KINGSBOROUGH COMMUNITY COLLEGE
The City University of New York

CURRICULUM TRANSMITTAL COVER PAGE

Department: Math and Computer Science **Date:** 2/21/2018

Title Of Course Or Degree: Precalculus for STEM Majors - MAT 9900

Change(s) Initiated: (Please check)

- ☐ Closing of Degree
- ☐ Closing of Certificate
- ☐ New Certificate Proposal
- ☐ New Degree Proposal
- ☑ New Course
- ☐ New 82 Course
- ☐ Deletion of Course
- ☐ Change in Degree or Certificate Requirements
- ☐ Change in Degree Requirements (adding concentration)
- ☐ Change in Pre/Co-Requisite
- ☐ Change in Course Designation
- ☐ Change in Course Description
- ☐ Change in Course Title, Numbers Credit and/or Hour
- ☐ Change in Academic Policy
- ☑ Pathways Submission:
  - ☐ Life and Physical Science
  - ☑ Math and Quantitative Reasoning
  - ☐ A. World Cultures and Global Issues
  - ☐ B. U.S. Experience in its Diversity
  - ☐ C. Creative Expression
  - ☐ D. Individual and Society
  - ☐ E. Scientific World

☐ **Other (please describe):** _____

PLEASE ATTACH MATERIAL TO ILLUSTRATE AND EXPLAIN ALL CHANGES

DEPARTMENTAL ACTION

Action by Department and/or Departmental Committee, if required:

Date Approved: 2/21/2018 **Signature, Committee Chairperson:** _____

I have reviewed the attached material/proposal

Signature, Department Chairperson: _____

Revised/Dec.2015/AK

KINGSBOROUGH COMMUNITY COLLEGE
THE CITY UNIVERSITY OF NEW YORK

NEW COURSE PROPOSAL FORM

1. **DEPARTMENT, COURSE NUMBER, AND TITLE (SPEAK TO ACADEMIC SCHEDULING FOR NEW COURSE NUMBER ASSIGNMENT):**

   Department of Mathematics and Computer Science
   Mat 9900
   Precalculus for STEM Majors

2. **DOES THIS COURSE MEET A GENERAL EDUCATION/CUNY CORE CATEGORY?**
   - ☐ **Life and Physical Science**
   - ☒ **Math and Quantitative Reasoning**
   - ☐ **A. World Cultures and Global Issues**
   - ☐ **B. U.S. Experience in its Diversity**
   - ☐ **C. Creative Expression**
   - ☐ **D. Individual and Society**
   - ☐ **E. Scientific World**

   IF YES, COMPLETE AND SUBMIT WITH THIS PROPOSAL A CUNY COMMON CORE SUBMISSION FORM.

3. **DESCRIBE HOW THIS COURSE TRANSFERS (REQUIRED FOR A.S. DEGREE COURSE). IF A.A.S. DEGREE COURSE AND DOES NOT TRANSFER, JUSTIFY ROLE OF COURSE, E.G. DESCRIBE OTHER LEARNING OBJECTIVES MET:**

4. **BULLETIN DESCRIPTION OF COURSE:**

   A course in analytic geometry and function theory. It covers both algebraic and functional aspects of polynomial and rational functions, radical functions, exponential and logarithmic functions, and both trigonometric and inverse trigonometric functions. It also includes a study of the conic sections and solving trigonometric equations. Recommended for students who will eventually take Calculus.

   This course is intended **only** for students whose major requires Calculus I (MAT 1500). Students who have completed MAT 1400 will **not** get credit for this course.

5. **CREDITS AND HOURS* (PLEASE CHECK ONE APPROPRIATE BOX BELOW BASED ON CREDITS):**

1-credit:	☐ 1 hour lecture ☐ 2 hours lab/field/gym
2-credits:	☐ 2 hours lecture ☐ 1 hour lecture, 2 hours lab/field

	☐ 4 hours lab/field
3-credits:	☐ 3 hours lecture ☐ 2 hours lecture, 2 hours lab/field ☐ 1 hour lecture, 4 hours lab/field ☐ 6 hours lab/field
4-credits:	☐ 4 hours lecture ☐ 3 hours lecture, 2 hours lab/field ☐ 2 hours lecture, 4 hours lab/field ☐ 1 hour lecture, 6 hours lab/field ☐ 8 hours lab/field
More than 4-credits:	☐ Number of credits: ____ (explain mix lecture/lab below) ___ Lecture ____Lab Explanation: This is a 6 hour course, 3 credits + 3 equated credits.

***Hours are hours per week in a typical 12-week semester**

6. **NUMBER OF EQUATED CREDITS IN ITEM #5:** 3

7. **COURSE PREREQUISITES AND COREQUISITES (IF NONE PLEASE INDICATE FOR EACH)**
   - **A. PREREQUISITE(S):** MAT 9800
   - **B. COREQUISITE(S):** None
   - **C. PRE/COREQUISITE(S):** None

8. **BRIEF RATIONALE TO JUSTIFY PROPOSED COURSE TO INCLUDE:**
   - **A. ENROLLMENT SUMMARY IF PREVIOUSLY OFFERED AS AN 82 (INCLUDE COMPLETE 4-DIGIT 82 COURSE NUMBER)**
   - **B. PROJECTED ENROLLMENT:** 3 - 4 sections per semester
   - **C. SUGGESTED CLASS LIMITS:** 30
   - **D. FREQUENCY COURSE IS LIKELY TO BE OFFERED:** Fall, Winter, Spring, Summer
   - **E. ROLE OF COURSE IN DEPARTMENT'S CURRICULUM AND COLLEGE'S MISSION:** Preparation for the Calculus, for STEM majors whose curriculum requires Mat 15.

9. **LIST COURSE(S), IF ANY, TO BE WITHDRAWN WHEN COURSE IS ADOPTED (NOTE THIS IS NOT THE SAME AS DELETING A COURSE):**

   None

10. **IF COURSE IS AN INTERNSHIP, INDEPENDENT STUDY, OR THE LIKE, PROVIDE AN EXPLANATION AS TO HOW THE STUDENT WILL EARN THE CREDITS AWARDED. THE CREDITS AWARDED SHOULD BE CONSISTENT WITH STUDENT EFFORTS REQUIRED IN A TRADITIONAL CLASSROOM SETTING:**

    N. A.

11. PROPOSED TEXT BOOK(S) AND/OR OTHER REQUIRED INSTRUCTIONAL MATERIAL(S):

Precaculus A Right Triangle Approach (2nd Custom Edition for Kingsborough Community College) by J.S. Ratti and Marcus McWaters, Pearson (2017)

12. REQUIRED COURSE FOR MAJOR OR AREA OF CONCENTRATION?

IF YES, COURSE IS REQUIRED, SUBMIT A SEPARATE CURRICULUM TRANSMITTAL COVER PAGE INDICATING A "CHANGE IN DEGREE OR CERTIFICATE REQUIREMENTS" AS WELL AS A PROPOSAL THAT MUST INCLUDE A RATIONALE AND THE FOLLOWING ADDITIONAL PAGES: A "CURRENT" DEGREE WITH ALL PROPOSED DELETIONS (STRIKEOUTS) AND ADDITIONS (BOLDED TEXT) CLEARLY INDICATED, AND A "PROPOSED" DEGREE, WHICH DISPLAYS THE DEGREE AS IT WILL APPEAR IN THE CATALOG (FOR A COPY OF THE MOST UP-TO-DATE DEGREE/CERTIFICATE REQUIREMENTS CONTACT AMANDA KALIN, EXT. 4611).

NYSED GUIDELINES OF 45 CREDITS OF LIBERAL ARTS COURSE WORK FOR AN ASSOCIATE OF ARTS DEGREE (A.A.), 30 CREDITS FOR AND ASSOCIATE OF SCIENCE DEGREE (A.S.), AND 20 CREDITS FOR AN APPLIED ASSOCIATE OF SCIENCE DEGREE (A.A.S.) MUST BE ADHERED TO FOR ALL 60 CREDIT PROGRAMS.

Required for students who intend to take calculus (MAT 1500) and who have not otherwise satisfied the prerequisite to MAT 1500.

13. IF OPEN ONLY TO SELECTED STUDENTS SPECIFY POPULATION:

Open to all students who satisfy the prerequisite requirement.

14. EXPLAIN WHAT STUDENTS WILL KNOW AND BE ABLE TO DO UPON COMPLETION OF COURSE:

Upon completion of the course, students will be able to:

1. Solve quadratic, polynomial, quadratic-like, radical, rational, exponential, logarithmic, trigonometric, and inverse trigonometric equations.
2. Solve linear, quadratic, polynomial, and rational inequalities.
3. Perform computations using a scientific calculator.
4. Sketch graphs of numerous functions and equations in two variables, including linear, square, cube, square root, absolute value, reciprocal, polynomial, rational, exponential, logarithmic, trigonometric, and inverse trigonometric functions; apply shifting techniques to obtain graphs of functions similar to those mentioned above.
5. Understand the geometric and algebraic relationships among these functions.
6. Create new functions by adding, subtracting, multiplying, dividing, and composing two or more given functions; find the inverse of a one-to-one function and relate the graphs of one-to-one and onto function and its inverse.
7. Obtain information about a function by analyzing its graph, including the domain, range, intercepts, symmetries, and intervals of increasing/decreasing/constant.
8. The Conic Sections: the parabola, ellipse, and hyperbola.
9. Graph trigonometric functions and understand transformation techniques: amplitude, period, frequency, and phase shift.

15. METHODS OF TEACHING –E.G. LECTURES, LABORATORIES, AND OTHER ASSIGNMENTS FOR STUDENTS, INCLUDING ANY OF THE FOLLOWING: DEMONSTRATIONS, GROUP WORK, WEBSITE OR E-MAIL INTERACTIONS AND/OR ASSIGNMENTS, PRACTICE IN APPLICATION OF SKILLS, ETC.:

The course is taught by classroom lecture and demonstration of specific algebraic and graphical concepts. Homework is assigned daily and is designed to improve and solidify student understanding and mastery of these concepts.

16. ASSIGNMENTS TO STUDENTS:

Assignments are taken from the textbook, and are chosen at the discretion of the instructor.

17. DESCRIBE METHOD OF EVALUATING LEARNING SPECIFIED IN #15 - INCLUDE PERCENTAGE BREAKDOWN FOR GRADING. IF A DEVELOPMENTAL COURSE INCLUDE HOW THE NEXT LEVEL COURSE IS DETERMINED AS WELL AS NEXT LEVEL PLACEMENT.

The evaluation of student learning is based upon regular classroom examinations and/or quizzes, in addition to a comprehensive departmental final examination. A typical breakdown would be:

Exam I:	17.5%
Exam II:	17.5%
Exam III:	17.5%
Exam IV:	17.5%
Final Exam:	30%

18. TOPICAL COURSE OUTLINE FOR THE 12 WEEK SEMESTER (WHICH SHOULD BE SPECIFIC REGARDING TOPICS COVERED, LEARNING ACTIVITIES, AND ASSIGNMENTS):

See attached.

19. SELECTED BIBLIOGRAPHY AND SOURCE MATERIALS:

1. Precalculus (10th Edition) by Ron Larson, Cengage Learning (2016)
2. Precalculus (10th Edition) by Michael Sullivan, Pearson Education (2018)
3. Precalculus: Mathematics for Calculus (7th Edition) by James Stewart, Lothar Redlin, and Saleem Watson, Cengage Learning (2016)
4. Precalculus by Jay Abramson, Openstax (2014)
5. Schaum's Outline of Precalculus by Fred Safier, McGraw-Hill (2013)
6. Precalculus Mathematics in a Nutshell by George F. Simmons, Resource Publications (2003)
7. Precalculus (7th Edition) by David Cohen and Theodore B. Lee, Brooks/Cole Cengage Learning (2012)
8. Precalculus (6th Edition) by Robert F. Blitzer, Pearson (2018)
9. Precalculus (6th Edition) by Margaret L. Lial, John Hornsby, David I. Schneider, and Callie J. Daniels, Pearson (2017)
10. Precalculus by Julie Miller and Donna Gerken, McGraw-Hill Education (2017)

Topical Course Outline

Hour	Topic
1	Review: Quadratic equations – Factoring Method, Square Root Property, completing the square, the Quadratic Formula and the discriminant
2	Review: Complex numbers – combining, multiplying, and dividing complex numbers; solving quadratic equations that have complex roots
3,4	Quadratic-like and polynomial equations
5	Radical equations
6	Review: Property of inequalities; solving linear inequalities; representing inequalities in interval and set notation; graphing sets on a number line
7-9	Polynomial and rational inequalities
10-13	Graphs of equations – linear equations in two variables (review), equations of circles (review), $y = x^2$, $y = x^3$, $x = y^2$, $y = \|x\|$, and $y = 1/x$; finding intercepts; checking for symmetry
14	Functions – definition of a function, functional notation, evaluating functions, implicit and explicit functions, finding domains
15	Obtaining information from the graph of a function – domain, range, intercepts, symmetry, the Vertical Line Test, intervals of increasing/decreasing/constant
16	Even and Odd Functions; Library of Basic Functions (Piecewise functions other than the absolute value function are optional)
17,18	Graphing Techniques – vertical and horizontal shifting, reflections, vertical (and horizontal) stretching and compressing; Combining several transformations
19	Review for Exam 1
20	Exam 1
21,22	Algebra of functions: adding, subtracting, multiplying, dividing, and composing functions; finding the domain of a sum, difference,

	product, quotient, or composition of two functions
23,24	One-to-One Functions; the Horizontal Line Test; Inverse Functions: definition, verifying inverse functions, finding inverse functions, relating the graphs of a one-to-one function and its inverse
25	Quadratic Functions and their graphs: standard and general form of a quadratic function; graphing using the vertex, axis of symmetry, and intercepts
26,27	Power Functions and their graphs; Polynomial Functions and their graphs: zeros and their multiplicities of a polynomial function, determining the maximum number of turning points and end behavior
28-30	The Division Algorithm; the Remainder Theorem; the Factor Theorem; The Rational Zeros Theorem; Descartes's Rule of Signs; synthetic division (review); finding the real and complex zeros of a polynomial function
31,32	Rational functions and their graphs; finding vertical and horizontal asymptotes
33	Review for Exam 2
34	Exam 2
35	Exponential Functions and their graphs; using the calculator to computer real powers of a real number using the scientific calculator; the number 'e'
36	Logarithmic Functions and their graphs; the Natural and Common Logarithms; conversions between exponential and logarithmic forms; finding exact values of logarithms
37	Properties of logarithms: Change of Base Formula, Sum and Difference of Logarithms Formulas and Logarithm of a Power of an Expression Formula
38,39	Logarithmic and exponential equations
40-45	Conic Sections: Parabola, ellipse, hyperbola
46	Review for Exam 3
47	Exam 3
48	Review of Right Triangle Trigonometry: Fundamental Identities; 30°-60°-90° and 45°-45°-90° triangles

49-52	Review of Trigonometry of any angle: ASTC and reference angles; coterminal, negative, and quadrantal angles; Fundamental Identities; Review of Angle Formulas: Sum/Difference of Angles, Double Angle, and Half-Angle
53-55	The Unit Circle Approach to Trigonometry; domain and range of the six trigonometric functions; periodicity
56, 57	Graphs of the six trigonometric functions
58-60	Graphing trigonometric functions using transformation techniques; amplitude, period, frequency, and phase shift
61,62	Inverse trigonometric functions: graphs of arcsine, arccosine, and arctangent functions; properties of inverse trig. functions; finding the exact values
63	First-degree trig. equations
64-67	Second-degree trig. equations; multiple function and multiple angle equations; equations involving inverse trigonometric functions
68	Review for Exam 4
69	Exam 4
70-72	Review for Final Examination