LEHMAN COLLEGE
OF THE
CITY UNIVERSITY OF NEW YORK

DEPARTMENT OF MATHEMATICS

CURRICULUM CHANGE

1. **Type of Change:** Change in note.

2. **From:** ~~Strikethrough~~ the changes

Department(s)	Mathematics
Career	[X] Undergraduate [ ] Graduate
Academic Level	[X] Regular [ ] Compensatory [ ] Developmental [ ] Remedial
Subject Area	Mathematics
Course Prefix & Number	MAT 171
Course Title	Elements of Precalculus
Description	The use of functions, graphs, and matrices to solve various applied problems. Geometry of linear, quadratic, logarithmic, and exponential functions. **Notes** (1) MAT 171 is a prerequisite for MAT 174. Students planning on taking MAT 175 should take both MAT 171 and MAT ~~103~~. (2) Students may not receive credit for both MAT 171 and MAT 172.
Pre/ Co Requisites	A grade of C (or better) in MAT 104 or placement by the Department of Mathematics.
Credits	4
Hours	4
Liberal Arts	[X] Yes [ ] No
Course Attribute (e.g. Writing Intensive, WAC, etc)	NA
General Education Component	____ Not Applicable ____ Required ____ English Composition _X_ Mathematics ____ Science ____ Flexible ____ World Cultures ____ US Experience in its Diversity ____ Creative Expression

	____ Individual and Society ____ Scientific World

3. **To:** Underline the changes

Department(s)	Mathematics
Career	[X] Undergraduate [ ] Graduate
Academic Level	[X] Regular [ ] Compensatory [ ] Developmental [ ] Remedial
Subject Area	Mathematics
Course Prefix & Number	MAT 171
Course Title	Elements of Precalculus
Description	The use of functions, graphs, and matrices to solve various applied problems. Geometry of linear, quadratic, logarithmic, and exponential functions. **Notes** (1) MAT 171 is a prerequisite for MAT 174. Students planning on taking MAT 175 should take both MAT 171 and MAT 108. (2) Students may not receive credit for both MAT 171 and MAT 172.
Pre/ Co Requisites	A grade of C (or better) in MAT 104 or placement by the Department of Mathematics.
Credits	4
Hours	4
Liberal Arts	[X] Yes [ ] No
Course Attribute (e.g. Writing Intensive, WAC, etc)	NA
General Education Component	____ Not Applicable ____ Required ____ English Composition __X__ Mathematics ____ Science ____ Flexible ____ World Cultures ____ US Experience in its Diversity ____ Creative Expression ____ Individual and Society ____ Scientific World

4. **Rationale (Explain how this change will impact the learning outcomes of the department and Major/Program):**
The numbering of our Trigonometry class was changed to MAT 108 because we were unable to use MAT 103. The numbering change, however, was never made to the note in the MAT 171 course description. This correction fixes the error.

5. **Date of departmental approval:** December 3, 2020

LEHMAN COLLEGE
OF THE
CITY UNIVERSITY OF NEW YORK

DEPARTMENT OF MATHEMATICS

CURRICULUM CHANGE

1. **Type of Change:** Change in course description and hours.

2. **From:** ~~Strikethrough~~ the changes

Department(s)	Mathematics
Career	[X] Undergraduate [ ] Graduate
Academic Level	[X] Regular [ ] Compensatory [ ] Developmental [ ] Remedial
Subject Area	Mathematics
Course Prefix & Number	MAT 315
Course Title	Algebra and Number Systems II
Description	Continuation of MAT 314. Further study of algebraic structures; polynomials; topics chosen from theory of equations; Galois theory; and ruler and compass constructions.
Pre/ Co Requisites	MAT 314
Credits	~~3~~
Hours	~~3~~
Liberal Arts	[X] Yes [ ] No
Course Attribute (e.g. Writing Intensive, WAC, etc)	NA
General Education Component	__X_ Not Applicable ____ Required ____ English Composition ____ Mathematics ____ Science ____ Flexible ____ World Cultures ____ US Experience in its Diversity ____ Creative Expression ____ Individual and Society ____ Scientific World

3. **To:** Underline the changes

Department(s)	Mathematics
Career	[X] Undergraduate [ ] Graduate
Academic Level	[X] Regular [ ] Compensatory [ ] Developmental [ ] Remedial
Subject Area	Mathematics
Course Prefix & Number	MAT 315
Course Title	Algebra and Number Systems II
Description	Continuation of MAT 314. Further study of algebraic structures; polynomials; topics chosen from theory of equations; fields; field extensions; Galois theory; and ruler and compass constructions.
Pre/ Co Requisites	MAT 314
Credits	4
Hours	4
Liberal Arts	[X] Yes [ ] No
Course Attribute (e.g. Writing Intensive, WAC, etc)	NA
General Education Component	__X_ Not Applicable _____ Required _____ English Composition _____ Mathematics _____ Science _____ Flexible _____ World Cultures _____ US Experience in its Diversity _____ Creative Expression _____ Individual and Society _____ Scientific World

4. **Rationale (Explain how this change will impact the learning outcomes of the department and Major/Program):**

MAT 315 is an upper-level mathematics course taken by students who may be considering graduate study in Mathematics. A thorough understanding of fields and field extensions are essential to any student considering further study in advanced algebra. To cover these necessary added topics, additional class time and added work expectation are necessary. In addition, MAT 315 meets with the graduate course MAT 616: a 4 hour, 4 credit class. This change in hours in MAT 315 is necessary to ensure comparable

content coverage, student assignment/workload expectations, and rigor as compared to the graduate section.

5. **Date of departmental approval:** December 3, 2020

LEHMAN COLLEGE
OF THE
CITY UNIVERSITY OF NEW YORK

DEPARTMENT OF MATHEMATICS

CURRICULUM CHANGE

1. **Type of change:** New Course

2.

Department(s)	Mathematics
Career	[X] Undergraduate [ ] Graduate
Academic Level	[X] Regular [ ] Compensatory [ ] Developmental [ ] Remedial
Subject Area	Mathematics
Course Prefix & Number	MAT 364
Course Title	Financial Mathematics
Description	Simple interest, compound interest, force of interest, time value of money, present and future values, level annuities, increasing and decreasing annuities, arithmetic and geometric progressions, loans and amortization, outstanding balance at any time, interest and principal payments at any time, price of a bond, immunization, interest rate swaps, stocks.
Pre/ Co Requisites	MAT 176
Credits	4
Hours	4
Liberal Arts	[X] Yes [ ] No
Course Attribute (e.g. Writing Intensive, WAC, etc)	NA
General Education Component	_X__ Not Applicable ____ Required ____ English Composition ____ Mathematics ____ Science ____ Flexible ____ World Cultures ____ US Experience in its Diversity ____ Creative Expression ____ Individual and Society

	____ Scientific World

3. **Rationale:**
How mathematics relates to finance is an interesting, involved, and advanced subject with many career opportunities. Students that successfully complete this course will be more competitive on the job market in finance-related fields. Note: The revised description includes the changes recommended by the instructor in the experimental course to cover the required material and prepare students for the actuary FM exam.

4. **Learning Outcomes (By the end of the course students will be expected to):**
- Define and calculate key financial terms related to various types of interest rates and the accumulated value of money.
- Understand and calculate key quantities concerning annuities.
- Amortize loans and calculate outstanding balance, interest, and principal repaid
- Understand bonds and related terminologies, be able to price a bond.
- Understand the concept of an interest rate swap and calculate swap rates.

5. **Date of Departmental Approval:** December 3, 2020

LEHMAN COLLEGE
OF THE
CITY UNIVERSITY OF NEW YORK

DEPARTMENT OF MATHEMATICS

CURRICULUM CHANGE

1. **Type of change:** New Course

2.

Department(s)	Mathematics
Career	[X] Undergraduate [ ] Graduate
Academic Level	[X] Regular [ ] Compensatory [ ] Developmental [ ] Remedial
Subject Area	Mathematics
Course Prefix & Number	MAT 430
Course Title	Advanced Probability and Applications
Description	Continuation of MAT 330. Conditional probability, applications of Bayes' theorem; prominent examples of probability mass and density functions; moments and central moments, moment generating function, probability generating functions, joint and marginal distributions, linear combination of linearly independent random variables, and applications of the central limit theorem. A strong emphasis on applying theory to problem-solving. Note. Material covered in this class will help students prepare for the Society of Actuaries' P Exam.
Pre/ Co Requisites	MAT 330
Credits	4
Hours	4
Liberal Arts	[X] Yes [ ] No
Course Attribute (e.g. Writing Intensive, WAC, etc)	NA
General Education Component	_X_ Not Applicable ____ Required ____ English Composition ____ Mathematics ____ Science ____ Flexible ____ World Cultures ____ US Experience in its Diversity

	____ Creative Expression ____ Individual and Society ____ Scientific World

3. **Rationale:**
This course covers additional topics in applied probability not covered in MAT 330. This course will allow students to apply the theoretical mathematics that they learn in MAT 330: Probability and Statistics to real-world problems. In addition, students will become familiar with how probability is used as a tool to solve problems encountered in actuarial science. Note: The revised description and hours includes the changes recommended by the instructor in the experimental course to cover the required material and prepare students for the actuary P exam.

4. **Learning Outcomes (By the end of the course students will be expected to):**
- Interpret and solve basic probability problems.
- Understand and calculate key quantities concerning binomial, negative binomial, geometric, Poisson, uniform, exponential, normal, random variables.
- Explain and calculate mean, mode, median, variance, and standard deviation.
- Interpret and calculate conditional probabilities.
- Understand the concept of independence and joint probability distributions.
- Calculate marginal densities.
- Understand and apply the central limit theorem

5. **Date of Departmental Approval:** December 3, 2020

LEHMAN COLLEGE
OF THE
CITY UNIVERSITY OF NEW YORK

DEPARTMENT OF MATHEMATICS

CURRICULUM CHANGE

1. **Type of change:** New Course

2.

Department(s)	Mathematics
Career	[X] Undergraduate [ ] Graduate
Academic Level	[X] Regular [ ] Compensatory [ ] Developmental [ ] Remedial
Subject Area	Mathematics
Course Prefix & Number	MAT 464
Course Title	Advanced Financial Mathematics and Applications
Description	Continuation of MAT 364. Further study of cash flows and rates, arithmetic and geometric annuities, loans, retrospective and prospective methods, bonds, callable bonds, dollar and time-weighted rates of return, duration and convexity of a set of cash flows, spot rates, Redington immunization, interest rate swaps. A strong emphasis on applying theory to problem-solving. Note. Material covered in this class will help students prepare for the Society of Actuaries' FM Exam.
Pre/ Co Requisites	MAT 364
Credits	4
Hours	4
Liberal Arts	[X] Yes [ ] No
Course Attribute (e.g. Writing Intensive, WAC, etc)	NA
General Education Component	_X__ Not Applicable ____ Required ____ English Composition ____ Mathematics ____ Science ____ Flexible ____ World Cultures ____ US Experience in its Diversity ____ Creative Expression

	____ Individual and Society ____ Scientific World

3. **Rationale:**
This course covers additional topics in applied financial mathematics not covered in MAT 364. This course will allow students to apply the theoretical mathematics that they learn in MAT 364: Financial Mathematics to real-world problems. In addition, students will become familiar with how financial mathematics is used as a tool to solve problems encountered in actuarial science. Note: The revised description and hours includes the changes recommended by the instructor in the experimental course to cover the required material and prepare students for the actuary FM exam.

4. **Learning Outcomes (By the end of the course students will be expected to):**
- Understand and calculate accumulated values, present and future values for a sequence of payments.
- Be able to amortize loans and calculate outstanding balances, interest and principal repaid.
- Understand the concept of bond and calculate its price as a function of the number of coupons, par value, interest rate, and coupon rate.
- Understand yield curves and calculate rates of return and measures of duration and convexity.
- Explain interest rate swaps and perform related calculations.

5. **Date of Departmental Approval:** December 3, 2020

LEHMAN COLLEGE
OF THE
CITY UNIVERSITY OF NEW YORK

DEPARTMENT OF MATHEMATICS

CURRICULUM CHANGE

Name of Program and Degree Award: Actuarial Mathematics Minor
Effective Term: Fall 2021

1. Type of Change: Create new minor.

2. Description:
Actuarial Mathematics Minor

The Actuarial Mathematics minor is designed to provide broad training in the basic mathematics needed to pursue a career in actuarial science. Special attention is given to probability, financial mathematics, and mathematical statistics. The courses are organized to assist the student to prepare for both the Actuarial P and Actuarial FM Exams; the program also includes a course recognized by the Society of Actuaries for Validation by Educational Experience (VEE) credit.

The requirements for the minor are the following 3 courses (12 credits):

MAT 327: Statistical Inference (4 credits)
MAT 430: Advanced Probability and Applications (4 credits)
MAT 464: Advanced Financial Mathematics and Applications (4 credits)

3. Rationale:
The profession of actuary consistently ranks among the top jobs in the United States with demand overpowering supply for the last 30+ years. In fact, employment of actuaries is projected to increase by 10% over the next 10 years. This minor will provide students with the mathematics necessary to pursue further study and/or a career in Actuarial Science. The program includes both theoretical and practical supports for students to successfully earn credentials recognized by the Society of Actuaries, the leading global professional organization for actuaries. These credentials will make our graduates more competitive on the job market and greatly increase their likelihood of future economic success – furthering Lehman's 90x30 vision and fueling its mission as an engine of upward social mobility for its students.

4. Date of departmental approval: December 3, 2020

LEHMAN COLLEGE
OF THE
CITY UNIVERSITY OF NEW YORK

DEPARTMENT OF MATHEMATICS

CURRICULUM CHANGE

Name of Program and Degree Award: Mathematics, B.A.
Hegis Number: 1701.00
Program Code: 34030
Effective Term: Fall 2021

1. **Type of Change:** Addition of Dual Degree Language

2. **From:**
Mathematics, B.A. (43-47 Credit Major)

There are twelve required courses: 31 Credits

		Credits
MAT 175	Calculus I	4
MAT 176	Calculus II	4
MAT 226	Vector Calculus	4
MAT 313	Elements of Linear Algebra	4
MAT 314	Algebra and Number Systems I	4
MAT 320	Analysis I	4
CMP 167	Programming Methods I	3
MAT 330	Probability and Statistics	4
	Or	
MAT 323	Ordinary Differential Equations	4
	Or	
MAT 424	Partial Differential Equations and Applications	4

12-16 credits in four additional courses chosen from among 200-level or higher MAT courses, not counting:

		Credits
MAT 231	Statistics for Biologists	4
MAT 300	Mathematical Models in the Social Sciences	3

MAT 301	Applied Statistics and Computer Analysis for Social Scientists	3
MAT 348	Mathematical Methods for Management	4
MAT 328	Techniques in Data Science	4

May be among the chosen:

	Credits
CMP 332 Numerical Methods	3

Note: Mathematics majors pursuing NYS teaching certification should consult with their education program adviser before choosing the required elective courses.

3. **To:**
Mathematics, B.A. (43-47 Credit Major)

There are twelve required courses: 31 Credits

		Credits
MAT 175	Calculus I	4
MAT 176	Calculus II	4
MAT 226	Vector Calculus	4
MAT 313	Elements of Linear Algebra	4
MAT 314	Algebra and Number Systems I	4
MAT 320	Analysis I	4
CMP 167	Programming Methods I	3
MAT 330	Probability and Statistics	4
	Or	
MAT 323	Ordinary Differential Equations	4
	Or	
MAT 424	Partial Differential Equations and Applications	4

12-16 credits in four additional courses chosen from among 200-level or higher MAT courses, not counting:

		Credits
MAT 231	Statistics for Biologists	4

MAT 300	Mathematical Models in the Social Sciences	3
MAT 301	Applied Statistics and Computer Analysis for Social Scientists	3
MAT 348	Mathematical Methods for Management	4
MAT 328	Techniques in Data Science	4

May be among the chosen:

	Credits
CMP 332 Numerical Methods	3

Note: Mathematics majors pursuing NYS teaching certification should consult with their education program adviser before choosing the required elective courses.

BA to MA Dual Credit Opportunity for Mathematics Majors

Undergraduate students majoring in Mathematics with 90 or more credits and a minimum of a (3.0) cumulative index and (3.0) index in the major may be permitted to enroll in up to 12 credits of graduate coursework for the College's MA in Pure Mathematics. The following graduate courses may be taken in place of related undergraduate courses.

MAT 616 (For MAT 315)
MAT 711 (For MAT 456)
MAT 733 (For MAT 432)
MAT 734 (For MAT 434)
MAT 741 (For MAT 433)
MAT 751 (For MAT 422)
MAT 753 (For MAT 423)
MAT 754 (For MAT 456)
MAT 759 (For MAT 456)
MAT 771 (For MAT 442)
MAT 775 (For MAT 441)
MAT 789 (For MAT 456)

The student must receive permission from the department prior to registration.

4. **Rationale (Explain how this change will impact learning outcomes of the department and Major/Program):**
New York State allows individuals to apply up to 12 credits towards both their undergraduate and graduate degrees in the same field with the permission of the department. This policy makes it clear which students and which electives qualify for this opportunity. The courses listed were specifically selected because they are the more advanced undergraduate electives offered by the Department of Mathematics. More specifically, they each require an advanced undergraduate elective as a prerequisite, thus meeting a high standard of academic and mathematical rigor appropriate for a graduate degree.

5. **Date of departmental approval:** December 3, 2020

LEHMAN COLLEGE
OF THE
CITY UNIVERSITY OF NEW YORK

DEPARTMENT OF MATHEMATICS &
DEPARTMENT OF ECONOMICS AND BUSINESS

CURRICULUM CHANGE

Name of Program and Degree Award: Economics and Mathematics, B.A.
Hegis Number: 2204.00
Program Code: 36853
Effective Term: Fall 2021

1. **Type of Change:** Add Additional MAT Electives

2. **From:**
Economics and Mathematics, B.A. (57-58 Credit Major)

Program Description: 57-58 Credits Major in Economics and Mathematics

Course Description:

Foundation Courses (23 credits)

	Credits
ECO 166 Introduction to Macroeconomics	3
ECO 167 Introduction to Microeconomics	3
ECO 302 Economic Statistics	3
ECO 402 Econometrics	4
MAT 175 Calculus I	4
MAT 176 Calculus II	4

MAT 155 (1 credit) is a co-requisite of MAT 175 and MAT 156 (1 credit) is a co-requisite of MAT 176.

Requirements (25 credits)

		Credits
ECO 300	Intermediate Macroeconomics	3
ECO 301	Intermediate Microeconomics	3
ECO 401	Introduction to Mathematical Economics	3
MAT 226	Vector Calculus	4

MAT 301	Applied Statistics and Computer Analysis for Social Scientists	3
MAT 313	Elements of Linear Algebra	4
MAT 330	Probability and Statistics	4

Electives (9-10 credits)

One Mathematics course to be chosen from the list below:

	Credits
MAT 347 Game Theory and Linear Programming	3
MAT 349 Operations Research	4
MAT 424 Partial Differential Equations and Applications	4

Two Economic courses to be chosen from the list below:

	Credits
ECO 305 Consumer Economics	3
ECO 306 Money and Banking	3
ECO 311 Public Economics	3
ECO 322 Economic History of Developing Countries	3
ECO 324 International Economics	3
ECO 326 Labor Economics	3
ECO 331 Industrial Organization and Regulation	3
ECO 338 Law and Economics	3
ECO 344 Economic Evaluation of Health Programs	3
ECO 345 Health Economics	3
ECO 431 Managerial Economics	3

3. **To:**
Economics and Mathematics, B.A. (57-58 Credit Major)

Program Description: 57-58 Credits Major in Economics and Mathematics

Course Description:

Foundation Courses (23 credits)

	Credits
ECO 166 Introduction to Macroeconomics	3
ECO 167 Introduction to Microeconomics	3
ECO 302 Economic Statistics	3
ECO 402 Econometrics	4

MAT 175 Calculus I	4
MAT 176 Calculus II	4

MAT 155 (1 credit) is a co-requisite of MAT 175 and MAT 156 (1 credit) is a co-requisite of MAT 176.

Requirements (25 credits)

		Credits
ECO 300	Intermediate Macroeconomics	3
ECO 301	Intermediate Microeconomics	3
ECO 401	Introduction to Mathematical Economics	3
MAT 226	Vector Calculus	4
MAT 301	Applied Statistics and Computer Analysis for Social Scientists	3
MAT 313	Elements of Linear Algebra	4
MAT 330	Probability and Statistics	4

Electives (9-10 credits)

One Mathematics course to be chosen from the list below:

		Credits
MAT 323	Ordinary Differential Equations	4
MAT 327	Statistical Inference	4
MAT 347	Game Theory and Linear Programming	3
MAT 364	Financial Mathematics	4
MAT 349	Operations Research	4
MAT 424	Partial Differential Equations and Applications	4
MAT 430	Advanced Probability and Applications	4
MAT 464	Advanced Financial Mathematics and Applications	4

Two Economic courses to be chosen from the list below:

	Credits
ECO 305 Consumer Economics	3
ECO 306 Money and Banking	3
ECO 311 Public Economics	3
ECO 322 Economic History of Developing Countries	3
ECO 324 International Economics	3
ECO 326 Labor Economics	3
ECO 331 Industrial Organization and Regulation	3

ECO 338 Law and Economics	3
ECO 344 Economic Evaluation of Health Programs	3
ECO 345 Health Economics	3
ECO 431 Managerial Economics	3

4. **Rationale (Explain how this change will impact learning outcomes of the department and Major/Program):**
The Departments of Mathematics and Business and Economics have identified existing and newly created MAT courses that are relevant to students pursuing this degree. Adding these classes to the list of possible MAT electives will not only help students to complete their degree on time, but also provide them with additional opportunities to pursue focused areas of mathematical study relevant to their program of study.

5. **Date of departmental approval:**
Department of Economics and Business:11/13/2020
Department of Mathematics: 2/3/2020