CNAS ASSESSMENT COMMITTEE
MATHEMATICS (MA) DEGREE PROGRAM
CURRICULAR MAPPINGS AND COURSE EXPECTED STUDENT LEARNING OUTCOMES (SLOs)

I. CURRICULAR MAPPINGS

A. DEGREE PROGRAM CURRICULAR MAPPING

MATH PROGRAM LEARNING OBJECTIVES

MA PR-1: Demonstrate critical thinking, problem solving skills and ability to use mathematical methods by identifying, evaluating, and classifying, analyzing, synthesizing, data and abstract ideas in various contexts and situations.

MA PR-2: Demonstrate the knowledge of current mathematical applications, computing practices and technology use in industry, and science and education.

MA PR-3: Demonstrate ability to use modern software, abstract thinking, and mathematical practices connected to scientific and industrial problems, and demonstrate these skills that are currently used by technologies in society and education.

MA PR-4: Perform skills that enable them to evaluate, propose and convey novel solutions to scientific and business problems, etc.

MA PR-5: Demonstrate a sense of exploration that enables students to pursue lifelong learning and currency in their careers in mathematics, statistics, education, high-tech and bi-tech industries.

COURSE NO. (Required, recommended or possibly needed for math majors)	LINK TO PROGRAM OBJECTIVES (The numbers are course SLO numbers that link the course to the program SLO – See Section II for the defined course SLO numbers)				
	MA PR-1	MA PR-2	MA PR-3	MA PR-4	MA PR-5
MA*088[1]	12345				
MA*151	12345				
MA*161A	1-10	1-10	1-10		
MA*161B	12345	12345	12345		
MA*165	1234	1234	1234		
MA*203	12345	12345		12345	12345
MA*204	12345	12345	12345	12345	12345
MA*205	12345	12345	12345		
MA*301	1234	1234		1234	
MA*302	12345		12345	12345	12345
MA*341	1234	1234		1234	1234
MA*351	1234			1234	
MA*361[2]					
MA*375	12345	12345	12345	12345	
MA*385	12345		12345	12345	12345
MA*411	12345				12345
MA*421	123				123
MA*422	123				123
MA*431	123456	123456		123456	123456
MA*441[2]					
MA*451[2]					
MA*453	1234	1234	1234	1234	1234
MA*460[2]					
MA*461[2]					

[1]Approved by CNAS-AAC/Dean to be offered as MA*115; **[2]PENDING FACULTY INPUT**

B. MATHEMATICS GE CURRICULAR MAPPING

ESSENTIAL SKILLS (MATHEMATICS) GE LEARNING OBJECTIVES	COURSE NO.	LINK TO MATH GE OBJECTIVES (The numbers are course SLO numbers that link the course to the program SLO – See Section II for the defined course SLO numbers)				
		MA GE-1	MA GE-2	MA GE-3	MA GE-4	MA GE-5
MA/GE-1: Utilize algebraic skills to interpret and process quantitative data.						
MA/GE-2: Demonstrate familiarity with basic mathematical concepts and methods.	MA*110	1234	1234	1234	1234	
MA/GE-3: Identify and classify functions by properties and applications areas.						
	MA*161a	1-10	1-10	1-10	1-10	
MA/GE-4: Develop skills to present, visualize and solve problems using mathematical modeling.						
	MA*161b	12345	12345	12345	12345	
	MA*165	1234	1234	1234	1234	
	MA*203	12345	12345	12345	12345	

C. DEVELOPMENTAL MATH MAPPING

DEVELOPMENTAL MATH LEARNING OBJECTIVES	COURSE NO.	LINK TO DEVELOPMENTAL OBJECTIVES (The numbers are course SLO numbers that link the course to the program SLO – See Section II for the defined course SLO numbers)				
		DEV MA-1	DEV MA-2	DEV MA-3	DEV MA-4	DEV MA-5
	MA*084A	1234	1234	1234		
DEV MA- 1: Perform algebraic operations on integers, fractions, decimals and expression involving variables.	MA*084B	12345	12345	12345	12345	
	MA*085	1234	1234	1234	1234	
DEV MA-2: Sketch graphs of linear equations and interpret graphs representing statistical data.						
DEV MA-3: Construct equations representing word problems and solve the equations mathematically.						
DEV MA-4: Demonstrate familiarity with geometric figures and the different units of measurement.						

II. MATH APPROVED COURSE EXPECTED SLOs

COURSE NO.	COURSE SLOs
MA*084A: Fundamentals of Mathematics I, Lecture Only (NDU)	**Upon successful completion of this course, students will be able to** 1. Perform algebraic operations on integers, fractions, decimals and expression involving variables. 2. Construct equations representing word problems and solve the equations mathematically. 3. Compute percentages in order to interpret statistical data. 4. Convert the units between two different systems. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
MA*084B: Fundamentals of Mathematics II, Lecture Only (NDU)	**Upon successful completion of this course, students will be able to** 1. Perform algebraic operations on integers, fractions, decimals and expression involving variables. 2. Generate graphs of linear equations and inequalities. 3. Interpret graphs representing statistical data. 4. Use algebraic representations to solve real-life applications and problems. 5. Demonstrate familiarity with geometric concepts and different units of measurement. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
MA*085: Fundamentals of Mathematics I, II (NDU)	**Upon successful completion of this course, students will be able to** 1. Perform algebraic operations on integers, fraction, decimals and expression involving variables. 2. Sketch graphs of linear equations and interpret graphs representing statistical data. 3. Construct equations representing word problems and solve the equations mathematically. 4. Demonstrate familiarity with geometric figures and the different units of measurement. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
MA*088: Intermediate Algebra (Approved by CNAS-AAC/Dean to be offered as MA*115)	**Upon successful completion of this course, students will be able to** 1. Demonstrate enhancement of basic fluency, in routine operations of elementary algebra (short pre-and post-session test will be administered) 2. Graph and sketch linear, quadratic, polynomial, rational, exponential and logarithmic functions. 3. Show facility with the analytic treatment of linear, quadratic, polynomial, rational, radical, exponential and logarithmic functions. 4. Exhibit evidence of a thorough acquaintance with exponential and logarithmic functions and with applications of these functions in such fields as the mathematics of personal finance, biology and physical science. 5. Formulate equations from quantitative data, given verbally; use learned algebraic methods to solve simultaneous sets of linear equations, to include the introductory use of elementary matrix methods. Note: With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
MA*110: Finite Mathematics	**Upon successful completion of this course, students will be able to** 1. Demonstrate familiarity with linear, quadratic, exponential and logarithmic functions. 2. Apply the concept of function in making models for problem solving. 3. Solve systems of equations and perform operations on matrices. 4. Construct mathematical models and solutions for optimization problems graphically. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

MA*151: Introductory Statistics	**Upon successful completion of this course, students will be able to** 1. Organize data and explore the frequency distribution of data. 2. Represent data in frequency distributions graphically. 3. Determine the probabilities of independent and dependent events. 4. Use and apply the normal distribution to compute the probability of a random outcome. 5. Demonstrate understanding and using linear regression to make prediction and interpretation. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
MA*161A: College Algebra and Trigonometry	**Upon successful completion of this course, students will be able to** 1. Demonstrate an understanding of polynomial, rational, exponential, and logarithmic functions and their corresponding graphical representations. 2. Generate graphs of polynomial, rational, exponential, and logarithmic functions without graphing calculator. 3. Use polynomial, rational, exponential, and logarithmic functions to solve real-life application and problems. 4. Demonstrate an understanding and application of systems of equations. 5. Use and apply the matrix method to solve systems of equations. 6. Sketch the graphs of different kinds of functions, identify their domain and range, and construct new functions from a given set of functions. 7. Solve different kinds of equations: linear, quadratic, radical, polynomial, exponential and logarithmic. 8. Formulate appropriate mathematical equations and use these equations to solve world problems. 9. Demonstrate skill in performing the fundamental operations on radicals, polynomials and complex numbers. 10. Perform algebraic operations on matrices and apply this knowledge in solving system of linear equations. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
MA*161B: College Algebra and Trigonometry	**Upon successful completion of this course, students will be able to** 1. Demonstrate understanding of trigonometric functions and the ability to sketch their graphs without a graphing calculator. 2. Verify trigonometric identities and solve trigonometric equations. 3. Use the Law of Cosines and the Law of Sines to solve application problems 4. Demonstrate understanding of DeMoivre's Theorem, vectors, the dot product and polar coordinates. 5. Demonstrate understanding of sequences, arithmetic series, geometric series, and the binomial theorem. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
MA*165: PreCalculus	**Upon successful completion of this course, students will be able to** 1. Identify functional relationships between two variables, both graphically and algebraically. 2. Specify the graphical and algebraic characteristics of polynomial, rational, exponential, logarithmic, and trigonometric functions. 3. Employ mathematical modeling techniques to solve problems using polynomial, rational, exponential, logarithmic, and trigonometric functions. 4. Identify the characteristics of the conic sections, both graphically and algebraically. ESP Specific Goals Students will: ⇨Develop enthusiasm for mathematics and sciences ⇨Create long lasting friendships, and learning community ⇨Become confident and independent problem solver ⇨Develop communications and team working skills **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
MA*203: Calculus I	**Upon successful completion of this course, students will be able to** 1. Demonstrate understanding of limits, continuity, and derivatives of functions. 2. Use the product, quotient and chain rules for direct and implicit differentiation. 3. Find derivatives of polynomial, rational, exponential, logarithmic, trigonometric and hyperbolic functions. 4. Use differential calculus in curve sketching and problems solving. 5. Find definite and indefinite integrals of a limited number of elementary functions. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.

MA*204: Calculus II	**Upon successful completion of this course, students will be able to** 1. **Apply** integrals to compute areas, volume and arc length. 2. **Identify** and **perform** various techniques to evaluate integrals. 3. **Solve** simple differential equations. 4. **Describe** objects in both rectangular and polar coordinate systems. 5. **Construct** Taylor series for different classes of functions. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
MA*205: Multivariable Calculus	**Upon successful completion of this course, students will be able to** 1. Demonstrate knowledge of the theory and applications of functions of several variables and vector-valued functions. 2. Apply differential calculus, multiple integrals and vector integral calculus to solve optimization, extreme value and other application problems 3. Perform partial differentiation, compute total and directional derivatives. 4. Use line integrals and surface integrals to gain insight of vector fields. 5. Describe divergence and curl in the context of general integral theorems. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
MA*301: Differential Equations	**Upon successful completion of this course, students will be able to** 1. Demonstrate ability to use the technology surrounding the study of differential equations. 2. Solve first order differential equations and those of higher order. 3. Use power series, Laplace transforms, and linear algebra techniques to solve differential equations. 4. Increase their mathematical maturity and ability to read mathematics and use it to solve applied problems. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
MA*302: Foundations of Higher Mathematics	**Upon successful completion of this course, students will be able to** 1. Implement set theoretic concepts to describe relations between mathematical objects. 2. Analyze, recognize and design the logical structure of mathematical statements. 3. Read, understand and explain complex mathematical proofs. 4. Invent and write down sound mathematical proofs utilizing various methods, including mathematical induction. 5. Demonstrate knowledge of functions, relations, orders and cardinalities. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
MA*341: Linear Algebra	**Upon successful completion of this course, students will be able to** 1. Use basic algorithms employed in linear algebra (e.g. Gauss-Jordan elimination). 2. Demonstrate knowledge of the theory and application of vectors, matrices, vector spaces and linear transformations. 3. Apply linear algebra for problem solving by demonstrating the ability to adapt the conceptual tools they are given to different kinds of problems. 4. Make use of appropriate computer software now available as an aid in calculations. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
MA*351: Discrete Structures	**Upon successful completion of this course, students will be able to** 1. Demonstrate the ability to perform calculations on population growth, using both the finite and the continuous models (logistic equations); a term paper on the problem of world population will be assigned. 2. Exhibit facility in mathematical problems possessing symmetries, both geometric and algebraic. 3. Show conceptual familiarity with concepts of descriptive statistics and performance of practical calculations in inferential statistics, to include hypothesis testing. 4. Show evidence of a significant familiarity with the problems of graph theory, to include Euler and Hamilton circuits. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
MA*361: N umber Theory	**PENDING FACULTY INPUT**
MA*375: Numerical Methods and Software	**Upon successful completion of this course, students will be able to** 1. Analyze the efficiency of numerical methods and estimate computational error patterns. 2. Utilize matrix algebra for solving linear systems of equations by elimination and iteration.

	3. Create best fitting curves to data and compute liner regression by the least squares methods. 4. Approximate integrals by the Newton Coates formulas, the trapezoid rule and Romberg's method. 5. Design and implement MATLAB programs and M-files to solve numerical problems. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
MA*385: Applied Statistics	**Upon successful completion of this course, students will be able to** 1. Determine the point and interval estimates of population parameters. 2. Perform steps for significance tests about the hypothesis of one or two populations. 3. Perform an ANOVA and subsequent tests for multiple comparisons. 4. Construct a chi-square table and perform chi-square tests. 5. Clarify the difference between nonparametric statistics and parametric statistics. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
MA*392: Laboratory Teaching and Assisting	**PENDING FACULTY INPUT**
MA*411: Introduction to Abstract Algebra	**Upon successful completion of this course, students will be able to** 1. Determine and verify whether a given abstract structure is a group, a ring, or neither of the two. 2. Recognize and apply the different ways of obtaining new structures from given ones like taking subgroups, subrings, subfields, or forming direct sums/products. 3. Solve problems dealing with concrete groups like cyclic groups and permutation groups by applying the intrinsic properties of these groups. 4. Compare algebraic features of mathematical systems through the use of homomorphism or isomorphism. 5. Prove general statements about properties of groups and rings by using deductive reasoning that proceeds from the defining axioms or from previously established theorems. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
MA*421: Introduction to Analysis I	**Upon successful completion of this course, students will be able to** 1. Demonstrate familiarity with the limits, sequences, series and continuous functions. 2. Refine skills in communicating mathematics effectively by participating in classroom discussions and presenting work orally in class. 3. Refine skill in reading, writing, and ascertaining the validity of proofs. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
MA*422: Introduction to Analysis II	**Upon successful completion of this course, students will be able to:** **1.** Demonstrate familiarity with the limits, sequences, series and continuous functions. **2.** Refine skills in communicating mathematics effectively by participating in classroom discussions and presenting work orally in class. **3.** Refine skill in reading, writing, and ascertaining the validity of proofs. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
MA*431: Topics in Advanced Mathematics	**Upon successful completion of this course, students will be able to** 1. Demonstrate the ability to read and understand mathematics proofs by reading and analyzing proofs in class, in homework assignments, and in exams. 2. Demonstrate the ability to create and write mathematics proofs by writing and explaining proofs in class, in homework assignments, and in exams. 3. Demonstrate the ability to use the techniques and theory covered to establish more complex results by presenting them in class, by completing homework assignments and taking exams. 4. Demonstrate effectively the ability to communicate mathematics verbally by reading and writing mathematics and by presenting work orally in class, turning in homework assignments on topics covered and taking exams. 5. Demonstrate knowledge of the basic axioms and theory underlying calculus by presenting them in class, by completing homework assignments and taking exams. 6. Refine skills in reading, writing, and ascertaining the validity of mathematical proofs. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
MA*441: Modern Geometry	**PENDING FACULTY INPUT**
MA*451: Probability and	**PENDING FACULTY INPUT**

Statistics	
MA*453: Operations Research Models	**Upon successful completion of this course, students will be able to** 1. Formulate linear programming model for variety of situations. Solve LP by using graphical methods, simplex method or duality. Perform sensitivity and post optimality analysis. 2. Identify the main features of a dynamical programming problem. Perform forward and backward recursion in DP. 3. Analyze the Markov chains and its long run behavior with applications. 4. Define the queuing systems, identify the service and arrival distributions, calculate the steady state. **Note:** With Program Faculty Consultation, an instructor may add additional SLOs to the above Program Faculty approved SLOs.
MA*460: Numerical Linear Algebra	**PENDING FACULTY INPUT**
MA*461: Numerical Analysis	**PENDING FACULTY INPUT**