
	Bus 420 or Bus 620	Foundations of Finance or Business Finance	4	Bus 2220 or Bus 2120	Business Finance	3 or 3	1*, 2, 3	replaces Bus 420, replaces Bus 620	
	Math 532	Mathematical Foundations of Actuarial Science	3					Semester version listed below: recommended.	
	CSE 200, 201, or 202	Computer Assisted Problem Solving for Business, Elementary Computer Programming, or Intro. To Programming & Algorithms for Engineers & Scientists	5 4 4					Semester versions are at 1000 level; listed above as prerequisites.	
Recommended extra courses									
				Math 3532	Mathematical Foundations of Actuarial Science	3	1*, 2*, 3**	3532 replaces 532; No longer required	
Major program learning outcomes									
Students will:	1	Acquire a strong general background in mathematics, statistics, and relevant concepts from actuarial science and business.							
	2	Develop analytical and problem solving skills.							
	3	Be prepared to pass national actuarial examinations administered by the Society of Actuaries and the Casualty Actuarial Society.							
* Learning outcomes are indicated for each course listed. Number of asterisks indicates level: none indicates beginning level, one is intermediate, two is advanced.									

# BA in Mathematics

Department of Mathematics, OSU

Note: BA and BS documents are identical for this major, except for the change of name. The only differences are in details of General Education requirements.

## TABLE OF CONTENTS.

- 0. Letter from Department Chair.
- 1. Rationale for semester plans.

## APPENDICES:

- A. Major program forms.
- B. Curriculum maps.
- C. Four-year plans.
- D. Transition policies.
- E. Generic course schedule.



To: Office of Academic Affairs  
From: Luis Casian, Chair, Department of Mathematics  
Date: January 2011  
Re: Semester program proposals for degree programs in the Department of Mathematics

The following programs in the Department of Mathematics are being converted from the quarter system to the semester system, with minimal changes:

1. BS in Mathematics
2. BA in Mathematics
3. Minor in Mathematics
4. BS in Actuarial Science
5. BA in Actuarial Science
6. MS in Mathematics
7. MMS in Mathematics
8. PhD in Mathematics

During the past year, the Department's Undergraduate Committee and Graduate Studies Committee have worked on semester conversions of those programs. This process involved frequent consultations with faculty members involved with particular courses or course sequences, and involved repeated editing of the conversion documents.

Many changes will also be made to the structure and flow of freshman-level math courses. Since those courses do not involve students enrolled in those eight programs, their changes are not discussed in these program conversion documents.

These proposed conversion plans and transition policies were approved by the Undergraduate and Graduate Committees, and were discussed during a faculty meeting in December 2, 2010. The semester conversion plans were approved by the Department's tenure-track faculty, by a vote of 49 yes and 0 no.

A handwritten signature in blue ink, appearing to read "Luis Casian".

Luis Casian  
Professor and Chair

**Rationale for semester plans: BS and BA in Math**

Note: BA and BS major requirements are identical for this major.  
The only differences are in details of General Education requirements.

**Tracks (sub-plans) within the mathematics major.**

The Department of Mathematics currently offers a BS in Mathematics, with six tracks within that major. With the conversion to semesters we will eliminate the *Applied Discrete Math* track, because of low enrollments. The remaining five tracks are

- Theoretical Mathematics
- Education Mathematics
- Bio-Mathematics
- Applied Mathematics
- Financial Mathematics

These will be implemented as sub-plans within the mathematics major.

**Transcript.**

The Department requests that the name of the sub-plan appear explicitly on each student's transcript.

**Changes in credit hours.**

This chart displays the numbers of credit hours required in the different tracks (sub-plans).

Track	Quarter hrs	(2/3)*Quarter	Semester hrs	Δ
Theoretical	53 – 55 5 out & 48 in 10 out & 45 in	35.3 – 36.7	38 – 39 4 out & 34 in 8 out & 31 in	+ 2.7
Education	53 – 55 5 out & 48 in 10 out & 45 in	35.3 – 36.7	39 – 40 4 out & 34 in 8 out & 31 in	+ 3.3 to + 3.7
Bio-Math	56 – 60 19 out & 37 in 26 out & 34 in	38.0 – 40.0	39 – 41 4 out & 35 in 15 out & 26 in	+ 3 to + 2.0
Applied	58 – 60 14 out & 44 in 19 out & 41 in	38.7 – 40.0	41 – 42 10 out & 31 in 14 out & 28 in	+ 2.3 to + 2.0
Financial	57 – 59 14 out & 43 in 19 out & 40 in	38.0 – 39.3	41 – 42 10 out & 31 in 14 out & 28 in	+ 3 to + 2.7

**Honors.**

Honors versions of courses are not mentioned explicitly within this documentation of the math major tracks. The understanding is that a student may replace a course requirement by an honors version of that course (if such an honors version is offered).

The Department of Mathematics has an active honors program, allowing strong undergraduate students to take four years of honors math courses.

To complete an ASC honors contract in Mathematics (in any track), a student must fulfill the course requirements listed below\*. Moreover, the GPA computed for all the courses taken to fulfill this requirement must be at least 2.7 (B- average).

- Honors analysis sequence (1181H - 2182H or 4181H - 4182H); and
- Four semesters of honors math courses beyond honors calculus.  
[Note: 1181H, 2182H, 4181H, and 4182H do not count in this category].
- Two semesters of abstract algebra (4580 - 4581 or 5590H - 5591H).
- Two semesters of abstract analysis (4547 – 4548, 4181H - 4182H, or a combination).

Here are two sample plans showing how those requirements might be fulfilled. Other combinations of courses can also be used to fulfill those requirements.

(1) 4181H - 4182H,  
5590H - 5591H, and  
5520H and one courses chosen from: 5522H, 5529H, 5530H, 5540H, 5576H.

(2) 1181H - 2182H;  
3345, 2568,  
4580 - 4581,  
4547 - 4548, and  
four courses chosen from: 5520H, 5522H, 5529H, 5530H, 5540H, and 5576H.

Notes on those rules for honors.

- As in combination (1) above, overlaps are allowed in those requirements.
- Some requirements for the math major may be fulfilled by honors courses. In particular:  
4181H fulfills the analysis requirement (4547 - 4548) in the Theoretical and Education Tracks.  
5520H fulfills requirements for both linear algebra (2568) and differential equations (2255).

---

\* The 4-digit numbers listed here all refer to Math course numbers.

## Math Major Requirements.

### *Prerequisite courses:*

All tracks of the major program have prerequisites that include Calculus I and II (Math 1151 and 1152), and the **Introductory Seminar (Math 1295)**.

### *Required courses:*

Some core courses are required for all tracks within the major:

Math 2153: Calculus 3

Math 3345: Foundations of Higher Mathematics

Math 2568: Linear Algebra

Math 4530 or Stat 4201: Probability or Introduction to Mathematical Statistics I

Stat 4202: Introduction to Mathematical Statistics II

Each track might include some additional prerequisite and required courses.

Note that substitutions can be made. For instance,

- **1295 (Introductory Seminar) can be waived for students who have an honors contract in math;**
- **3345 (Foundations) can be waived for students with C- or better in both 4181H and 4182H;**  
[Note: Students may take 2182H and 3345 concurrently.]
- **honors courses can be substituted for non-honors courses. For example, 5520H can replace 2568, 5530H can replace 4530, etc.**

### **Double-counting rule for dual degrees:**

For math majors pursuing a dual degree, any course from the following list:

{ **Math 2568, Math 5520H, Math 4530, Math 5530H, Stat 4201, Stat 4202** },

**may be counted toward a math major *only if* that course is not counted as a prerequisite or as a requirement for a degree in another College.**

## **Grade Prerequisites.**

Academically weak students sometimes encounter serious difficulties in math course sequences, because success in each course requires mastery of the central ideas taught in the preceding course. To improve success rates in those courses, we will implement the “C-minus Rule”:

A student may enter a given math course only with a grade of C- or better in the prerequisite math course.

This rule has been in place for several years for the transitions from 150 to 151, from 151 to 152, and from 152 to 153. This rule is included in the prerequisites for most of the mainstream undergraduate math courses, in the semester system. (**Exceptions include Math 1116, 2173, 2174, 2177, and 2415.**) Similar rules are standard practice at many colleges and universities in Ohio and in other states.



**Changes in individual math course credits.**

The Department of Mathematics embraces the idea that most upper division semester courses should be **3 credits**, running MWF for the whole semester.

Course sequences running for three quarters naturally transform into two-semester sequences. Individual 5-credit quarter courses typically become 3-credit semester courses. But in some cases the semester version of a course involves an increase in credit hours. Math major tracks that require several of those courses end up with fairly large increases in credit hours. Here is a list of the math courses in question, along with credit hours, quarter → semester.

254 → 2153	calculus 3	5 → 4
350 → 3350	intro to math biology	3 → 3
556 → 4556	dynamical systems	3 → 3
530 → 3530	probability	3 → 3
589 → 3589	intro to financial math	3 → 3
512 (557) → 4512	partial differential eqs	3 → 3
513 (551) → 4551	vector analysis	3 → 3
514 (552) → 4552	complex analysis	3 → 3
568 (571 – 572) → 2568	linear algebra	3 → 3
578 → 4578	discrete math models	5 → 4
647 → 5001	set theory	3 → 3

Here are short explanations for those course transitions.

**254:** The sequence 1151 – 1152 – 2153 of standard calculus courses has topics specified by the Ohio Transfer Assurance Guides (TAGs), as posted at

<http://regents.ohio.gov/transfer/otm/otm-learning-outcomes.php>

The semester credits 5, 5, 4 are in line with recommendations from the Board of Regents.

**350 and 556:** These courses are part of the newly developed bio-mathematics curriculum. Course developers are using the semester conversion as an opportunity to expand those courses to include more topics useful for students studying mathematical biology.

**530:** This probability course is sometimes used as an alternative to Stat 420 even though there are some differences in content. The expanded course 3530 will include all the probability needed for math and actuarial science majors, and is aligned closely enough with statistics courses that it can act as a prerequisite for Stat 4202. This increase in content has been recommended by leaders of both the financial math track and the actuarial science major.

**589:** This “Introduction to Financial Mathematics” will expand to include more of the basic mathematical tools needed to model asset pricing and to begin to understand techniques of stochastic calculus.

**512, 513, and 514** are 3-credit courses taken mostly by engineering students. Corresponding 5-credit courses (557, 551, and 552) are taken primarily by math and science majors and some graduate students in engineering. With semester conversion, we will reduce the number of courses by combining each of these pairs into a single 3-credit semester course.

**568** is a 3-credit linear algebra course very crowded with topics. For decades, client engineering departments have insisted on a 3-credit course (in quarters), rather than the more natural 5-credit course needed to explain the ideas appropriately. With semesters, that pressure will decrease because engineering students will have the option of Math 2174: half linear algebra and half differential equations. Both 568 and the two-quarter sequence 571-572 will convert to 2568.

**578:** This 5-credit course currently has a computer science course prerequisite. Students work on mathematical projects using whatever computer languages they already know. People re-designing this course decided to provide a more uniform experience by requiring students to use a standard linear algebra software package. After a couple of weeks in class learning about MATLAB, students with minimal programming experience will be able to use that software in their projects. Inclusion of training in that software helps justify the use of 4 semester credits rather than 3. That increase of credits is balanced by the omission of a CSE course prerequisite. A copy of a concurrence email message from CSE is included at the end of this Rationale.

---

## **COMMENTS on changes in the tracks (sub-plans).**

### **Theoretical track.**

Currently the requirement of Math 530 or Stat 420 is hidden, since the required course Stat 421 has one of those two courses as a prerequisite. With semester conversion, we will list an explicit requirement: Math 5530 or Stat 4201. This decision increases the official hours within the major. The increase in core requirements is mitigated by a small decrease in elective hours.

### **Education track.**

This option is a fairly small alteration of the Theoretical track: Differential Equations is not required, but three electives in the Theoretical track are required here. Those three courses (geometry, discrete modeling, and history of mathematics) are important for the Education track because of their direct connections with high school teaching.

### **Applied track.**

Added credits from various individual course conversions are balanced by moving a few courses from required to elective, and adjusting the total number of elective hours.

### **Biology track.**

Courses in the quarter system were converted directly to corresponding courses in the semester system, leading to a slight increase in credit hours.

### **Financial track.**

This track involves the largest total increase in individual course credits: the conversion of each of the required courses Math 512, 530, 568, 589, and Stat 420, 421 increases the count by one credit. The current 57 to 59 quarter credits, correspond to 38 to 39.3 semester credits, but a direct conversion leads to 44 to 45 semester credits. This impact was lessened by removing Math 3588 (Practicum in Actuarial Science) from the required list. Changes in content in this Practicum make it more closely aligned with the Actuarial program, and less suitable for students in the Financial Math track. As enrollments in the Financial track grow, we hope to create one or two new courses designed for that audience. We will be able move forward with that plan after hiring a faculty member who specializes in financial mathematics.

Majors in the Financial Math track are required to take Econ 2001.01 and 2002.01. They may substitute the .02 versions, but Econ 2001.02 and 2002.02 are courses designed for students majoring in Economics.

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## Detailed plans for the conversion.

The four appendices below contain more detailed plans for each of the five tracks in both quarter and semester format.

### **Appendix A:**

*Major Program Forms* for each track, in both the quarter and semester systems.

### **Appendix B:**

A *Curriculum Map* for each track. That map lists the quarter and semester courses in each track of the major, and indicates which Program Learning Goals are emphasized in each semester course.

### **Appendix C:**

Sample *Four-Year Plans* for each track are provided, for both quarters and semesters.

In most cases, students can complete this major by taking at most 18 credit hours per semester. Exceptions naturally arise for honors students, who have very ambitious course schedule, and for students in applied tracks that require significant preparation in other sciences. (The credit hour load is often decreased because students earn college credits while still in high school.)

### **Appendix D:**

*Transition Policies* for math majors. In most cases the transition involves straightforward, one-for-one substitutions of courses and course sequences. Two upper division course sequences (Math 547-548-549 and 580-581-582) require special transition courses in Au12. Plans for transition of the mainstream calculus courses are outlined in Appendix D as well.

Transition plans for all math service courses at OSU appears in a separate document, posted at the semester conversion web page

<http://www.math.ohio-state.edu/semesters>.

### **Appendix E:**

*Generic Course Schedules* for math majors in the traditional track encountering semesters at different points in their careers.

**Math 4578 Concurrence from CSE**

From: Neelam Soundarajan [neelam@cse.ohio-state.edu]  
Sent: Thursday, January 27, 2011 10:32 AM  
To: Shapiro, Daniel  
Cc: neelam@cse.ohio-state.edu; supowit@cse.ohio-state.edu  
Subject: RE: Math 578

Dear Dan,

I talked to a couple of people in our dept. and the consensus was that although we do plan to offer a 2-cr MATLAB course that would be appropriate for students interested in developing skills in MATLAB programming, given that you require only minimal familiarity with MATLAB, we concur with your proposed plans for MATH 4578, including two MATLAB training sessions.

Best wishes,

--Neelam.

=====  
Neelam Soundarajan  
Acting Assoc. Chair  
CSE Dept.  
=====

---

On Tuesday, January 25, 2011, at 1:47 PM, Shapiro, Daniel writes:

Dear Neelam,

I'm writing again about the semester conversion of Math 578. As mentioned in messages sent in early December, we plan to run Math 4578, "Discrete Mathematical Models", with a format somewhat different from the current Math 578. The semester course will not have any formal prerequisite of a CSE course. Instead, it will include enough MATLAB training so that students can complete simple projects using that software.

To facility the approval process for this course, it would be convenient to include a "concurrence" from CSE. That concurrence can be given in an email message to me.

Sincerely,  
Dan S.

Daniel Shapiro  
Professor and Vice Chair  
Department of Mathematics - OSU

APPENDIX A.

**MAJOR PROGRAM FORM (QUARTERS)**  
College of Arts and Sciences

			<b>Mathematics Major – Theoretical Track</b>
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Name: last first middle Major

OSU email address (name.n):	Student number:
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Degree Sought (circle one): <b>BS</b> <b>BA</b>	Expected date of graduation (qtr/yr):
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Have you filed a degree application in the college office? (circle one): <b>YES</b> <b>NO</b>
---

NOTE: This form is NOT a degree application.

If completing two majors, list both of them below, and file a separate form for each one:

--	--

**Part A: Required Prerequisites (and / or supplementary requirements)**

Courses	Hours	Grade	Courses	Hours	Grade
<b>Math 151</b>	<b>5</b>		<b>Math 153</b>	<b>5</b>	
<b>Math 152</b>	<b>5</b>				

**Part B: Major Program (Minimum grade of “C-”, and minimum grade average of “C” (2.00) required.)**

Core Requirements (Substitutions are rarely permitted)

Courses	Hours	Grade	Courses	Hours	Grade
<b>Math 254</b>	<b>5</b>		<b>Math 345</b>	<b>4</b>	
<b>Math 568 or 571</b>	<b>3</b>		<b>Stat 421</b>	<b>5</b>	

**Required Courses for Traditional Track:**

<b>Math 255</b>	<b>5</b>		<b>Math 530 or Stat 420</b>	<b>3 or 5</b>	
<b>Math 547</b>	<b>3</b>		<b>Math 580</b>	<b>3</b>	
<b>Math 548</b>	<b>3</b>		<b>Math 581</b>	<b>3</b>	
<b>Math 549</b>	<b>3</b>		<b>Math 582</b>	<b>3</b>	
<b>Electives (10 credit hours) chosen from a list of math courses. See Curriculum Map for details.</b>					

**53 or 55**

Total of Part B only

Check whether this is:	<b>X</b>	
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See back for information about major programs.      original      revision

Distribution: One copy each - Faculty adviser, Student, College Office

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Signature of faculty adviser

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Name of adviser (please print)

<b>Mathematics</b>	<b>292-</b>
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Department      Campus phone

	Date:
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APPENDIX A.

**MAJOR PROGRAM FORM (QUARTERS)**  
College of Arts and Sciences

			<b>Mathematics Major – Education Track</b>
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Name: last first middle Major

OSU email address (name.n):	Student number:
Degree Sought (circle one): <b>BS</b> <b>BA</b>	Expected date of graduation (qtr/yr):

Have you filed a degree application in the college office? (circle one):      YES      NO
---

NOTE: This form is NOT a degree application.

If completing two majors, list both of them below, and file a separate form for each one:

--	--

**Part A: Required Prerequisites (and / or supplementary requirements)**

Courses	Hours	Grade	Courses	Hours	Grade
<b>Math 151</b>	<b>5</b>		<b>Math 153</b>	<b>5</b>	
<b>Math 152</b>	<b>5</b>				

**Part B: Major Program (Minimum grade of “C-”, and minimum grade average of “C” (2.00) required.)**

Core Requirements (Substitutions are rarely permitted)

Courses	Hours	Grade	Courses	Hours	Grade
<b>Math 254*</b>	<b>5</b>		<b>Math 345*</b>	<b>4</b>	
<b>Math 568* or 571*</b>	<b>3</b>		<b>Stat 421*</b>	<b>5</b>	

**Required Courses for Educational Track:**

<b>Math 547</b>	<b>3</b>		<b>Math 580*</b>	<b>3</b>	
<b>Math 548</b>	<b>3</b>		<b>Math 581*</b>	<b>3</b>	
<b>Math 549</b>	<b>3</b>		<b>Math 582</b>	<b>3</b>	
<b>Math 530 or Stat 420</b>	<b>3 or 5</b>		<b>Math 507*</b>	<b>5</b>	
<b>Math 504*</b>	<b>5</b>		<b>Math 578*</b>	<b>5</b>	
<b>* needed for OSU MEd program</b>					

**53 or 55**

Total of Part B only

Check whether this is:	<input checked="" type="checkbox"/>		
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See back for information about major programs.      original      revision

Distribution: One copy each - Faculty adviser, Student, College Office

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Signature of faculty adviser

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Name of adviser (please print)

<b>Mathematics</b>	<b>292-</b>
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Department      Campus phone

	Date:
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APPENDIX A.

**MAJOR PROGRAM FORM (QUARTERS)**

College of Arts and Sciences

			<b>Mathematics Major – Bio-Math Track</b>
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Name: last first middle Major

OSU email address (name.n):	Student number:
Degree Sought (circle one): <b>BS</b> <b>BA</b>	Expected date of graduation (qtr/yr):

Have you filed a degree application in the college office? (circle one):      YES      NO
---

NOTE: This form is NOT a degree application.

If completing two majors, list both of them below, and file a separate form for each one:

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**Part A: Required Prerequisites (and / or supplementary requirements)**

Courses	Hours	Grade	Courses	Hours	Grade
<b>Math 151</b>	<b>5</b>		<b>Chem 121</b>	<b>5</b>	
<b>Math 152</b>	<b>5</b>		<b>Bio 113</b>	<b>5</b>	
<b>Math 153</b>	<b>5</b>		<b>Bio 114</b>	<b>5</b>	

**Part B: Major Program (Minimum grade of "C-", and minimum grade average of "C" (2.00) required.)**

Core Requirements (Substitutions are rarely permitted)

Courses	Hours	Grade	Courses	Hours	Grade
<b>Math 254</b>	<b>5</b>				
<b>Math 345</b>	<b>4</b>		<b>Math 530 or Stat 420</b>	<b>3 or 5</b>	
<b>Math 571</b>	<b>3</b>		<b>Stat 421</b>	<b>5</b>	
<b>Math 572</b>	<b>3</b>				

**Required Courses for Bio-Mathematics Track**

<b>Math 255</b>	<b>5</b>		<b>Math 350</b>	<b>3</b>	
<b>Math 512</b>	<b>3</b>		<b>Bio 401 - 402 or MG 660 - 661</b>	<b>5, 5</b>	
<b>Math 607</b>	<b>5</b>				
<b>Electives (9 credit hours) chosen from a list of math &amp; science courses. See Curriculum Map for details.</b>					

**58 - 60**

Total of Part B only

Check whether this is:	<b>x</b>	
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See back for information about major programs.      original      revision

Distribution: One copy each - Faculty adviser, Student, College Office

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Signature of faculty adviser

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Name of adviser (please print)

<b>Mathematics</b>	<b>292-</b>
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Department      Campus phone

	Date:
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APPENDIX A.

**MAJOR PROGRAM FORM (SEMESTERS)**  
College of Arts and Sciences

			<b>Mathematics Major – Bio-Math Track</b>
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Name: last first middle Major

OSU email address (name.n):	Student number:
Degree Sought (circle one): <b>BS</b> <b>BA</b>	Expected date of graduation (sem/yr):

Have you filed a degree application in the college office? (circle one):      YES      NO
---

NOTE: This form is NOT a degree application.

If completing two majors, list both of them below, and file a separate form for each one:

--	--

**Part A: Required Prerequisites (and / or supplementary requirements)**

Courses	Hours	Grade	Courses	Hours	Grade
<b>Math 1151</b>	<b>5</b>		<b>Chem 1210</b>	<b>5</b>	
<b>Math 1152</b>	<b>5</b>		<b>Bio 1113</b>	<b>4</b>	
<b>Math 1295</b>	<b>1</b>		<b>Bio 1114</b>	<b>4</b>	

**Part B: Major Program (Minimum grade of “C-”, and minimum grade average of “C” (2.00) required.)**

Core Requirements (Substitutions are rarely permitted)

Courses	Hours	Grade	Courses	Hours	Grade
<b>Math 2153</b>	<b>4</b>		<b>Math 3345</b>	<b>3</b>	
<b>Math 2568</b>	<b>3</b>		<b>Math 4530 or Stat 4201</b>	<b>3 or 4</b>	
			<b>Stat 4202</b>	<b>4</b>	

**Required Courses for Bio-Math Track:**

<b>Math 3350</b>	<b>3</b>		<b>Math 2255</b>	<b>3</b>	
			<b>Bio 3401 or MG 5660</b>	<b>4 or 5</b>	
<b>Two of the following three:</b>					
<b>Math 3607, 4557, 4556</b>	<b>3, 3</b>		<b>Electives (6 credits) chosen from a list of math &amp; science courses. See Curriculum Map for details.</b>	<b>6</b>	

<b>39 - 41</b>
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Total of Part B only

Check whether this is:	<b>x</b>	
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See back for information about major programs.      original      revision  
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Signature of faculty adviser	
Name of adviser (please print)	
<b>Mathematics</b>	<b>292-</b>
Department	Campus phone
	Date:

APPENDIX A.

**MAJOR PROGRAM FORM (QUARTERS)**  
College of Arts and Sciences

			<b>Math Major – Applied Track - Chemistry Option</b>
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Name: last first middle Major

OSU email address (name.n):	Student number:
Degree Sought (circle one): <b>BS</b> <b>BA</b>	Expected date of graduation (qtr/yr):

Have you filed a degree application in the college office? (circle one): <b>YES</b> <b>NO</b>
---

NOTE: This form is NOT a degree application.

If completing two majors, list both of them below, and file a separate form for each one:

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**Part A: Required Prerequisites (and / or supplementary requirements)**

Courses	Hours	Grade	Courses	Hours	Grade
Math 151	5		Physics 131	5	
Math 152	5		Physics 132	5	
Math 153	5		Physics 133	5	
Chem 121	5		Chem 123	5	
Chem 122	5		CSE 202 or equivalent	4	

**Part B: Major Program (Minimum grade of "C-", and minimum grade average of "C" (2.00) required.)**

Core Requirements (Substitutions are rarely permitted)

Courses	Hours	Grade	Courses	Hours	Grade
Math 254	5		Math 345	4	
Math 571	3		Stat 421	5	

**Required Courses for Applied Math Track:**

**Group I Electives: Math courses 9 hours from:**

Math 255 or 415	5 or 4		Math 547, 548, 549	3, 3, 3	
Math 512	3		Math 601, 602, 603.02	3, 3, 3	
Math 514	3		Math 665, 666	4, 4	
Math 572	3		Math 701	5	
Math 530 or Stat 420	3 or 5		Math 513 or 551	3 or 5	
Math 607	5				
<b>Group II Electives: Chemistry. 9 hrs from:</b>					
Chem 221	5		Chem 530-531-532	3, 3, 3	

56 to 59

Total of Part B only

Check whether this is:	<input checked="" type="checkbox"/>	
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See back for information about major programs.

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Signature of faculty adviser

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Name of adviser (please print)

<b>Mathematics</b>	292-
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Department

Campus phone

	Date:
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APPENDIX A.

**MAJOR PROGRAM FORM (QUARTERS)**

College of Arts and Sciences

			<b>Math Major – Applied Track - Physics Option</b>
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Name: last first middle Major

OSU email address (name.n):	Student number:
Degree Sought (circle one): <b>BS</b> <b>BA</b>	Expected date of graduation (qtr/yr):

Have you filed a degree application in the college office? (circle one):      YES      NO
---

NOTE: This form is NOT a degree application.

If completing two majors, list both of them below, and file a separate form for each one:

--	--

**Part A: Required Prerequisites (and / or supplementary requirements)**

Courses	Hours	Grade	Courses	Hours	Grade
Math 151	5		Physics 131	5	
Math 152	5		Physics 132	5	
Math 153	5		Physics 133	5	
			CSE 202	4	

**Part B: Major Program (Minimum grade of "C-", and minimum grade average of "C" (2.00) required.)**

Core Requirements (Substitutions are rarely permitted)

Courses	Hours	Grade	Courses	Hours	Grade
Math 254	5		Math 345	4	
Math 571	3		Stat 421	5	

**Required Courses for Applied Math Track:**

**Group I Electives: Math courses 9 hours from:**

Math 255 or 415	5 or 4		Math 547, 548, 549	3, 3, 3	
Math 512	3		Math 601, 602, 603.02	3, 3, 3	
Math 514	3		Math 665, 666	4, 4	
Math 572	3		Math 701	5	
Math 530 or Stat 420	3 or 5		Math 513 or 551	3 or 5	
Math 607	5				
<b>Group II Electives: Physics. 12 hrs from:</b>					
Phys 261, 262, 263	4, 4, 4				
various 600-level courses					

59 - 64

Total of Part B only

Check whether this is:	x	
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See back for information about major programs.

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Signature of faculty adviser

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Name of adviser (please print)

<b>Mathematics</b>	<b>292-</b>
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Department

Campus phone

	Date:
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APPENDIX A.  
**MAJOR PROGRAM FORM (SEMESTERS)**  
College of Arts and Sciences

			<b>Math Major – Applied Track - Physics Option</b>
Name: last	first	middle	Major

OSU email address (name.n):	Student number:
Degree Sought (circle one): <b>BS</b> <b>BA</b>	Expected date of graduation (sem/yr):

Have you filed a degree application in the college office? (circle one): <b>YES</b> <b>NO</b>
---

NOTE: This form is NOT a degree application.

If completing two majors, list both of them below, and file a separate form for each one:

--	--

**Part A: Required Prerequisites (and / or supplementary requirements)**

Courses	Hours	Grade	Courses	Hours	Grade
<b>Math 1151</b>	<b>5</b>		<b>Physics 1250</b>	<b>5</b>	
<b>Math 1152</b>	<b>5</b>		<b>Physics 1251</b>	<b>5</b>	
<b>Math 1295</b>	<b>1</b>		<b>CSE 1222 or equivalent</b>	<b>3</b>	

**Part B: Major Program (Minimum grade of "C-", and minimum grade average of "C" (2.00) required.)**

Core Requirements (Substitutions are rarely permitted)

Courses	Hours	Grade	Courses	Hours	Grade
<b>Math 2153</b>	<b>4</b>		<b>Math 3345</b>	<b>3</b>	
<b>Math 4530 or Stat 4201</b>	<b>3 or 4</b>		<b>Stat 4202</b>	<b>4</b>	
<b>Math 2568</b>	<b>3</b>				

**Required Courses for Applied Math Track:**

<b>Math 2255</b>	<b>3</b>		<b>Math 4557</b>	<b>3</b>	
<b>Two of the following three: Math 3607, 4552, or 4556</b>	<b>3, 3</b>				

**Group I Electives, Math. 6 hours from:**

<b>Math 4547, 4548</b>	<b>3, 3</b>		<b>Math 5756, 5757</b>	<b>3, 3</b>	
<b>Math 5101, 5102</b>	<b>3, 3</b>		<b>Math 5451</b>	<b>3</b>	
			<b>Math 4551</b>	<b>3</b>	

**Group II Electives, Physics. 8 hrs from:**

<b>Physics 2300, 2301</b>	<b>4, 4</b>				
<b>various 5000-level courses</b>					

**43 - 44**

Total of Part B only

Check whether this is:	<b>x</b>	
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See back for information about major programs.

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Distribution: One copy each - Faculty adviser, Student, College Office

Signature of faculty adviser	
Name of adviser (please print)	
<b>Mathematics</b>	<b>292-</b>
Department	Campus phone
	Date:

APPENDIX A.

**MAJOR PROGRAM FORM (QUARTERS)**  
College of Arts and Sciences

			<b>Mathematics Major – Financial Track</b>
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Name: last first middle Major

OSU email address (name.n):	Student number:
Degree Sought (circle one): <b>BS</b> <b>BA</b>	Expected date of graduation (qtr/yr):

Have you filed a degree application in the college office? (circle one):      YES      NO
---

NOTE: This form is NOT a degree application.

If completing two majors, list both of them below, and file a separate form for each one:

--	--

**Part A: Required Prerequisites (and / or supplementary requirements)**

Courses	Hours	Grade	Courses	Hours	Grade
Math 151	5		Econ 200	5	
Math 152	5		Econ 201	5	
Math 153	5		Acct 310	5	
			CS&E 200	5	

**Part B: Major Program (Minimum grade of "C-", and minimum grade average of "C" (2.00) required.)**

Core Requirements (Substitutions are rarely permitted)

Courses	Hours	Grade	Courses	Hours	Grade
Math 254	5		Math 345	4	
Math 568 or 571	3		Stat 421	5	

**Required Courses for Financial Track**

Math 255	5		Math 618	4	
Math 512	3		Math 632	4	
Math 530 or Stat 420	3, 5		CSE 201 or 202	5	
Math 589	3		Bus Fin 420 or 620	4	
Math 607	5		Math 588	4	

57 - 59

Total of Part B only

Check whether this is:	X	
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See back for information about major programs.      original      revision

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<b>Mathematics</b>
Department <span style="float: right;">Campus phone</span>
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Math Major, Theoretical Track 53 - 55 quarter hrs become 38 - 39 semester credit hrs.								
Segment of major program	Quarter course #	Quarter course name	Credit hours	Semester course #	Semester course name	Units	Learning outcome	Nature of conversion
<b>Prerequisites (15 quarter credit hours become 11 semester credit hours; some may double-count in GEC)</b>								
	Math 151	Calculus and Analytic Geometry I	5	Math 1151	Calculus 1	5	1, 2, 3	replaces 151-152-153
	Math 152	Calculus and Analytic Geometry II	5	Math 1152	Calculus 2	5	1, 2, 3	
	Math 153	Calculus and Analytic Geometry III	5	Math 1295	Introductory Seminar	1	5	new requirement
<b>Core major requirements (20 to 22 quarter credit hours become 17 to 18 semester credit hours)</b>								
	Math 254	Calculus and Analytic Geometry IV	5	Math 2153	Calculus 3	4	1*, 2*, 3	expands on 254
	Math 345	Foundations of Higher Mathematics	4	Math 3345	Foundations of Higher Mathematics	3	1**, 2, 3*, 4*	expands on 345
	Math 568	Linear Algebra	3	Math 2568	Linear Algebra	3	1, 2, 3, 5	expands on 568 or 571
	Math 530 or Stat 420	Probability or Intro to Math Stat I	3 or 5	Math 4530 or Stat 4201	Probability or Intro to Math Stat I	3 or 4	1*, 2, 3*, 4*, 5*	Math 4530 expands on 530 Stat 4201 expands on Stat 420
	Stat 421	Intro to Math Stat II	5	Stat 4202	Intro to Math Stat II	4	1, 3, 5	Stat 4202 expands on Stat 421
<b>Required courses in track (23 quarter credit hours become 15 semester credit hours)</b>								
	Math 255	Differential Equations and Their Applications	5	Math 2255	Differential Equations and Their Applications	3	1, 2*, 3*, 4	replaces 255
	Math 547	Introductory Analysis I	3	Math 4547	Introductory Analysis 1	3	1**, 2**, 3*, 4**, 5	Math 4547-4548 replaces 547-548-549
	Math 548	Introductory Analysis II	3	Math 4548	Introductory Analysis 2	3	1**, 2**, 3*, 4**, 5	
	Math 549	Introductory Analysis III	3					
	Math 580	Algebra I	3	Math 4580	Abstract Algebra 1	3	1**, 2**, 3*, 4**, 5	Math 4580-4581 replaces 580-581-582
	Math 581	Algebra II	3	Math 4581	Abstract Algebra 2	3	1**, 2**, 3*, 4**, 5	
	Math 582	Algebra III	3					
<b>Electives (10 quarter credit hours become 6 semester credit hours)</b>								
	Math 504	History of Mathematics	5	Math 4504	History of Mathematics	3	1**, 2*, 3*, 4**, 5**	replaces 504
	Math 507	Advanced Geometry	5	Math 4507	Geometry	3	1**, 2*, 3*, 4**, 5**	replaces 507
	Math 512	Partial Differential Equations and Boundary Value Problems	3	Math 4557	Partial Differential Equations and Boundary Value Problems	3	1*, 3*, 4*, 5*	replaces 557; expands on 512
	Math 513 or Math 551	Vector Analysis	3 or 5	Math 4551	Vector Analysis	3	1*, 2*, 3*, 4*, 5*	replaces 551; expands on 513
	Math 514 or Math 552	Complex Variables	3 or 5	Math 4552	Complex Analysis	3	1*, 2*, 3*, 4*, 5*	replaces 552; expands on 514
	Math 573	Elementary Number Theory	5	Math 4573	Elementary Number Theory	3	1**, 2*, 3*, 4*, 5*	replaces 573
	Math 575	Combinatorial Mathematics and Graph Theory	5	Math 4575	Combinatorial Mathematics and Graph Theory	3	1*, 2*, 3*, 4*, 5*	replaces 575
	Math 578	Discrete Mathematical Models	5	Math 4578	Discrete Mathematical Models	4	1*, 2*, 3*, 4*, 5**	expands on 578
<b>Major program learning outcomes</b>								
	1	Learn conceptual frameworks needed to study higher mathematics, including an introduction to mathematical reasoning, and an understanding of how to read and write proofs.						
	2	Acquire basic mastery of core areas of mathematics, including calculus, analysis and algebra.						
	3	Develop powerful mathematical problem solving skills.						
	4	Learn to communicate mathematical understanding effectively.						
	5	Become proficient in chosen tracks within the major.						
* Learning outcomes are indicated for each semester course listed. Number of asterisks indicates level: beginning, intermediate, or advanced.								

Math Major, Education Track 53 - 55 quarter hrs become 39 - 40 semester credit hrs.								
Segment of major program	Quarter course #	Quarter course name	Credit hours	Semester course #	Semester course name	Units	Learning outcome	Nature of conversion
<b>Prerequisites (15 quarter credit hours become 11 semester credit hours; some may double-count in GEC)</b>								
	Math 151	Calculus and Analytic Geometry I	5	Math 1151	Calculus 1	5	1, 2, 3	1151-1152 replaces
	Math 152	Calculus and Analytic Geometry II	5	Math 1152	Calculus 2	5	1, 2, 3	151-152-153
	Math 153	Calculus and Analytic Geometry III	5	Math 1295	Introductory Seminar	1	5	new requirement
	CSE 201, 202, or 221	Computer Problem Solving for Business, Elem Computer Programming, Software Dev. Using Cmpnts	4 4 4					Former data analysis requirement is now folded into Math 4578.
<b>Core major requirements (20 to 22 quarter credit hours become 17 to 18 semester credit hours)</b>								
	Math 254*	Calculus and Analytic Geometry IV	5	Math 2153*	Calculus 3	4	1*, 2*, 3	expands on 254
	Math 345* or Math 568*	Foundations of Higher Mathematics Linear Algebra or	4	Math 3345*	Foundations of Higher Mathematics	3	1**, 2**, 3*, 4*, 5*	expands on 345
	Math 571*	Linear Algebra for Applications I	3	Math 2568*	Linear Algebra	3	1, 2, 3, 5	expands on 568/571
	Math 530 or Stat 420	Probability or Intro to Math Stat I	3 or 5	Math 4530 or Stat 4201	Probability or Intro to Math Stat I	3 or 4	1**, 2, 3*, 4*, 5*	expands on 530; Stat 4201 expands on Stat 420
	Stat 421*	Intro to Math Stat II	5	Stat 4202*	Intro to Math Stat II	4	1, 3, 5*	Stat 4202 expands on Stat 421
<b>Required courses in track (33 quarter credit hours become 22 semester credit hours)</b>								
	Math 547	Introductory Analysis I	3	Math 4547	Introductory Analysis 1	3	1**, 2**, 3*, 4**, 5	4547-4548 replaces 547-548-549
	Math 548	Introductory Analysis II	3	Math 4548	Introductory Analysis 2	3	1**, 2**, 3*, 4**, 5	
	Math 549	Introductory Analysis III	3					
	Math 580*	Algebra I	3	Math 4580*	Abstract Algebra 1	3	1**, 2**, 3*, 4**, 5*	4580-4581 replaces 580-581-582
	Math 581*	Algebra II	3	Math 4581*	Abstract Algebra 2	3	1**, 2**, 3*, 4**, 5*	
	Math 582	Algebra III	3					
	Math 504*	History of Mathematics	5	Math 4504*	History of Mathematics	3	1**, 2**, 3*, 4**, 5	replaces 504
	Math 507*	Advanced Geometry	5	Math 4507*	Geometry	3	1**, 2**, 3*, 4**, 5**	replaces 507
	Math 578*	Discrete Mathematical Models	5	Math 4578*	Discrete Mathematical Models	4	1**, 2, 3**, 4**, 5*	expands on 578
Courses marked with * are needed for the MEd program at OSU.								
<b>Major program learning outcomes</b>								
	1	Learn conceptual frameworks needed to study higher mathematics, including an introduction to mathematical reasoning, and an understanding of how to read and write proofs.						
	2	Acquire basic mastery of core areas of mathematics, including calculus, analysis and algebra.						
	3	Develop powerful mathematical problem solving skills.						
	4	Learn to communicate mathematical understanding effectively.						
	5	Become proficient in chosen tracks within the major.						
* Learning outcomes are indicated for each semester course listed. Number of asterisks indicates level: beginning, intermediate, or advanced.								

Math Major, Biology Track 56 - 60 quarter hrs become 39 - 41 semester hrs.								
Segment of major program	Quarter course #	Quarter course name	Credit hours	Semester course #	Semester course name	Units	Learning outcome	Nature of conversion
<b>Prerequisites (30 quarter credit hours become 24 semester credit hours; some may double-count in GEC)</b>								
	Math 151	Calculus and Analytic Geometry I	5	Math 1151	Calculus 1	5	1, 2, 3	
	Math 152	Calculus and Analytic Geometry II	5	Math 1152	Calculus 2	5	1, 2, 3	1151-1152 replaces 151-152-153
	Math 153	Calculus and Analytic Geometry III	5	Math 1295	Introductory Seminar	1	5	new requirement
	Bio 113	BioSci: Energy Transfer and Development	5	Bio 1113	BioSci: Energy Transfer and Development	4	5	
	Bio 114	BioSci: Form, Function, Diversity, and Ecology	5	Bio 1114	BioSci: Form, Function, Diversity, and Ecology	4	5	Bio 1113-1114 Replaces Bio 113-114
	Chem 121	General Chemistry	5	Chem 1210	General Chemistry	5	5	Chem 1210 replaces Chem 121
<b>Core major requirements (23-25 quarter credit hours become 17-18 semester credit hours)</b>								
	Math 254	Calculus and Analytic Geometry IV	5	Math 2153	Calculus 3	4	1*, 2**, 3	expands on 254
	Math 345	Foundations of Higher Math	4	Math 3345	Foundations of Higher Math	3	1**, 2**, 3*, 4*	expands on 345
	Math 571-2	Linear Alg for Appl I, II	3, 3	Math 2568	Linear algebra	3	1*, 2*, 3*, 5	replaces 571-571, expands on 568
	Math 530 or Stat 420	Probability or Intro to Math Stat I	3 or 5	Math 4530 or Stat 4201	Probability or Intro to Math Stat I	3 or 4	1**, 2, 3*, 4*, 5*	4530 expands on 530; Stat 4201 replaces Stat 420
	Stat 421	Intro to Math Stat II	5	Stat 4202	Intro to Math Stat II	4	1, 5	Stat 4202 replaces Stat 421
<b>Required courses in track (35 quarter credit hours become 24 semester credit hours)</b>								
	Math 350	Intro to Mathematical Biology	3	Math 3350	Intro to Mathematical Biology	3	4*, 5	replaces 350
	Math 255	Diff Equations and Appls	5	Math 2255	Differential Equations and Appls	3	1*, 2**, 3*, 4	replaces 255
	Bio 401 - 2 or MG 660 - 1	Integrated Biology I, II, Integrated Mol & Cell Bio I, II	5, 5	Bio 3401 or MG 5660	Integrated Biology, Integrated Mol & Cell Bio	4 or 5	5*	Bio 3401 replaces Bio 401-402
	Math 512	Partial Differential Equations	3					
	Math 607	Essentials of Numerical Analysis	5	Two of the following three:				
				Math 4557	Partial Differential Equations	3	1*, 2, 3**, 5**	4557 expands on 557
				Math 4556	Dynamical Systems	3	1*, 2, 3**, 5**	4556 expands on 556
				Math 3607	Beginning Scientific Computing	3	1*, 2, 3**, 5**	3607 is the undergraduate version of 607
<b>Electives (9 credit hrs) Must include courses within and outside of Math</b>				<b>Electives (6 credit hours)</b>				
				Any of 4557, 4556, 3607 not counted as a required course.			1*, 2, 3**, 5**	
	Math 547	Introductory Analysis I	3	Math 4547	Introductory Analysis 1	3	1**, 2**, 3*, 4**	Math 4547-4548 replaces Math 547-548-549
	Math 580	Algebra I	3	Math 4580	Abstract Algebra 1	3	1**, 2**, 3*, 4**	Math 4580-4581 replaces Math 580-581-582
	Math 514	Complex Variables	3	Math 4552	Complex Analysis	3	1*, 2**, 3**, 4*, 5*	replaces 514 or 552
	Math 540H	Calculus on Manifolds	5	Math 5540H	Honors Differential Geometry	5	1**, 2**, 3**, 4*, 5*	replaces 540H-541H
	Math 513 or 551	Vector Analysis	3 or 5	Math 4551	Vector Analysis	3	1**, 3**, 4*, 5*	replaces 513 & 551
	Math 601, 602, or 603.02	Math Principles in Science I, II, III	3, 3, 3	Math 5101-5102	Linear Math in Finite & Infinite Dimensions	3, 3	1*, 2*, 3** 4**, 5*	5101-5102 replace 601-602- 603.02
	Bchem 511	Intro to Biological Chemistry	5	Bchem 4511	Intro to Biological Chemistry	4	5**	Bchem 4511 replaces Bchem 511
	EEOB 400	Evolution	5	EEOB 3310	Evolution	4	5**	EEOB 3310 replaces EEOB 400
	EEOB 410	Animal form and function	4	EEOB 4520	Animal form and function	3	5**	EEOB 4520 replaces EEOB 410
	EEOB 503	Introductory Ecology (Lec + Lab)	6	EEOB 3420	Introductory Ecology	4	5**	EEOB 3420 replaces EEOB 503
	Chem 251	Organic chemistry	4	Chem 2510	Organic chemistry	4	5**	Chem 2510 replaces Chem 251
	MolGen 500	General genetics	5	MolGen 4500	General genetics	3	5**	MolGen 4500 replaces MolGen 509
	MolGen 601	Eukaryotic Mol Gen Lab	5	MolGen 5601	Eukaryotic Mol Gen Lab	4	5**	MolGen 5601 replaces MolGen 601
<b>Major program learning outcomes</b>								
	1	Learn conceptual frameworks needed to study higher mathematics, including an introduction to mathematical reasoning, and an understanding of how to read and write proofs.						
	2	Acquire basic mastery of core areas of mathematics, including calculus, analysis and algebra.						
	3	Develop powerful mathematical problem solving skills.						
	4	Learn to communicate mathematical understanding effectively.						
	5	Become proficient in chosen tracks within the major.						
* Learning outcomes are indicated for each semester course listed. Number of asterisks indicates level: beginning, intermediate, or advanced.								

Math Major, Applied Track (options Physics or Chemistry) 58 - 60 quarter hrs become 41 - 42 semester hrs.									
Segment of major program	Quarter course #	Quarter course name	Credit hours	Semester course #	Semester course name	Units	Learning outcome	Nature of conversion	
<b>Prerequisites (34 quarter credit hours become 24 semester credit hours; some may double-count in GEC)</b>									
	Math 151	Calculus and Analytic Geometry I	5	Math 1151	Calculus 1	5	1, 2, 3		
	Math 152	Calculus and Analytic Geometry II	5	Math 1152	Calculus 2	5	1, 2, 3	1151-1152 replaces 151-152-153	
	Math 153	Calculus and Analytic Geometry III	5	Math 1295	Introductory Seminar	1	5	new requirement	
Prerequisite courses like the following, depend on Applied Area:									
	Phys 131, 132, 133	Calc-based Physics 1, 2, 3	5, 5, 5	Phys 1250, 1251	Calc-based Physics 1, 2	5, 5	3, 5*	Phys 1250-1251 replaces Phys 131-132-133 CSE 1222 replaces 202.	
	CSE 202	Intro to Programming & Algorithms	4	CSE 1222	Intro to Programming in C++	3	3, 5*	C++ is the most appropriate option.	
	Bio 113, 114 Chem 121, 122, 123	Biological Sciences General Chemistry	5, 5 5, 5, 5	Bio 1113, 1114 Chem 1210, 1220	Biological Sciences General Chemistry	4, 4 5, 5	3, 5* 3, 5*	replace Bio 113, 114 replace Chem 121-122-123	
<b>Core major requirements (23-25 quarter credit hours become 17-18 semester credit hours)</b>									
	Math 254	Calculus and Analytic Geometry IV	5	Math 2153	Calculus 3	4	1*, 2*, 3	expands on 254	
	Math 345	Fdns of Higher Mathematics	4	Math 3345	Fdns of Higher Mathematics	3	1**, 2**, 3*, 4*	expands on 345	
	Math 571-2	Linear Algebra I, II	3, 3	Math 2568	Linear Algebra	3	1*, 2**, 3*, 4, 5	replaces 571-572	
	Math 530 or Stat 420	Probability, or Intro to Math Stat I	3 or 5	Math 4530 or Stat 4201	Probability or Intro to Math Stat I	3 or 4	1*, 2, 3**, 4*, 5*	expands on 530; Stat 4201 replaces Stat 420	
	Stat 421	Intro to Math Stat II	5	Stat 4202	Intro to Math Stat II	4	1, 3*, 5	Stat 4202 replaces Stat 421	
<b>Required &amp; Elective courses in track (34 quarter credit hours become 24 semester credit hours)</b>									
<b>Required:</b>									
	Math 512	Partial Diff Equations	3	Math 4557	Partial Diff Eqs	3	1, 2**, 3*, 4, 5	replaces 557, expands on 512	
	Math 255	Diff Equations and Appls	5	Math 2255	Differential Equations and Appls	3	1, 2**, 3**, 4	replaces 255	
	Math 607	Essentials of Numerical Analysis	5	Two of the following three:					
	Math 514	Complex Variables	3	Math 3607	Beginning Scientific Computing	3	3**, 4, 5*	replaces parts of 607	
				Math 4552	Complex Analysis	3	1*, 2**, 3*, 4*, 5*	replaces 552, expands on 514	
				Math 4556	Dynamical Systems	3	1, 3*, 4*, 5*	expands on 556	
<b>Electives (at least 9 quarter hours in math and 9 in the applied area):</b>									
<b>Electives (at least 6 units in math and 6 in the applied area):</b>									
<b>Group I - Math</b>									
	Math 556	Differential Eqs I	3	Any of 4552, 4556, 3607 not counted as a required course.			3		
	Math 513 or 551	Vector Analysis	3 or 5	Math 4551	Vector Analysis	3	1*, 3*, 4*, 5*	replaces 513 & 551	
	Math 601, 602, or 603.02	Math Principles in Science I, II, III	3, 3, 3	Math 5101, 5102	Linear Math in Finite & Infinite Dimensions	3, 3	1, 2**, 3*, 5*	5101-5102 replace 601-602- 603.02	
	Math 547, 548, 549	Intro Analysis I, II, III	3, 3, 3	Math 4547, 4548	Introductory Analysis 1, 2	3, 3	1**, 2**, 3*, 4*	4547-4548 replace 547-548-549	
	Math 665, 666	Applied Differential Geometry I, II	4, 4	Math 5756, 5757	Methods in Relativity Theory I, II	3, 3	3, 4*, 5*	5756-5757 replace 665-666	
	Math 701	Calculus of Variation & Tensors	5	Math 5451	Calculus of Variation & Tensors	3	1, 2, 3*, 4, 5**	replaces 701	
<b>Group II - Applied Area</b>									
<b>Option 1: Physics</b>									
	Phys 261-262-263	Dyn of Particles & Waves I, II, III	4, 4, 4	Phys 2300-2301	Dyn of Particles & Waves I, II, III	4, 4, 4	5**	Phys 2300-2301 replace Phys 261-262-263	
<b>Option 2: Chemistry</b>									
	Chem 221	Analytical Chemistry	5	Chem 2210	Analytical Chemistry	5	5**	Chem 2210 expands on Chem 221	
	Chem 530-531-531	Physical Chemistry 1, 2, 3	3, 3, 3	Chem 4300-4310	Physical Chemistry 1, 2	3, 3	5**	Chem 4300-4310 replace Chem 530-531-532	
<b>Major program learning outcomes</b>									
	1	Learn conceptual frameworks needed to study higher mathematics, including an introduction to mathematical reasoning, and an understanding of how to read and write proofs.							
	2	Acquire basic mastery of core areas of mathematics, including calculus, analysis and algebra.							
	3	Develop powerful mathematical problem solving skills.							
	4	Learn to communicate mathematical understanding effectively.							
	5	Become proficient in chosen tracks within the major.							
* Learning outcomes are indicated for each semester course listed. Number of asterisks indicates level: beginning, intermediate, or advanced.									

Math Major, Financial Track 57 - 59 quarter hrs become 41 - 42 semester credit hrs.								
Segment of major program	Quarter course #	Quarter course name	Credit hours	Semester course #	Semester course name	Units	Learning outcome	Nature of conversion
<b>Prerequisites (35 quarter credit hours become 24 semester credit hours; some may double-count in GEC)</b>								
	Math 151	Calculus and Analytic Geometry I	5	Math 1151	Calculus 1	5	1, 2, 3	
	Math 152	Calculus and Analytic Geometry II	5	Math 1152	Calculus 2	5	1, 2, 3	1151-1152 replaces 151-152-153
	Math 153	Calculus and Analytic Geometry III	5	Math 1295	Introductory Seminar	1	5	new requirement
	Acct 310	Foundations of Accounting	5	Acct 2000	Foundations of Accounting	3	3, 5*	Acct 2000 replaces Acct 310
	Econ 200	Principles of Microeconomics	5	Econ 2001.01	Principles of Microeconomics	3	3, 5*	Econ 2001.01 replaces Econ 200
	Econ 201	Principles of Macroeconomics	5	Econ 2002.01	Principles of Macroeconomics	3	3, 5*	Econ 2002.01 replaces Econ 200
	CSE 200	Computer Assisted Problem Solving for Business	5	CSE 1113	Computer Assisted Problem Solving for Business	4	3, 5*	CSE 1113 replaces CSE 200
<b>Core major requirements (20 or 22 quarter credit hours become 17 or 18 semester credit hours)</b>								
	Math 254	Calculus and Analytic Geometry IV	5	Math 2153	Calculus 3	4	1*, 2*, 3**	expands on 254
	Math 345	Foundations of Higher Math	4	Math 3345	Foundations of Higher Math	3	1**, 2**, 3*, 4*	expands on 345
	Math 530 or Stat 420	Probability or Intro to Math Stat I	3 or 5	Math 4530 or Stat 4201	Probability or Intro to Math Stat I	3 or 4	1**, 2, 3**, 4*, 5*	
	Math 568	Linear Algebra	3	Math 2568	Linear Algebra	3	1*, 2**, 3, 5	expands on 568 or 571
	Stat 421	Intro to Math Stat II	5	Stat 4202	Intro to Math Stat II	4	1, 3, 5*	Stat 4202 replaces Stat 421
<b>Required courses in track (36 quarter credit hours become 24 semester credit hours)</b>								
	Math 255	Differential Equations and Their Applications	5	Math 2255	Differential Equations and Their Applications	3	1, 2**, 3**, 4*	replaces Math 255
	Math 512	Partial Differential Equations & Boundary Value Problems	3	Math 4557	Partial Differential Equations	3	1, 2**, 3**, 5**	replaces 512 or 557
	Math 588	Practicum in Actuarial Science	4					no longer offered to Financial Math majors
	Math 589	Introduction to Mathematical Finance	3	Math 3589	Introduction to Financial Mathematics	3	3*, 4*, 5**	replaces 589
	Math 607	Essentials of Numerical Analysis	5	Math 3607	Begin Sci Computing	3	3*, 4*, 5**	replaces parts of 607
	Math 618	Theory of Interest	4	Math 3618	Theory of Interest	3	3*, 4**, 5**	replaces 618
	Math 632	Actuarial Mathematics III	4	Math 5632	Financial Economics	3	3*, 4**, 5**	replaces 632
	Bus 420 or 620	Foundations of Finance, Business Finance	4 or 4	Bus Fin 3120 or 3220	Foundations of Finance, Business Finance	3 or 3	3*, 4*, 5**	replaces BUS 420, 620
	CSE 201 or 202	Elementary Computer Programming, Intro. to Programming & Algorithms	4 or 4	CSE 1223, 1222	Intro to Computer Prog. in Java, Intro to Computer Prog. in C++	3 or 3	3, 5*	replaces CSE 201, 202
<b>Electives</b>	none			none				
<b>Major program learning outcomes</b>								
	1	Learn conceptual frameworks needed to study higher mathematics, including an introduction to mathematical reasoning, and an understanding of how to read and write proofs.						
	2	Acquire basic mastery of core areas of mathematics, including calculus, analysis and algebra.						
	3	Develop powerful mathematical problem solving skills.						
	4	Learn to communicate mathematical understanding effectively.						
	5	Become proficient in chosen tracks within the major.						
* Learning outcomes are indicated for each course listed. Number of asterisks indicates level: beginning, intermediate, or advanced.								

### SAMPLE FOUR-YEAR PLANS

*Italic* indicates prerequisite courses, not counted in the major.

#### Math Major: **Theoretical Track** **Quarters**

	Au	Wi	Sp	Hours in major
YR 1.	<i>Math 151 (5)</i> GEC	<i>Math 152 (5)</i> GEC	<i>Math 153 (5)</i> GEC	0
YR 2.	Math 254 (5) GEC	Math 255 (5) GEC	Math 345 (4) Math 568 (3) GEC	17
YR 3.	Math 580 (3) Math 530 (3) or Stat 420 (5) GEC	Math 581 (3) Stat 421 (5) GEC	Math 582 (3) GEC	17 or 19
YR 4.	Math 547 (3) Math Elective* (5) GEC	Math 548 (3) Math Elective* (3) GEC	Math 549 (3) GEC	19

#### Math Major: **Theoretical Track** **Semesters**

	Au	Sp	Hours in major
YR 1.	<i>Math 1151 (5)</i> GE	<i>Math 1152 (5)</i> <i>Math 1295 (1)</i> GE	0
YR 2.	Math 2153 (4) GE	Math 3345 (3) Math 2568 (3) GE	10
YR 3.	Math 4580 (3) Math 4530 (3) or Stat 4201 (4) Math 2255 (3) GE	Math 4581 (3) Stat 4202 (4) GE	16 or 17
YR 4.	Math 4547 (3) Math Elective* (3) GE	Math 4548 (3) Math Elective* (3) GE	12

\* Check with your faculty adviser to determine choices for elective courses.

Math Major: **HONORS Theoretical Track** **Quarters**

	Au	Wi	Sp	Hours in major
YR 1.	Math 190H (5) GEC	Math 191H (5) GEC	Math 264H (5) GEC	15
YR 2.	Math 520H (5) GEC	Math 521H (5) GEC	Math 522H (4) GEC	15
YR 3.	Math 594H (5) or Math 531H Math 590H (5) GEC	Math 540H (5) or Math 576H (5) Math 591H (5) GEC	Math 541H (5) or Math 577H (5) Math 592H (5)	30
YR 4.	Math 531H (5) GEC	Stat 421 (5) GEC	GEC GEC	10

Math Major: **HONORS Theoretical Track** **Semesters**

	Au	Sp	Hours in major
YR 1.	Math 4181H (5) GE	Math 4182H (5) GE	10
YR 2.	Math 5520H (5) GE	Math 5522H (5) GE	10
YR 3.	Math 5590H (5) Math 5529H (5) or Math 5576H (5) GE	Math 5591H (5) Math 5530H (5) or Math 5540H (5) GE	20
YR 4.	Math 5576H (5) or Math 5529H (5) Stat 4202 (4) GE	Math 5540H (5) or Math 5530H (5) GE	14



Math Major: Education Track **Quarters**

	Au	Wi	Sp	Hours in major
YR 1.	<i>Math 151 (5)</i> GEC	<i>Math 152 (5)</i> <i>CSE 201, 202,</i> <i>or 221 (4)</i>	<i>Math 153 (5)</i> GEC	0
YR 2.	Math 254 (5) GEC	Math 568 (3) GEC	Math 345 (4) GEC	12
YR 3.	Math 580 (3) Stat 420 (5) GEC	Math 581 (3) Stat 421 (5) GEC	Math 582 (3) Math 578 (5) GEC	24
YR 4.	Math 547 (3) Math 507 (5) GEC	Math 548 (3) GEC	Math 549 (3) Math 504 (5) GEC	19

Math Major: Education Track **Semesters**

	Au	Sp	Hours in major
YR 1.	<i>Math 1151 (5)</i> GE	<i>Math 1152 (5)</i> <i>Math 1295 (1)</i>	0
YR 2.	Math 2153 (4) GE GE	Math 3345 (3) Math 2568 (3) GE	10
YR 3.	Math 4580 (3) Stat 4201 (4) GE	Math 4581 (3) Stat 4202 (4) GE	14
YR 4.	Math 4547 (3) Math 4504 (3) Math 4507 (3) GE	Math 4548 (3) Math 4578 (4) GE	16

Math Major: **Bio-Math Track** Quarters

	Au	Wi	Sp	Hours in major
YR 1.	<i>Math 151 (5)</i> <i>Chem 121 (5)</i> GEC	<i>Math 152 (5)</i> <i>Bio 113 (5)</i> GEC	<i>Math 153 (5)</i> <i>Bio 114 (5)</i> GEC	0
YR 2.	Math 254 (5) GEC	Math 255 (5) Stat 420 (5) GEC	Math 345 (4) Math 512 (3) Stat 421 (5)	27
YR 3.	Math 571 (3) MolGen 660 (5) GEC	Math 572 (3) MolGen 661 (5) GEC	Math 350 (3) GEC	19
YR 4.	Math or Bio* (3) GEC	Math 607 (5) Math or Bio* (3) GEC	Math or Bio* (3) GEC	14

Math Major: **Bio-Math Track** Semesters

	Au	Sp	Hours in major
YR 1.	<i>Math 1151 (5)</i> <i>Chem 1210 (5)</i> GE	<i>Math 1152 (5)</i> <i>Bio 1113 (4)</i> GE	0
YR 2.	Math 2153 (4) <i>Bio 1114 (4)</i> <i>Math 1295 (1)</i> GE	Math 2255 (3) Math 2568 (3) Stat 4201 (4)	15
YR 3.	Stat 4202 (4) Math 3345 (3) GE	Math 4556** (3) Math 3350 (3) GE	12
YR 4.	<i>Bio 3401 (4) or MolGen 5660 (5)</i> Math 3607** (3) GE	Math or Bio Elective* (3) Math or Bio Elective* (3) GE	13 or 14

\* Check with your faculty adviser to determine choices for elective courses.

\*\* Majors in this track need credit for two of the following three courses: 4556, 4557, 3607.

Math Major: **Applied Track** **Quarters**

	Au	Wi	Sp	Hours in major
YR 1.	<i>Math 151 (5)</i> GEC	<i>Math 152 (5)</i> <i>Physics 131 (5)</i> GEC	<i>Math 153 (5)</i> <i>Physics 132 (5)</i> GEC	0
YR 2.	Math 254 (5) <i>Physics 133 (5)</i> GEC	Math 255 (5) GEC	Math 345 (4) Math 512 (3) GEC	17
YR 3.	Math 571 (3) Stat 420 (5) GEC	Math 572 (3) Math 607 (5) GEC	Math 514 (3) Stat 421 (5) GEC	24
YR 4.	Math Elective* (3) Applied Elective* (3) GEC	Math Elective* (3) Applied Elective* (3) GEC	Math Elective* (3) Applied Elective* (3) GEC	18

Math Major: **Applied Track** **Semesters**

	Au	Sp	Hours in major
YR 1.	<i>Math 1151 (5)</i> <i>CSE 1222 (3)</i> GE	<i>Math 1152 (5)</i> <i>Physics 1250 (5)</i> GE	0
YR 2.	Math 2153 (4) <i>Physics 1251 (5)</i> <i>Math 1295 (1)</i> GE	Math 3345 (3) Math 2255 (3) Math 2568 (3)	13
YR 3.	Stat 4201 (4) Math 3607** (3) Math 4557 (3)	Stat 4202 (4) Math 4552** (3) GE	17
YR 4.	Math Elective* (3) Applied Elective* (3) GE	Math Elective* (3) Applied Elective* (3) GE	12

\* Check with your faculty adviser to determine choices for elective courses.

\*\* Majors in this track need credit for two of the following three courses: 4552, 4556, 3607.

Math Major: **Financial Track** **Quarters**

	Au	Wi	Sp	Hours in major
YR 1.	<i>Math 151 (5)</i> <i>CSE 200 (5)</i> GEC	<i>Math 152 (5)</i> <i>Econ 200 (5)</i> GEC	<i>Math 153 (5)</i> <i>Econ 201 (5)</i> GEC	0
YR 2.	Math 254 (5) <i>Acct 310 (5)</i> GEC	Math 255 (5) CSE 201 (4) GEC	Math 345 (4) Math 568 (3) GEC	21
YR 3.	Stat 420 (5) GEC	Stat 421 (5) Math 512 (3) GEC	Bus Fin 620 (4) GEC	17
YR 4.	Math 618 (4) GEC	Math 589 (3) Math 607 (5) GEC	Math 588 (4) Math 632 (4) GEC	20

Math Major: **Financial Track** **Semesters**

	Au	Sp	Hours in major
YR 1.	<i>Math 1151 (5)</i> <i>CSE 2111 (3)</i> GE	<i>Math 1152 (5)</i> <i>Econ 2001.01 (3)</i> GE	0
YR 2.	Math 2153 (4) <i>Econ 2002.01 (3)</i> <i>Acct 2000 (3)</i>	Math 3345 (3) Math 2568 (3) <i>Math 1295 (1)</i> GE	10
YR 3.	Stat 4201 (4) Math 2255 (3) GE	Stat 4202 (4) Math 4557 (3) Math 3589 (3)	17
YR 4.	Math 3618 (3) Math 3607 (3) CSE 1222 (3) GE	Math 5632 (3) <i>Bus Fin 3220 (3)</i> GE	15

## Transition Policies and Plans for students getting a BS or BA in Math.

Requirements for a B.S. in Mathematics will undergo minimal changes in the conversion to semesters. Perhaps the largest change is the new seminar: Math majors not completing an honors contract are required to pass Math 1295, a 1-credit “introductory seminar”.

Every math course or course sequence (prerequisite, required, or elective) under quarters will have a corresponding course or course sequence under semesters. In some cases this transition involves an increase in credit hours, typically motivated by the expectation that upper division semester math courses will be 3 credits. In most cases, these increases are balanced by small rearrangements of required and elective courses.

Transition policies for freshman-level courses are more difficult to work out because those courses are usually in a long sequence that can be entered at different points. The only one of those transitions that is relevant for math majors is the mainstream calculus sequence, Math 151-152-153-254. Those plans are outlined on a separate page below.

Two difficult transition arise in upper division courses taken by math majors:

Students might be part way through a 500-level math course sequence at the end of Spring 2012.

This can happen for Math **547-548-549** and **580-581-582**, corresponding to Math **4547-4548** and Math **4580-4581**. Those course sequences in quarters begin in both Autumn and Winter. Each of the four corresponding semester courses will be offered in both Autumn and Spring Semesters.

Since Math 547 and 580 are not offered in Spring, few students will have credit for just one course in the sequence when semesters arrive. Advisors will guide those students on a case-by-case basis.

Students who complete Math 547-548 in Winter and Spring of 2012 will enter the 3-credit transition course Math **4544** offered only in Au12. Math 4544 will be Math 549 done in a semester. This will include all topics not in 549, done in greater detail, and proceeding through the mathematical ideas at slower pace. This arrangement will not cause delays in graduation.

Students who complete Math 580-581 in Winter and Spring of 2012 will enter the 3-credit transition course Math **4584** offered only in Au12. Math 4584 will be Math 582 done in a semester. This will include all topics not in 582, done in greater detail, and proceeding through the mathematical ideas at slower pace. This arrangement will not cause delays in graduation.

### ADVISING.

Three full-time counselors are currently available in the *Math Advising Office* for walk-in appointments to help students determine their best paths through the many options for math at OSU. General information about that office is posted at <http://www.math.ohio-state.edu/counseling>. Those counselors devote most of their effort assisting students from other departments. They evaluate math transfer credit, deal with issues involved with the Math Placement Exam, advise students having difficulties with math classes, work with many recruitment activities, etc. In addition, the math counselors work closely with Math and Actuarial Science majors, helping them complete major and minor program forms and facilitating the process of connecting majors with faculty advisors.

From Winter 2011 through Spring 2012 the math advisors will send messages to all undergraduate majors in the Math Department, highlighting the various math course options available with semesters. They will direct the efforts to complete a TAP form for every math and actuarial science major who will be at OSU after Sp12. The Department’s staff members, faculty advisors, and departmental administrators will be able to deal with the expected numbers of majors who encounter difficulties in the process of conversion to semesters.

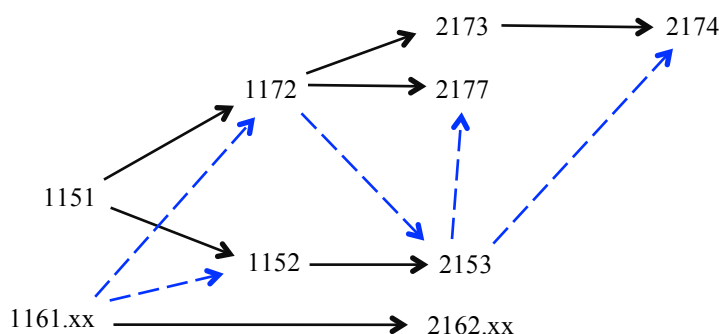
However, throughout 2012 we expect floods of students from outside the Math Department to visit the Math Advising Office with questions about transition processes, especially concerning semester transitions of the many lower-division math courses. We hope that the Department will be able to find funds to hire enough extra help during the transition year to make it possible to handle that advising burden.

## Calculus transition plans.

With semesters, calculus will split into different strands.

Note: 1151, 1152, 2153, 2568, and 2255 satisfy the *Transfer Assurance Guides* provided by Ohio's Board of Regents.

Course sequences starting with calculus	majors that use them
• Standard Calculus: 1151 – 1152 – 2153 – 2568 – 2255	math, act sci, some sciences
• Eng. Calculus: 1151 – 1172 – 2173 – 2174	AE, ISE, ME, CBE, Eng Phys
• Eng. Calculus Topics: 1151 – 1172 – 2177	BME, CEEGS, FABE, MSE, WE
• Calc – LinAlg – DiffEq: 1151 – 1172 – 2568 – 2415	ECE
• Calculus + Discrete: 1151 – 1172 – 2568 – 2566	CSE, CIS
• Accelerated Calculus: 1161 – 2162 (+ 2568 + 2415)	FEH
• Honors Calculus: 1181H – 2182H	honors math
• Honors Analysis: 4181H – 4182H	honors math



Arrows indicate ways students may move among these courses:

Dotted line: allowed but not recommended:

1161 → 1152, 1161 → 1172, 1172 → 2153, and 2153 → 2177 involve overlapping material.

2153 → 2174: students miss coverage of second order constant coefficient ODEs.

No arrow from X to Y: students with credit for Course X may not enroll in Course Y.

### Honors courses

Students with C- or better in 1181H or 4181H may enter 1172 or 2153.

### Linear Algebra

2568 prereq: C- or better in 1172, 2153, 2162.xx, 1181H, or 4182H.

### Diff Eqs:

2255 prereq: C- or better in 2153, or 2162.xx, or 2173.

Note: 2255 and 2415 exclude each other.

2415 prereq: credit for 2153, or 2162.xx, or 2173, or {1172 and 2568}.

4556 prereq: C- or better in 2153, or 2162, or 2173.

4557 prereq: C- or better in 2255 or 2415.

4512 prereq: C- or better in 2174, 2255, 2415 or equivalent.

Note: 4512 is intended for engineers.

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\* Math and Act Sci majors with credit for Math 2174 must also take 2255 and 2568, even though that involves overlaps in content.

Here are short descriptions of these courses. Credit hours are indicated in parentheses.

- 1151 Calculus 1** (5) limits, derivatives, max-min, definite integrals, Fundamental Theorem.
- 1152 Calculus 2** (5) integration techniques, sequences and series, convergence tests, Taylor series, parametric and polar curves, (optional: vectors).
- 1161 Accelerated Calculus 1** (5) limits, derivatives, max-min, integrals, techniques of integration, applications.
- 1172 Engineering Math A** (5) integration, sequences & series, Taylor series, vectors and parametric curves, several variables, partial derivatives, max-min.
- 2153 Calculus 3** (4) vectors, several variables, partial derivatives, max-min, multiple integrals, line integrals and vector fields, divergence, curl, integration theorems.
- 2162 Accelerated Calculus 2** (5) sequences & series, Taylor series, vectors, parametric curves, partial derivatives, optimization, multiple integrals, line integrals, divergence, curl, integration theorems.
- 2173 Engineering Math B** (3) multiple integrals, line integrals, vector fields, second order constant coefficient ODEs.
- 2174 Linear Algebra and Differential Equations** (3) vectors, matrices, diagonalization, systems of linear ODEs, Fourier series, PDEs.
- 2177 Mathematical Topics for Engineers** (4) multiple integrals, line integrals, matrices and linear systems, constant coefficient ODEs, Fourier series, PDEs.
- 2255 ODEs** (3) first order methods, existence and uniqueness, second order linear equations, Wronskian, undetermined coefficients, variation of parameter, series solutions, Laplace transform.
- 2415 ODEs and PDEs** (3) first and second order ODEs, Fourier series, constant coefficient PDEs, boundary and initial value problems, systems of ODEs.
- 2568 Linear Algebra** (3) systems of equations, matrices, vector spaces, dimension, linear transformations, determinants, eigenvalues, diagonalization, orthogonality.
- 4512 Applied PDEs** (3) first and second order equations, boundary value problems, separation of variables, Fourier series, Green's functions, wave and diffusion equation, Schrodinger's equation, Bessel functions.
- 4556 Dynamical Systems** (3) systems of linear, first-order ODEs, existence and uniqueness, phase plane analysis, bifurcation theory, stability, oscillations, applications and modeling.
- 4557 PDEs** (3) first and second order PDEs, initial value and boundary value problems, Fourier series, Green's functions, nonlinear theory: wave, heat, and Laplace equation. Applications.

Abbreviations: ODE = ordinary differential equation, PDE = partial differential equation.

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## TRANSITION PLANS for Freshman Calculus.

Here are different scenarios for students at the end of Spring 2012. More detailed information about Math course transition options appears in separate documents, posted at [www.math.ohio-state.edu/semesters](http://www.math.ohio-state.edu/semesters).

- *Completed 151-152-153:* may take 2153, (not 2173 or 2177).
- *Engineers on track to complete 151-152-153:* In Sp12, take the 5-credit transition course **Math 154** instead of 153. With credit for 154, they may enter Math 2173 or 2177, (not 2153).

- *Completed 151-152:* may enter 1152 or 1172, but that direct transition repeats about 6 weeks of material.

There are two ways to avoid that overlap.

**1** Students with C- or better in Math 151 may enroll in **Math 114**, a 3-credit transition course in Sp12, or in **Math 1114** a 2-credit transition course in Su12 or Au12.

Math 151 plus {114 or 1114} is equivalent to Math 1151.

Math 114 and 1114 will use video lectures that each student will view independently, on a personal computer. Recitation classes following those lectures come in two formats, to accommodate different needs of students. Each recitation class will have a maximal enrollment of 30 students. Both of the formats will have video lectures, on-line homework assignments, and a **proctored, paper-and-pencil, final exam**.

Formats for the recitation sections are:

- 1. Hybrid:** Students meet in traditional, live, recitation sections meeting in an OSU classroom twice a week.
  - The best option. In Columbus, this class will probably be offered Sp12, Su12, and the first term of Au12.
- 2. Online:** At the scheduled class time, each student logs in to the class using a personal computer, communicating with the instructor through microphone and chat box. Students will hear their recitation instructor and see the problems being written out.
  - For students unable to attend a traditional class.

C- or better in 114 or 1114: may enter 1152 or 1172.

D+ or lower in 114 or 1114: re-enroll in 1114, or enter 1151 (repeating the 151 topics).

**2** Students with C- or better Math 152 in Sp12 may enter the 3-credit transition courses **Math 1534** or **1544**. These courses correspond directly to the quarter courses:

1534 = Math 153 presented in a semester. Students with C- or better in 1534 may enter Math 2153.

1544 = Math 154 presented in a semester. Students with C- or better in 1544 may enter Math 2173 or 2177.

- *Completed 151:*

Advising at the end of Sp12: Math 1114. We recommend the live recitation option if possible.



**AP-Calculus credit:**

Students who took AP-calculus exams in high school will get credit for certain OSU calculus courses.

Score	Credit for:	Recommended Courses
AB-1, AB-2, BC-1, BC-2	no credit	Use OSU Math Placement Exam
AB-3	1151	1151
AB-4	1151	1152 or 1172
AB-5	1151	1161.xx, 1152, 1172; or 1181H or 4181H with advisor approval
BC-3	1151	1161.xx, 1152, 1172; or 1181H or 4181H with advisor approval
BC-4, 5	1151, 1152	2153; or 1181H, 4181H with advisor approval, or: 1162.02 or 2162.02: with FEH-advisor approval

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## Generic transition schedules.

Here are generic course schedules for math majors (theoretical track) who will experience the transition to semesters at different points in their undergraduate careers. Credit hours are indicated to the right of each course in the major program. Similar schedules can be generated for the other tracks.

Nearly all math majors will move smoothly to the new system. A few difficulties will arise, for unanticipated reasons, leading to some individual studies courses run by appropriate faculty members.

Graduating $\leq$ Sp12	Graduating Sp13	Graduating Sp14	Graduating Sp15	Graduating $\geq$ Sp16
(Au08)	(Au09)	(Au10)	(Au11)	(Au12)
Math 151 (Calc I) 5	Math 151 (Calc I) 5	Math 151 (Calc I) 5	Math 151 (Calc I) 5	Math 1151 (Calc 1) 5
Math 152 (Calc II) 5	Math 152 (Calc II) 5	Math 152 (Calc II) 5	Math 152 (Calc II) 5	Math 1152 (Calc 2) 5
Math 153 (Calc III) 5	Math 153 (Calc III) 5	Math 153 (Calc III) 5	Math 153 (Calc III)	GEs
GECs	GECs	GECs	GECs	
Math 254 (Cal IV) 5	Math 254 (Calc IV) 5	Math 254 (Calc IV) 5	Math 2153 (Calc 3) 4	Math 2153 (Calc 3) 4
Math 255 (ODE) 5	Math 255 (ODE) 5	Math 255 (ODE) 4	Math 2255 (ODE) 3	Math 2255 (ODE) 3
Math 345 (Hi Math) 4	Math 345 (Hi Math) 4	Math 345 (Hi Math) 4	Math 3345 (Hi Math) 3	Math 3345 (Hi Math) 3
Math 568 (Lin Alg) 3	Math 568 (Lin Alg) 3	Math 568 (Lin Alg) 3	Math 2568 (Lin Alg) 3	Math 2568 (Lin Alg) 3
GECs	GECs	GECs	Math 1295 (Seminar) 1	Math 1295 (Seminar) 1
			GEs	GEs
Math 580 (Ab Alg I) 3	Math 580 (Ab Alg I) 3	Math 4580 (Ab Alg 1) 3	Math 4580 (Ab Alg 1) 3	Math 4580 (Ab Alg 1) 3
Math 581 (Ab Alg I) 3	Math 581 (Ab Alg I) 3	Math 4581 (Ab Alg 2) 3	Math 4581 (Ab Alg 2) 3	Math 4581 (Ab Alg 2) 3
Math 582 (Ab Alg I) 3	Math 582 (Ab Alg I) 3	Math 4530 (Prob) 3	Math 4530 (Prob) 3	Math 4530 (Prob) 3
Math 530 (Prob) 3	Math 530 (Prob) 3	Stat 4202 (Stat) 4	Stat 4202 (Stat) 4	Stat 4202 (Stat) 4
Stat 421 (Stat) 5	Stat 421 (Stat) 5	GECs	GECs	GECs
GECs	GECs			
Math 547 (An I) 3	Math 4547 (An 1) 3	Math 4547 (An 1) 3	Math 4547 (An 1) 3	Math 4547 (An 1) 3
Math 548 (An II) 3	Math 4548 (An 2) 3	Math 4548 (An 2) 3	Math 4548 (An 2) 3	Math 4548 (An 2) 3
Math 549 (An III) 3	Math 4507 (Geom) 3	Math 4507 (Geom) 3	Math 4507 (Geom) 3	Math 4507 (Geom) 3
Math 507 (Geom) 5	Math 4552 (Cx An) 3	Math 4552 (Cx An) 3	Math 4552 (Cx An) 3	Math 4552 (Cx An) 3
Math 552 (Cx Vbl) 5	GECs	GECs	GECs	GECs
GECs				

# BA in Actuarial Science

Department of Mathematics, OSU

Note: BA and BS documents are identical for this major, except for the change of name. The only differences are in details of General Education requirements.

## TABLE OF CONTENTS.

0. Letter from Department Chair.
1. Program learning goals.
2. Rationale for changes.
3. List of semester courses.
4. Advising sheets for quarter system and semester system.
5. Four-year plan of courses
6. Application to enter the major.
7. Transition policies.
8. Curriculum map.



To: Office of Academic Affairs  
From: Luis Casian, Chair, Department of Mathematics  
Date: January 2011  
Re: Semester program proposals for degree programs in the Department of Mathematics

The following programs in the Department of Mathematics are being converted from the quarter system to the semester system, with minimal changes:

1. BS in Mathematics
2. BA in Mathematics
3. Minor in Mathematics
4. BS in Actuarial Science
5. BA in Actuarial Science
6. MS in Mathematics
7. MMS in Mathematics
8. PhD in Mathematics

During the past year, the Department's Undergraduate Committee and Graduate Studies Committee have worked on semester conversions of those programs. This process involved frequent consultations with faculty members involved with particular courses or course sequences, and involved repeated editing of the conversion documents.

Many changes will also be made to the structure and flow of freshman-level math courses. Since those courses do not involve students enrolled in those eight programs, their changes are not discussed in these program conversion documents.

These proposed conversion plans and transition policies were approved by the Undergraduate and Graduate Committees, and were discussed during a faculty meeting in December 2, 2010. The semester conversion plans were approved by the Department's tenure-track faculty, by a vote of 49 yes and 0 no.

A handwritten signature in blue ink, appearing to read "Luis Casian".

Luis Casian  
Professor and Chair

## 1. Program Learning Goals.

Students majoring in actuarial science will:

- (1) acquire a strong general background in mathematics, statistics, and relevant concepts from actuarial science and business;
- (2) develop analytical and problem solving skills;
- (3) be prepared to pass national actuarial examinations administered by the Society of Actuaries and the Casualty Actuarial Society.

## 2. Rationale for Changes in the Actuarial Sciences Major.

Changes to the actuarial science major can be summarized as follows:

- (a) *One required course in probability instead of two.*

Two probability courses (Math 530 and Stat 420) are currently required, but only one is required in the proposed semester program. The 3-credit course Math 530 alone does not provide enough preparation for students for the actuarial exam in probability, so an additional statistics course was required. Each of the semester courses Math 4530 and Stat 4201 will cover enough probability to prepare students for the actuarial exam, so the major requires students to take only one of those two courses.

- (b) *Change of one required course to elective.*

With changes in the curriculum of professional exams, the currently required Math 532 has become a course designed for exam preparation. We propose to drop the corresponding semester course Math 3532 as a requirement, and list it as an free elective course.

- (c) *New course sequence in loss models.*

Courses in the current major program cover topics for all the initial actuarial exams except one, Exam C/4: Construction and Evaluation of Models. In the semester plan, two elective courses are proposed, Math 5633 and 5634. With the addition of this two-course sequence, the courses will cover all five preliminary exams administered by the Society of Actuaries (SOA) and Casualty Actuarial Society (CAS). Students can take this sequence instead of Math 5630 and 5631 to fulfill part of the major requirements, and students on fast track can take both sequences while at OSU. The addition of this new sequence gives our students a more flexible and complete actuarial education.

(d) *Enrollment control: Creation of a Pre-Major.*

In recent years the number of actuarial science majors has increased sharply, from about 80 students in 2005 to 300 students at the end of 2010. This increase causes several symptoms of stress:

- More than one-quarter of current majors have marginal performance and struggle to find internships and jobs as actuaries.
- Actuarial advisors and coordinators are seriously overburdened.
- All courses taken by actuarial science majors are full, with waiting lists.

By analyzing grades in various courses taken fairly early by actuarial science majors, we found that the probability course is a reliable indicator of success. Therefore we plan to create a pre-major program to provide an early warning to the weakest students that this major might not be fruitful for them.

To apply to be an Actuarial Science major, a student must

- (1) have a cumulative GPA (for courses at Ohio State) of at least 3.0; and
- (2) either earn a B- or better in a Probability course taken at Ohio State (Math 4530, Stat 4201, or Math 5530H)\*; or pass one of the actuarial exams administered by SOA/CAS.

The number of students admitted to the major will equal the Actuarial Science Program's enrollment capacity. If the number of qualified applicants exceeds that capacity, admission to the major will be based on the student's grade point average in relevant math courses.

Students have until the second Friday of each semester to file an application to enter the major. An Actuarial Science Committee will review the files and notify applicants of the Committee's decisions. Students who have not gained admission to the major may reapply in subsequent semesters. Students who want their application to be reconsidered may file an appeal with the Actuarial Science Committee.

With this plan, together with advising by the math counselors and faculty advisers, nearly all pre-majors in Actuarial Science will know early in their third year whether they will be able to enter the major. Pre-majors who are not admitted to this major will most naturally move toward the financial track of the mathematics major.

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\* May also use Math 530, Math 531H, or Stat 420 to fulfill this requirement.

(e) *Courses that count toward two degree programs.*

In recent years, many academically strong students majoring in actuarial science have worked toward double majors and dual degrees. The Department of Mathematics has implemented the following exclusion rule for courses in linear algebra, probability, and mathematical statistics. The goal is to ensure that actuarial science majors working toward a second bachelor's degree are designing programs that are reasonable disjoint from one another,

Double-counting rule for dual degrees:

For students pursuing a dual degree, any of the courses:

{ Math 2568, Math 5520H, Math 4530, Math 5530H, Stat 4201, Stat 4202 },  
may be counted toward an actuarial science major only if that course is not counted as a prerequisite or as a requirement for a degree in another College.

### 3. List of semester courses used by majors in Actuarial Science.

- Required Prerequisites
  - (a) Math 1151: Calculus I (5 cr)
  - (b) Math 1152: Calculus II (5 cr)
  - (c) CSE 2111: Modeling and Problem Solving with Spreadsheets and Databases (3 cr);  
or  
CSE 1222, Intro to Programming in C++ (3 cr); or  
CSE 1223, Intro to Programming in Java (3 cr)
  - (d) Econ 2001.01: Microeconomics (3 cr)\*
  - (e) Econ 2002.01: Macroeconomics (3 cr)\*
  - (f) AcctMIS 2000: Foundations of Accounting (3 cr)
- Required Courses
  - (g) Math 2153: Calculus 3 (4 cr)
  - (h) Math 2568: Linear Algebra (3 cr)
  - (i) Math 3618: Theory of Interest (3 cr)
  - (j) Stat 4201: Introduction to Mathematical Statistics I (4 cr)  
or Math 4530: Probability (3 cr)
  - (k) Stat 4202: Introduction to Mathematical Statistics II (4 cr)
  - (l) Math 3588: Practicum in Actuarial Science (3 cr)
  - (m) Math 5630: Life Contingencies 1 (3 cr); or  
Math 5633: Loss Models 1 (3 cr)
  - (n) Math 5631: Life Contingencies 2 (3 cr); or  
Math 5634: Loss Models 2 (3 cr)
  - (o) Math 5632: Financial Economics (3 cr)
  - (p) Bus Fin 2220 or 2120: Business Finance (3 cr)
- Recommended Courses (if not taken as a required course)
  - (q) Math 3532: Mathematical Foundations of Actuarial Science (3 cr)
  - (r) Math 4530: Probability (3 cr)
  - (s) Math 5630: Life Contingencies 1 (3 cr)
  - (t) Math 5631: Life Contingencies 2 (3 cr)
  - (u) Math 5633: Loss Models 1 (3 cr)
  - (v) Math 5634: Loss Models 2 (3 cr)

Students can complete this major by taking at most 18 credit hours per semester.

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\*Econ 2001.02 & 2002.02 are intended for economics majors. Those courses can substitute for the .01 courses .



4. Comparison of Advising Sheets for Quarters and Semesters.

Current advising form for quarters:

**MAJOR PROGRAM FORM (QUARTERS)**  
College of Arts and Sciences

			Actuarial Science
Name: last	first	middle	Major

OSU email address (name.n):	Student number:
Degree Sought (circle one): <b>BS</b> <b>BA</b>	Expected date of graduation (qtr/yr):

Have you filed a degree application in the college office? (circle one):      YES      NO
---

(NOTE: This form is NOT a degree application)

If completing two majors, list both of them below, and file a separate form for each one:

--	--

Part A: Required Prerequisites (and / or supplementary requirements)

Courses	Hours	Grade	Courses	Hours	Grade
Econ 200	5		Math 151	5	
Econ 201	5		Math 152	5	
Acct 310	5		Math 153	5	

Part B: Major Program (Minimum grade of "C-", and minimum grade average of "C" (2.00) required.)  
Core Requirements (Substitutions are rarely permitted)

Courses	Hours	Grade	Courses	Hours	Grade
Math 254	5		Math 618	4	
Math 568	3		Math 630	4	
Math 530	3		Math 631	4	
Math 532	3		Math 632	4	
Stat 420	5		Math 588	4	
Stat 421	5		Bus Fin 620	4	
CSE 200, 201, or 221	5				

53

Total of Part B only

Check whether this is:	x	
------------------------	---	--

See back for information about major programs.      original      revision  
Distribution: One copy each - Faculty adviser, Student, College Office, 130 Denney Hall

Signature of faculty adviser	
Name of adviser (please print)	
Mathematics	292-
Department	Campus phone
Date:	



5. Four year plans.

**SAMPLE FOUR-YEAR PLAN**

Note. *Italic* indicates prerequisite courses, not counted in the major.

**Actuarial Science, Quarters**

	Au	Wi	Sp	Hours in major
YR 1.	<i>Math 151 (5)</i> CSE 200 (5) GECs	<i>Math 152 (5)</i> <i>Econ 200 (5)</i> GECs	<i>Math 153 (5)</i> <i>Econ 201 (5)</i> GECs	0
YR 2.	Math 254 (5) <i>Acct 310 (5)</i> GECs	Math 568 (3) GECs	GECs	13
YR 3.	Math 618 (4) Math 530 (3) GECs	Stat 420 (5) Bus Fin 620 (4) GECs	Math 588 (4) Math 532 (3) GECs SOA Exam P	21
YR 4.	Math 630 (4) SOA Exam FM	Math 631 (4) GECs	Math 632 (4) Stat 421 (5) GECs	17

**Actuarial Science, Semesters**

	Au	Sp	Hours in major
YR 1.	<i>Math 1151 (5)</i> CSE 2111, 1222, 1223 (3) <i>Econ 2001.01 (3)</i> GEs	<i>Math 1152 (5)</i> <i>Acct 2000 (3)</i> <i>Econ 2002.01 (3)</i> GEs	0
YR 2.	Math 2153 (4) Math 3618 (3) GEs	Math 2568 (3) Math 4530 (3) or Stat 4201 (4) SOA Exam FM	13 or 14
YR 3.	Stat 4202 (4) Math 5632 (3) SOA Exam P	Math 3588 (3) Bus Fin 2220 or 2120 (3) GEs	13
YR 4.	Math 5630* (3) GEs	Math 5631* (3) SOA Exam MFE	6

\* 5630-5631 may be replaced by 5633-5634.

6. Application to enter the major.

**Application to enter the Actuarial Sciences Undergraduate Major**

**The Ohio State University  
College of the Arts and Sciences**

**Full Name** \_\_\_\_\_

**OSU ID** \_\_\_\_\_

**OSU E-Mail (name.n)** \_\_\_\_\_

This completed and signed form should be submitted to your college office.

To be admitted as an Actuarial Science major, a student must

(1) have a cumulative GPA (for courses at Ohio State) of at least 3.0; **and**

(2) either

(i) earn B- or better in Math 4530, Stat 4201, or Math 5530H, taken at Ohio State; or

(ii) pass one of the actuarial exams administered by SOA/CAS.

**(1) Total hours of courses taken at OSU** \_\_\_\_\_ **GPA in those courses** \_\_\_\_\_

**(2):**

(i) (circle one) **Math 4530, Math 5530H, or Stat 4201** **Final Grade** \_\_\_\_\_

OR

(ii) **Actuarial Exam:** \_\_\_\_\_ **Date** \_\_\_\_\_

Attach a copy of official notice from SOA/CAS showing your passing of the exam.

**APPROVED BY:** \_\_\_\_\_

Signature of Math Dept. Representative

Date

\_\_\_\_\_  
Print Name of Math Dept. Representative

\_\_\_\_\_  
Academic Unit

\_\_\_\_\_  
Campus phone and/or e-mail

## 7. Transition Policies.

Except for probability, all courses and course sequences required by this major have simple and direct correspondences between quarter versions and semester versions. Further details of those correspondences appear on the Curriculum Map in Section 8 below.

Actuarial science majors will not have their graduation delayed because of the University's conversion to semesters.

### **Probability requirement.**

Rules are changing for Math 530 and Stat 420. In the quarter system, majors in actuarial science were required to have credit for both of those courses. With semesters, majors need credit for only one of the corresponding courses, Math 4530 or Stat 4201. In addition, for a student who has not passed one of the actuarial exams, the pre-major requires that student to take either Math 4530 or Stat 4201 at Ohio State, and to earn a grade of B- or better.

The pre-major requirements will apply to students who declare an Actuarial Science major in Autumn 2012 or later. Students who declare the major before Au12 are allowed to fulfill this requirement in two different ways:

- (1) pass both Math 530 and Stat 420, or
- (2) earn B- or better in one of Math 530 or Stat 420.

Transition plans and policies for all freshman and sophomore math courses are described in separate documents posted at the Math Department's web page

<http://www.math.ohio-state.edu/semesters>.

### Actuarial Science Major

Sample curricula for students at different stages of the semester transition

Graduating ≤ Sp12	Graduating Sp13	Graduating Sp14	Graduating Sp15	Graduating ≥ Sp16
(Au08)	(Au09)	(Au10)	(Au11)	(Au12)
Math 151 (Calc I) 5	Math 151 (Calc I) 5	Math 151 (Calc I) 5	Math 151 (Calc I) 5	Math 1151 (Calc 1) 5
Math 152 (Calc II) 5	Math 152 (Calc II) 5	Math 152 (Calc II) 5	Math 152 (Calc II) 5	Math 1152 (Calc 2) 5
Math 153 (Calc III) 5	Math 153 (Calc III) 5	Math 153 (Calc III) 5	Math 153 (Calc III) 5	CSE 2111 (Prob Solv) 3
CSE 200 (Prob Solv) 5	CSE 200 (Prob Solv) 5	CSE 200 (Prob Solv) 5	CSE 200 (Prob Solv) 5	Econ 2001.01 (Micro) 3
Econ 201 (Micro) 5	Econ 201 (Micro) 5	Econ 201 (Micro) 5	Econ 201 (Micro) 5	Econ 2002.01 (Macro) 3
Econ 202 (Macro) 5	Econ 202 (Macro) 5	Econ 202 (Macro) 5	Econ 202 (Macro) 5	GEs
GECs	GECs	GECs	GECs	
Math 254 (Cal IV) 5	Math 254 (Calc IV) 5	Math 254 (Calc IV) 5	Math 2153 (Calc 3) 4	Math 2153 (Calc 3) 4
Math 568 (Lin Alg) 3	Math 568 (Lin Alg) 3	Math 568 (Lin Alg) 3	Math 2568 (Lin Alg) 3	Math 2568 (Lin Alg) 3
Acct 310 (Fdn of Acct) 5	Acct 310 (Fdn of Acct) 5	Acct 310 (Fdn of Acct) 5	Acct 2000 (Fdn of Acct) 3	Acct 2000 (Fdn of Acct) 3
GECs	GECs	GECs	GEs	GEs
Math 618 (Thy of Int) 4	Math 618 (Thy of Int) 4	Math 3618 (Thy of Int) 3	Math 3618 (Thy of Int) 3	Math 3618 (Thy of Int) 3
Math 530 (Prob) 3	Math 530 (Prob) 3	Math 4530 (Prob) 3	Math 4530 (Prob) 3	Math 4530 (Prob) 3
Stat 420 (Math Stat I) 5	Stat 420 (Math Stat I) 5	Stat 4202 (Stat 2) 4	Stat 4202 (Stat 2) 4	Stat 4202 (Stat 2) 4
Bus Fin 620 (Finance) 4	Bus Fin 620 (Finance) 4	Bus Fin 2220 (Finance) 3	Bus Fin 2220 (Finance) 3	Bus Fin 2220 (Finance) 3
Math 588 (Practicum) 4	Math 588 (Practicum) 4	Math 3588 (Practicum) 3	Math 3588 (Practicum) 3	Math 3588 (Practicum) 3
Math 532 (Math Fdns) 3	Math 532 (Math Fdns) 3	GEs	GEs	GEs
GECs	GECs			
Math 630 (Act Math I) 4	Math 5630 (Life Ctg 1) 3	Math 5630 (Life Ctg 1) 3	Math 5630 (Life Ctg 1) 3	Math 5630 (Life Ctg 1) 3
Math 631 (Act Math II) 4	Math 5631 (Life Ctg 2) 3	Math 5631 (Life Ctg 2) 3	Math 5631 (Life Ctg 2) 3	Math 5631 (Life Ctg 2) 3
Math 632 (Act Math III) 4	Math 5632 (Fin Econ) 3	Math 5632 (Fin Econ) 3	Math 5632 (Fin Econ) 3	Math 5632 (Fin Econ) 3
Stat 421 (Math Stat II) 5	Stat 4202 (Stat 2) 4	GEs	GEs	GEs
GECs	GEs			

<b>Actuarial Science Major</b> 45 or 48 quarter credit hrs become 32 or 33 semester credit hrs.								
Segment of major program	Quarter course #	Quarter course name	Credit hours	Semester course #	Semester course name	Units	Learning outcome	Nature of conversion
<b>Prerequisites (30 quarter credit hours become 22 or 23 semester credit hours; some may double-count in GEC)</b>								
	Math 151	Calculus and Analytic Geometry I	5	Math 1151	Calculus 1	5	1, 2, 3	Math 1151-1152 replace 151-152-153
	Math 152	Calculus and Analytic Geometry II	5	Math 1152	Calculus 2	5	1, 2, 3	
	Math 153	Calculus and Analytic Geometry III	5					
	Acct 310	Foundations of Accounting	5	Acct 2000	Foundations of Accounting	3	1	Acct 2000 replaces Acct 310
	Econ 200	Principles of Microeconomics	5	Econ 2001.01	Principles of Microeconomics	3	1	Econ 2001.01 replaces Econ 200
	Econ 201	Principles of Macroeconomics	5	Econ 2002.01	Principles of Macroeconomics	3	1	Econ 2002.01 replaces Econ 200
				CSE 2111, CSE 1223, or CSE 1222	Modeling & Pro Solv with Spreadsheets & Databases, or Intro to Computer Prog. in Java, or Intro to Computer Prog. in C++	3	1, 2*	replaces CSE 200, replaces CSE 201, replaces CSE 202
<b>Major requirements (45 or 48 quarter credit hours become 32 or 33 semester credit hours)</b>								
	Math 254	Calculus and Analytic Geometry IV	5	Math 2153	Calculus 3	4	1*, 2*, 3	expands on 254
	Math 568	Linear Algebra	3	Math 2568	Linear Algebra	3	1*, 2, 3	expands on 568 or 571
	Math 530 or Stat 420	Probability Introduction to Mathematical Statistics I	3 or 5	Math 4530 or Stat 4201	Probability Introduction to Mathematical Statistics 1	3 or 4	1**, 2*, 3**	expands on Math 530, expands on Stat 420
	Stat 421	Introduction to Mathematical Statistics II	5	Stat 4202	Introduction to Mathematical Statistics 2	4	1**, 2**, 3**	replaces Stat 421
	Math 588	Practicum in Actuarial Science	4	Math 3588	Practicum in Actuarial Science	3	2*, 3**	replaces 588
	Math 618	Theory of Interest	4	Math 3618	Theory of Interest	3	1*, 2**, 3**	expands on 618
<b>One of the following two-course sequences:</b>								
	Math 630	Actuarial Mathematics I	4	Math 5630	Life Contingencies 1	3	1*, 2**, 3**	replaces 630
	Math 631	Actuarial Mathematics II	4	Math 5631	Life Contingencies 2	3	1*, 2**, 3**	replaces 631
				Math 5633	Loss Models 1	3	1*, 2**, 3**	New courses.
				Math 5634	Loss Models 2	3	1*, 2**, 3**	
	Math 632	Actuarial Mathematics III	4	Math 5632	Financial Economics	3	1*, 2**, 3**	expands on 632
	Bus 420 or Bus 620	Foundations of Finance or Business Finance	4	Bus 2220 or Bus 2120	Business Finance	3 or 3	1*, 2, 3	replaces Bus 420, replaces Bus 620
	Math 532	Mathematical Foundations of Actuarial Science	3					Semester version listed below: recommended.
	CSE 200, 201, or 202	Computer Assisted Problem Solving for Business, Elementary Computer Programming, or Intro. To Programming & Algorithms for Engineers & Scientists	5 4 4					Semester versions are at 1000 level; listed above as prerequisites.
<b>Recommended extra courses</b>								
				Math 3532	Mathematical Foundations of Actuarial Science	3	1*, 2*, 3**	3532 replaces 532; No longer required
<b>Major program learning outcomes</b>								
Students will:	<b>1</b>	Acquire a strong general background in mathematics, statistics, and relevant concepts from actuarial science and business.						
	<b>2</b>	Develop analytical and problem solving skills.						
	<b>3</b>	Be prepared to pass national actuarial examinations administered by the Society of Actuaries and the Casualty Actuarial Society.						
* Learning outcomes are indicated for each course listed. Number of asterisks indicates level: none indicates beginning level, one is intermediate, two is advanced.								